The Impact of The Removal of Regulatory Controls:

Empirical and Experimental Evidence

by

Praveen Kujal

A Dissertation Submitted to the Faculty of the
DEPARTMENT OF ECONOMICS

In Partial Fulfillment of the Requirements
For the Degree of

DOCTOR OF PHILOSOPHY

In the Graduate College
THE UNIVERSITY OF ARIZONA

1 9 9 4

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

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

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

U·M·I

University Microfilms International
A Bell & Howell Information Company
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
313/761-4700 800/521-0600

Order Number 9506988

The impact of the removal of regulatory controls: Empirical and experimental evidence

Kujal, Praveen, Ph.D.

The University of Arizona, 1994

U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

The Impact of The Removal of Regulatory Controls:

Empirical and Experimental Evidence

by

Praveen Kujal

A Dissertation Submitted to the Faculty of the
DEPARTMENT OF ECONOMICS

In Partial Fulfillment of the Requirements
For the Degree of

DOCTOR OF PHILOSOPHY

In the Graduate College
THE UNIVERSITY OF ARIZONA

1 9 9 4

THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the Final Examination Committee, we certify that we have read the dissertation prepared by Praveen KUJAL

entitled The Impact of The Removal of Regulatory Controls: Empirical and Experimental Evidence.

and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy

R. Mark Isaac	August 9, 1994. Date
Ronald L. Oaxaca	August 9, 1994. Date
Stanley S. Reynolds	August 9, 1994. Date
	Date
	Date

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copy of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

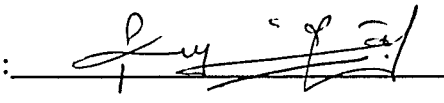
Dissertation Director	8/9/94 Date

R. Mark Isaac

STATEMENT BY THE AUTHOR

This dissertation has been submitted in partial fulfillment of the requirements for an advanced degree at the University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the Library.

Brief quotations from this dissertation are allowable without special permisssion, provided that accurate knowledge of source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the head of the major department or the Dean of the Graduate College when in his or her judgement the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the author.

SIGNED: 

ACKNOWLEDGEMENTS

I would like to thank the all members of my dissertation committee for their patience in seeing this through. Especially Mark Isaac who sat through what was a vague idea and helped me reach this stage. Special thanks also go to Vernon Smith and James Cox. To Vernon Smith for teaching me how to look at economics and getting me interested in Experimental Economics. To Jim Cox for listening to me for weeks and convincing me that this will be a worthwhile venture. Thanks are also due to Ken Kroner who served as an infinitely durable sounding board. To John Drabicki who provided moral support through the hardest two years of my life. Finally, thanks are due to all the economies around the world that chose to deregulate hence giving me a research topic.

To my friends, Anand and Venkat, who made sure I got dinner every night.

To all the people in the department of economics who were encouraging and helpful at every stage. Finally the people at the Economic Science Laboratory. Shawn Lamamster provided invaluable help during the running of the experiments. I am of course very grateful to the Economic Science Laboratory for providing me financial support for running the experiments.

In the end I would not like to forget Dave Conn who also taught me a lot about economics.

TO MY

FATHER AND (LATE) MOTHER

TABLE OF CONTENTS

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES-Continued

ABSTRACT

This dissertation looks at the impacts of removing regulatory controls on market structure, market performance, and market power. It looks at the effect of removing price and quantity controls in several economies and in Posted-Offer experimental markets. Understanding the impact of regulatory controls, and their removal, is increasingly relevant in the light of the world-wide relaxation of regulatory barriers.

I first look at the effect of removal of market controls in several economies all over the world and identify factors that can impede the deregulatory process. This is followed by a study of the effect of deregulation in the car and the scooter industry in India. The relaxation of regulatory controls is found to impact to market structure, product mix, and quality. Both the markets become increasingly competitive both in product mix and quality. The relaxation of regulatory controls has clearly benefited the consumers by increasing product choice and quality.

Two types of quantity controls, firm-specifc and market quotas, are identified. It is found that firm-specifc quotas alter the market supply in a fundamentally different manner than do market quotas. The removal of price controls and firm-specifc quantity controls is studied in an experimental posted offer market. It is found that firm-specifc quotas affect the convergence of average contracted prices in Posted-Offer markets. Prices tend to converge from below the market clearing price. Secondly, markets under price controls are more efficcient than under quantity restricions. This is explained by looking at the effect on search space. Quantity

restrictions affect the price search space in a different manner than do price controls. Quantity controls allow search in the price space thereby affecting the short run equilibrium in markets. Sellers tend to price themselves out of the market in the short run thereby affecting the short-run efficiency. Finally, I look at the effect on dynamic market power of removing quantity restrictions. It is shown that the measurement of market power in an environment with changing capacities can lead to misleading conclusions. What is perceived as a decline in market power may infact not affect the market power of the incumbents. Thus near monopoly outcomes can be misleadingly viewed as declines in market power.

Chapter-1

The Scope and Significance of De-Regulation

1. Introduction

In the past few years several world economies have witnessed an easing of controls both over economic and political activities.[1] All these economies, from totally planned to mixed, had a regime of controls, ranging from price controls (both over intermediate and final products) to distributional controls, and to direct government ownership of enterprises.[2] The extent of government participation in the economy varied between totally planned to mixed economies. In the mixed economies some private enterprise coexisted with the public sector, but were subject to substantial regulation. On the other hand in most of the centrally planned economies private enterprise was almost non-existent in the industrial sector.

Some of the economies that have eased economic controls, or have moved towards privatization, in the last few years are: India, New Zealand,and Britain (public sector co-existing with the private sector); and Hungary, Poland, Russia and the former Czechoslovakia (all previously totally planned economies). With the removal of regulatory barriers in these economies it will be interesting to study their transition towards a market economy. Given that most of these economies have only recently

---

[1] That is, certain economies have removed (Hungary, Poland, etc.) or reduced market controls while other economies (Britain, New-Zealand, etc.) have moved towards increased privatization.

[2] As in Britain, New Zealand, and India.

started experimenting with the removal of market controls, it will be a while before one will be able to see the consequences.

It will undoubtedly be true that the transition process itself raises interesting new questions. The questions raised by the deregulatory process ranges from how to 'create' markets in these economies to the transformation of the property rights rules. First, the most important question is, "How does one create private markets in what were previously totally planned economies?" This problem is exacerbated (for the planned economies) by the fact that no private property had existed. Another important question is, "What will be the obstacles to this transition towards a market economy?" The obstacles will arise due to a complex interplay of social, economic, and political factors. The social factors could be the resistance of a closed society to the changes in their social structure. That is, co-operatives will no more get state subsidies (taken for granted under socialism) and would have had to bear the risk of their enterprise. Also, economic efficiency (in a market economy) demands that resources be diverted from inefficient to efficient uses. As a result, individuals stand to lose (for example, jobs will be lost) and gain (opportunity to profit from enterprise) from the change. This will result in the creation of interest groups, for and against the changes, and create obstacles in the path towards privatization. Another fallout of a movement towards a market economy is increased autonomy. Increased autonomy implies delegation and liquidation of bureaucratic power, and this will not be received with much enthusiasm.

Furthermore, the deregulatory process will raise questions such as how costly are

these changes going to be? Do there exist effective means which may be used to understand the outcomes that may be generated from such changes? If such means exist, what do they tell us about the deregulation process? In this context, we will look at the Indian experience from the removal of these market controls in chapter-2. We examine the car and the scooter industry in India, where the outcomes from the removal of the market controls are evident. In order to analyze the impact of the removal of the market controls, chapter-3 and chapter-4 report the results of economic experiments designed to analyze the processes generated from the removal of the market controls.

This chapter proceeds as follows. We first identify the economies that have moved towards privatization and look at some of the paths (with the help of examples) these economies have chosen to implement privatization. This classification is based upon the economies' economic structure (that is, the property rights rules). This is followed by the analysis of some of the problems associated with the removal of the market controls and the regulatory implications associated with the deregulatory process.[3]

1.1. International Deregulatory Experiences.

Over the last decade, especially the last few years, there has been a change in the political climate of the world. There are not many economies left in the world, besides North Korea and Cuba, where political freedom has not begun to express itself.

---

[3] An analysis of the Political Economy of Deregulation for the Indian car and the scooter industry is done in chapter II. In the chapter the pre- and post deregulation scenario of the Indian car and scooter industry is studied.

Following this change in the political climate is the change in market organization, or the alteration of the property rights. Almost all the economies undergoing political changes are trying to develop institutional structures where private incentives play an important role in determining individual performance. To examine the economies undergoing political and economic changes we will first classify the economies on the basis of the economic structure before the reforms.

The economies are classified into three broad categories. First, planned economies, which includes the former Soviet Union, Poland, Hungary, the former Czechoslovakia, etc. Second, we will look at European Economic Community and the changing regulatory environment because of European unification. Third, we will look at economies where a large public sector co-exists with the private sector (we will call these mixed economies). This will include economies such as Britain, India, New Zealand, and Italy.

1.2. Planned Economies.

In the last few years we see that several of the planned economies in the world have changed or have made an effort towards changing their economic structure and still others are contemplating such changes. That is, there has been a trend towards changing rules regarding property rights, thereby changing the incentive structure prevalent in these economies. Some of the economies that have moved towards changing the incentive structure are (the former) Czechoslovakia, the (former) Soviet Union, Romania, Poland,

Hungary, (the former) East Germany, and Bulgaria.[4]

The common trend in all these economies is that they are moving (have already moved) towards a free market economy where property right rules promote private incentives. How these economies make the transition from planned to market economies varies across the economies, from the economic laws used in the former Soviet Union to Poland's National Consolidation Plan (Feb., 1989). Below, we look at some of the measures these economies have taken and the problems that may crop as they ease their restrictive economic laws.

1.2.1. (The Former) Soviet Union:

This is an overview of some of the changes that took place in the Soviet Union before its political break up. The institutional changes were brought about at the farm level, the firm level, in the exchange system and in the financial structure. Some of the changes that took place are as follows.

Starting July 1988 cooperatives were given a status equivalent to that of the state enterprises. There were to be restrictions on their size and few (almost none)[5] limits to the industries and services they can be involved in. There were no limits upon the

---

[4] In Bulgaria the trend towards privatization is not clear; however, recently the political structure has changed and the communist party has been overthrown.

It is worth mentioning that recently (The Economist, Jan. 27, 1989) there was a political demonstration in Mongolia. The major demands of the demonstrators were an end to one party rule, an elected parliament, and the introduction of free market reforms.

[5] In 1987 Gorbachev made a statement which said that the activities from which cooperatives cannot take part are the 'illegal' activities only!

amount the co-operative members could earn. The co-op members were to be able to share income, both on the basis of the amount of the work and capital contributed.[6] The co-operatives would not have to fulfill any plans and will be able to set their own prices.[7] There initial freedom were, however, quickly restricted (Dec. 1988). The co-operatives were then banned from some activities outright such as producing films, or treating patients with venereal diseases. For some other activities such as making perfumes they needed special contracts.[8]

Other reforms included reforms in the pricing system, credit reforms, agricultural reforms, reforms in the workplace, the State Enterprise Law, joint ventures, issue of Eurobonds, promoting private business, reforms in the wages policy, the incentive system, new system of supply, and reform of the financial system. We will now look at these reforms individually.

(i) Pricing system: There was an attempt to set prices such that they reflected supply and demand characteristics and were not set regardless of the consumer 'valuation' of the goods. Prices were to be set such that they reflected costs of production and the individual preferences of the buyers. Under this pricing reform real-cost pricing of industrial goods and consumer goods was was being propagated. Real cost pricing was

---

[6] A restriction, however, applies, that only those who work for the co-operatives can draw an income from them.

[7] The Economist, June 4, 1988, p.61.

[8] Each republic has also been given the freedom to impose extra restrictions of it's own upon the co-operatives.

considered a pre-condition for dynamic and balanced functioning of the economy.[9]

We thus see that in an economy where resource allocation was primarily by plans, prices playing no role at all, goods were starting to be allocated on the basis of relative scarcity. It was a reform in the resource allocation process in that 'perceived' needs (by the planner) no longer determine resource allocation. That is, resources would have been allocated on the basis of the 'rationing' role (that is , resources go to individuals who value them most) of prices. Resource allocation on the basis of plans and/or needs was thus substituted by resource allocation on the basis of relative scarcity.

(ii) Credit: Capital markets did not exist in the Soviet Union. A new law was passed that allowed banks to assess credit risks and to make loans to private businesses. Eventually businesses were to be allowed to lend money to each other through the bond market.[10]

(iii) Agricultural reforms: Individual farm co-operatives were given more autonomy. The co-operatives could sell the goods that were in excess of the amount contracted to the state. The state had also loosened it's controls over the farms. The state and the collective farms were allowed to sell 30% of their planned output independently. As a result a free market for food had slowly started to develop.

(iv) The State Enterprise Law: This law was passed in January 1988. The law

---

[9] OECD Observer, ibid.

[10] Blackman, Kip, "Gorbachev's Economic Gamble", Canadian Business Review, Summer 1988, p.29.

provided broader powers to the labor collective councils such that they could participate in the election and the dismissal of the enterprise management. The State Enterprise Law also enabled enterprises to finance their operations themselves and negotiate their own contracts for all purchase and sales decisions. Under this law factory managers had greater autonomy in determining prices and quantities.

The system of rigid planned targets was being replaced by minimum quotas. The quotas were to be set such that the manager could produce quantities well above the minimum requirements.

(v) Eurobonds: A $274 million Eurobond issue was floated on July 26, 1988. The purpose of the issue was to link the economy more to the industrialized west.[11]

(vi) Private business: A law was passed in May 1987 to promote private business. Private enterprise was permitted in the small scale sector. Since the passing of the law on co-operatives the number of co-operatives has grown to 50,000.[12] Emphasis was also put on the legalization of enterprise organized on a co-operative basis. Such enterprise could have up to 50 partners, who could freely determine their (own) pricing and marketing strategy. Also, new enterprise were permitted to make output and purchase decisions on their own.

(vii) Wages: The new wage system was introduced such that workers received remuneration on the basis of the quality of the work and the performance of the entire

---

[11] Business Week, Aug. 15, 1988, p.56.

[12] The Economist, Jan. 14, 1989, p.45.

enterprise.[13]

(viii) Incentives: Each firm was allowed to reatain their earnings. These (retained) earnings could be used by the management of the enterprise (on their discretion) for social purposes, such as the construction of creches, sports facilities, etc.

(ix) Supply: The proposal was to develop wholesale trade system which would eventually replace the centralized system for allocation of inputs and investment goods.

(x) Financial system: The intention was to remove the financial dependence of the enterprise on the state. The enterprise was to bear the financial responsibility for its own expenditure and investment. The implication of this was that money and bank lending was allowed to play a much larger role.[14]

Talks were also underway to open a Soviet bank in Canada.[15] Security Pacific Business Finance Limited (of England) signed a joint venture agreement with the Soviet-owned Moscow Nardony Bank in London to fund trade between Britain and the former Soviet Union.[16]

(xi) Joint ventures: Several private companies from the industrialized west and other countries were starting joint ventures. Fiat (Italy) had signed an agreement whereby

---

[13] OECD Observer, April-May, 1988, p.4.

[14] This implies that for the success of the measures undertaken to increase private autonomy the banking system should be modified and should diversify to cater to the larger (financial) role.

[15] Canadian Business Review, ibid.

[16] Business Week, ibid, p.57.

it was to produce 900,000 cars annually.[17] GM (U.S.A) was to supply car parts to the Soviet Union.[18] Pratt and Whitney were entering the Soviet aviation market through the Soviet government and the Motoron and Turbinen Union.[19] India had been operating a restaurant in Moscow now for three years. These restaurants were managed by the government owned Indian Tourist Development Corporation (ITDC) and they had plans to set up two more restaurants in Moscow. One of these restaurants was a joint venture with the Raddison chain of the United states. Another Indian hotelier, the Taj Group, was also setting up hotels in the Soviet Union. The Taj group had joined hands with Intourist and three hotels were under construction at Tashkent, Bukhara, and Samarkand.[20]

In 1990 the 'Shatalin Plan'[21] was approved (the alternative plan being proposed by the Soviet prime minister Ryzkov). The Shatalin plan was a 500 day, day-to-day, agenda to privatize the Soviet economy. The plan was radical in it's changes, however, the major objectives were the same as outlined above. The plan was radical in the sense that it accepted openly that, "Humanity has not yet developed anything more efficient than a market economy....The prerequisite to ensure the effective functioning of the market (includes) *de jure* equality of all types of property, including private property....revenue

---

[17] The New York Times, May 30, 1990, pD4(L), col. 3.

[18] The Wall Street Journal, June 8, 1990, p.A3(W), p.A3(E). col. 4.

[19] The New York Times, May 19, 1990, p.19(N), p.33(L), col.3.

[20] India Today, August 31, 1990, p.114.

[21] The Economist, Sept. 15, 1990.

from property should be recognized as lawful profit".[22] Thus the need for private property rights was recognized. The plan also emphasized the need for the change in the balance of power between the center and the republics.

Under the Shatalin plan, farmers could claim their plots of land, state enterprises were to be sold in a stage by stage manner, state monopolies were to be broken up, monetary and financial reforms were recognized as being necessary, government spending needed to be cut, and finally there was to be a 'controlled' price reform.

The Shatalin plan differed from the plan put forth by former Prime Minister Ryzkov in that, the prime minister's plan proposed stabilization first, through price deregulation and budget cuts, and then proceed with the structural reforms, i.e, privatization. Under the Shatalin plan price deregulation was to be last, and budget cuts only occured at the second stage of the plan.

Problems with the changes in the property rights rules.

Now, we look at some of the problems that had arisen due to the removal of some of the market controls in the Soviet Union. That is, some of the outcomes associated with the deregulatory process and the hurdles that the (deregulatory) process faced.

Imposition or removal of regulatory barriers results in the creation of special interest groups.[23] That is, there exist groups that will lose due to the removal of the market controls, and there are groups who stand to gain from the removal of the market

---

[22] ibid.

[23] See chapter III.

controls.[24,25] These groups will try their best to stall (if against the change) or accelerate (if for) the changes. It is not surprising that a similar scenario arose in many of the planned economies removing their market controls. That is (at least in the short run), one group that lost, in these planned economies, were the members of the government. The removal of the market controls cut down on the size of the bureaucracy, as decision making became independent and increasingly decentralized.[26] It is, therefore, reasonable to expect that the bureaucrats did try to impede the deregulatory process or find ways to sabotage it. Below we look at some of the examples drawn from the deregulatory experience of the Eastern block countries and EEC.

One of the major impediments to the introduction of a free market in the Soviet Union was that the changes were being blocked by the bureaucrats. Greater autonomy (in decision) also brings forth a smaller bureaucracy. As a result in the transition towards a market economy bureaucratic power was curbed, bureaucratic structure became leaner, and many bureaucrats lost their jobs. Also, the politicians (who had enjoyed special

---

[24] For example, say, for the case of a monopoly created due to government licensing. The monopoly stands to lose if the government controls are lifted and the consumers stand to gain from the increased competition (assuming that competition will make the market more efficient). The consumers will then form an interest group for the removal of the market controls, and the monopoly will lobby against the removal of the entry barriers.

[25] See, Noll and Owen, The Political Economy of Deregulation, American Enterprise Institute, 1983.

[26] For example, trivial decisions such as the needs of households are not made by the government officials but by the households themselves.

privileges until now) had to give up much of the administrative control. It is not surprising that increased resistance from the bureaucrats and the politicians towards the changes was forthcoming. For example, after the law on the privatization of co-operatives was passed, a decision was made (by the bureaucrats) to tax the co-operatives at 90%. Although the law was soon rescinded it was a good indicator of the resistance such laws met from the bureaucrats.

Gorbachev's offer of long term leases to farmers had also met with resistance from the farmers themselves.[27] One of the reasons for the above could be that (until then) Russia had collectivized it's peasantry into a rural proletariat which did not take the leasing offer with much enthusiasm. The lack of enthusiasm could be due to the fact that independent farming would entail higher risk. The farmers had not borne full risk of their enterprise (due to large state subsidies and risk sharing in co-operatives) as a result there may not have been much enthusiasm towards the new leasing law.

The State Enterprise Law had also not met with considerable support from the managers (of enterprise's) or from the bureaucrats.[28] One reason that could be ascribed for the above phenomenon is that managers were more accountable under the new law. Greater autonomy brought about more independent decision making, which made one accountable for the decisions made. Thus, managers may not have been willing to look

---

[27] The Economist, January 14 1989.

[28] Beckman, Kip, "Gorbachev's Economic Gamble," Canadian Business Review, Summer 1988.

towards such changes with much relief (unless the rewards resulting from the changes were large, which probably was not the case at the early stages of changes.

Other nations may face similar problems in their quest for achieving a market economy. Inflationary spirals (due to lack of government subsidies) are/and were becoming a feature in all the planned economies seeking freer markets. Another problem would be the resistance to change from the labor unions. Perpetual job security will not be a characteristic of any economy in transition (towards a market economy), as resources are diverted towards efficient activities. As a result jobs are lost, the goods of capitalism will not be instantaneous, not without it's pitfalls, as relative scarcity becomes an important factor in determining resource allocation. As a result the less fortunate (efficient) will not be guaranteed jobs or daily necessities. All of this may be temporary but it creates a lot of resentment amongst the people hurt by these and this resentment may (also) slow down the process of change.

Below we present some of the reforms that other planned economies such as, Poland, the former Czechoslovakia and East Germany, and Hungary are undergoing. Some of the problems faced by these economies were, or will be, the same as faced by the former Soviet Union. As all these economies underwent a change, from a system with no private property rights to one with private property rights.

1.2.2. Poland:

Poland had adopted the "National Consolidation Plan". Under this plan, the enterprises can conduct experiments with ownership. Some of the apparatchiks (managers

of state enterprises) were turning state-owned business they managed into their own private business through a process called "enfranchisement of the nomenklatura". Enfranchisement can occur in several different ways. To quote The Economist (Aug. 26, 1989).

> In it's most common (and most corrupt) form, someone establishes a private company....with minimal capital. The boss of the state company, and perhaps the chief engineer in it's design department, buy or are given shares. When the state firm receives a request for business, the boss refuses, and recommends instead the private company in which he owns shares. The private company then leases space, tools and designers from the state enterprise." p.26.

Other variations were the purchase of state assets below book value or adding a few state-enterprise managers to the boards of new companies (The Economist, ibid).

Poland had also made a move to privatize the Gdansk shipyard. The Polish government was planning to first turn it into a joint stock company and then sell off shares in large chunks, workers can purchase 20% of the shares.[29]

Some foreign companies had also started operation in Poland, Fiat had signed an agreement to manufacture 270,000 cars in Warsaw.[30]

1.2.3. Hungary:

Hungary had also been making market reforms (privatizing). One of such measures was the Conversion Law, under which the initiative for a buy-out rests with the top managers. Formally the decision was to be taken by the enterprise council, where

---

[29] The Economist, April 28, 1990.

[30] The New York Times, May 30, 1990, p.C3(N), col.3.

management appointees and elected workers' representatives sat in equal numbers, however, the management had the deciding vote.

Under this procedure, managers who want to privatize their business must find one or more capitalists (foreign or domestic) to put up a minimum of 20% of it's market value as estimated by licensed auditors. After this, another 20% of the share-holding was to be handed over to the (yet undeveloped) "State Asset Fund". If the private capitalists decided to start with more than 20% of their share than they would have had voting control. They would have then been free to sell the remaining share capital to whomever they wanted to on any terms. The sales could have been made over a three year period on no more than a 10% paid up basis.[31,32]

Hungary had also opened up it's borders for foreign collaborations. Several foreign companies were investing in the Hungarian economy. Mobil had been talking with Hungary (and Poland) to set up service stations.[33] Italians had a joint venture project with the Hungarians to set up a chemical plant.[34] Levi Strauss jeans had set up a plant in Hungary.[35] Avon cosmetics had also started to sell it's cosmetic line in Hungary.[36]

---

[31] No companies have yet been converted under the conversion law. Another law is needed to establish the State Asset Fund. The Economist, Aug. 26, 1989, p.37.

[32] The Economist (Jan. 9, 1990, p.80) reported that Hungary would start to make a move towards private banking.

[33] Platt's Oilgram News, Feb. 8, 1990, p.1.

[34] ibid, April 10, 1990, p.1.

[35] The Wall Street Journal, April 5, 1990, p.A1(E), col.1.

Avis (car rentals) had also started operation in Hungary.[37]

1.2.4. (The Former) Czechoslovakia:

The former Czechoslovakia had also made a transition towards privatizing. Farm co-operatives were allowed and co-operative ownership outside of agriculture had rapidly been increasing. Private firms were permitted , though they were heavily taxed and there was limited access to capital.[38]

1.2.5. (The Former) East Germany:

Amongst all the East European economies East Germany probably had the most rapid transition towards privatization due its merger with West Germany.

1.3. Mixed Economies.

Several of the world's mixed economies had been steadily removing market controls. The trend towards privatization has varied across these economies, due to the different economic structures exiting prior to the removal of these market controls. The economies that moved towards increased privatization (or deregulated markets) were Britain, New Zealand, and India.

We now look at the some examples of privatization in these economies.

---

[36] Women's Wear Daily, April 5, 1990, p2(1).

[37] Travel Weekly, March 12, 1990, pE34(2).

[38] Svejnar, Jan , "A Framework For The Economic Transformation Of Czechoslovakia", PlanEcon Report, Vol. V, No. 52, Dec. 29, 1989.

1.3.1. Britain:

Britain had been moving towards privatization since Margaret Thatcher came to power. Since 1979[39], 54 of Britain's state-owned companies had been sold to the private sector. Some of the well known companies that were privatized are Jaguar, British Telecom, Rolls-Royce, British Steel, and British Airways. Britain had also made a move towards selling it's water and electric utilities. Water utilities had been privatized[40], but the move to completely privatize electricity had not been accomplished (and has met with a lot of public resistance) and the issue is still being debated.[41] One may also mention that the privatization of British Rail was also being debated. No clear guidelines were laid out, the focus at that time being on improving the efficiency of British Rail.[42]

1.3.2. New Zealand:

New Zealand also made a bid towards privatizing public sector firms. Some of the companies (or parts of) already sold were 13% of BNZ (Bank of New Zealand), NZ Steel, DFC NZ (a merchant bank) and Petroleum Corporation of New Zealand. The government had planned to privatize several state owned enterprises and raise $14 billion

---

[39] True upto 1990.

[40] There are now ten water companies.

[41] The performance of the water shares recently has hardly helped the cause for electric privatization. The water shares fell (on an average) by 23% since their February peak.
The Economist, May 5, 1990.

[42] The Economist, September 15, 1990, p.71.

by 1992.[43] Some of the state owned enterprises they had planned to sell were the postal service, Post Bank (a government owned savings bank), Coalcorp, Government Property Services (property management), Shipping Corporation, Communicate (a government-owned PR firm), and the Government Printing Office. Some other assets which were not ready for sale, but were in the pipeline, are Forestry Corporation, Tourist Hotel Corporation, Land Corporation, Telecom, Electricorp, NZ Post (which faces monopoly problems), NZ Rail Corporation, and the Rural Bank.[44]

1.3.3. India:

India had de-regulated a large part of it's industrial sector by 1990. The deregulation process included removal of entry barriers in industries where private enterprise were not permitted and, allowed free entry into markets where licensing regulated firm participation. Some of examples of deregulation in the Indian industry are the petrochemicals, commercial vehicles, the drug industry, the car industry, the two wheeler industry (including motor-cycles, scooters, and mopeds), telecommunications, and the steel industry. We look at the case of deregulation in the scooter and the car industry (in India) in chapter 2.

After the deregulation in the petrochemicals industry there had been a rush for setting up plants. The result, a glut (over-production) of petrochemicals in the near future

---

[43] The official reason of the government for the sale is the government's crippling debt.

[44] Euromoney, November 1988, p.101.

is predicted as installed capacity is expected to go up substantially.[45]

Entry into the commercial vehicles market was also relaxed. As a result the market had seen entry by several firms, both in the class of medium heavy and heavy vehicles. Foreign collaborations had been set up with Japanese companies such as Mitsubishi, Toyota, Mazda and Nissan. Demand was over-estimated by the producers resulting in over-production of medium-heavy vehicles.

The private sector was allowed entry into the steel sector. The public sector had a virtual monopoly over steel manufacturing (the private sector had a token existence). As a part of relaxing entry into the steel sector, quotas (that is maximum allowable output) had been upped for existing smaller plants, while the private sector could set up plants of up to 1 million tonnes.[46]

Also, foreign collaborations were allowed in many industries. The major industries in which foreign collaborations were allowed are Metallurgical, Electric Industries, Automotive Ancillaries, Industry Machinery, Agricultural Machinery, Commercial Office and Household Equipment, Electric Equipment and their Components, Machine Tools, Grinding Machines, Boring Machines, Shaping and Slotting machines, Gear Cutting Generatings, Finishing and Testing Machines, Honing and Polishing

---

[45] As of June 1989 the government has received applications to build 2.7 million tonnes (1 tonne = 1000 kilogram) of the new ethylene production capacity. The projected domestic demand for these products is 1.4 million tonnes by 1995. The Economist, July 15, 1989.

[46] India Today, August 31, 1990 (p.125).

machines, Wire Working Machines, Hammer and Forging Machines, and Press and Sheet Metal Working Machinery.[47]

1.3.4. European Economic Community:

The EEC planned to become unified by 1992. This was in principle intended to result in a European market with no internal trade barriers, the national trade barriers having been lifted. This is an example of lifting of market controls between countries. The implication of the removal of these controls will be felt directly by all European firms and it should be interesting to see the result of this on the market structure and the size of the firms. Reports[48] predicted that a unified EEC might increase the communities output anywhere from 2.5% to 6.5% or five times as much (depending upon the author of the study).[49]

The EEC had also decided to deregulate it's freight market.[50] It would be interesting to see the outcome of the deregulatory process: that is, will the large carriers

---

[47] Annexure-8E, List of Industries where Foreign Collaboration is welcome. Jain, Rajiv, "Guide to Industries-Policies and Procedures, 1989-90". India Investment Publication, 1989.

[48] The Economist, Nov. 18, 1989, p.77.

[49] The Economist, Nov. 18, 1989.

[50] Prior to deregulation small companies operating in Europe had to buy expensive permits to operate in West Germany. As a result of deregulation permits that were changing hands for DM100,000-150,000 ($45,000-75,000) each in 1986 have halved in value. The Economist, Dec. 9, 1989.

wipe out the smaller carriers?[51] From our past experience with freight deregulation, we have seen that freight deregulation in Australia (in 1954) has produced some large companies. In America (which opened up interstate trucking in 1980) there still exist a large number of small operators (deregulation benefitted small and hurt large operators by getting rid of government backed cartels). In Britain, which deregulated road haulage in 1968, big firms participation in the general haulage market is minimal (as they were unable to compete with cheaper owner-driven vehicles).[52] We thus see that the answer (about the implications of freight deregulation) is not clear, though one should note that the only parallelism between all the above examples may be that the freight industry was deregulated. That is, geographical factors may play an important part in determining the implications of the deregulatory process, and comparisons may thus not be of much help.

Regulatory Implications of The Unification of EEC:

An important issue arising out the unification of the EEC are the regulatory implications. Individual countries are affected by the actions of other countries. Thus, there exists a need for a centralized regulatory authority for EEC (in Brussels), along with

---

[51] Already the small operators in Europe have formed an association (British International Freight Association). The association has around 700 member companies, most of them employing ten of fewer people. The association has created a network that will allow the small operators to stay in touch with each other through electronic mail. (This system seems similar to the airline booking system in America.)

Other large companies (such as Swiss-based Danzas and Holland's Franz Maas) have also decide to employ some of the small operators as subcontractors. The Economist, ibid.

[52] The Economist, ibid.

the country-wide regulatory bodies. These two (regulatory) institutions would have to collaborate with each other to work out the regulatory framework compatible with individual nations and the EEC. No doubt, the rules (for regulation) would have to be drawn out together. The process will not be easy, nor without it's pitfalls. A recent paper[53] suggests that concentrating greater regulatory power in Brussels can be beneficial to both consumers and member governments.[54] Another good reason to devolve regulatory power may be to increase regulatory credibility.[55] That is, regulatory power at Brussels may also reduce the risk of "state capture" or "industry capture" of the regulatory agencies, which should tend to increase firm compliance with the regulation's. Economic arguments notwithstanding, cooperation between nations may not be easy to achieve.

Another problem that may arise is (potentially) excessive regulatory power in the hands of bureaucrats. The regulatory aims may tend to reflect the aims of the bureaucratic staff rather than what is actually desired. Finally, the biggest question will

---

[53] Konstatine and Seabright, "Regulation in the European Community", Oxford Economic Review, Vol.5, no. 2.

[54] Their argument is that by a centralized regulatory mechanism externalities can be internalized more efficiently. That is, a nation may tolerate larger levels of emissions of, say sulphur dioxide, as the cost transcend national boundaries while the benefits totally accrue to the nation. Governments may therefore tolerate higher levels of pollution than a European target may dictate. Thus all countries will become worse off by pursuing their individual interests. As a result devolve greater regulatory power to the centralized regulatory authority in Brussels.

[55] The Economist, Aug. 19, 1989.

be of regulatory responsibility. That is, who bears the (final) regulatory responsibilities, Brussels or the national regulators?

Thus we see that regulation in Europe is a multilayered problem, encompassing public good problems, compliance problems, problems of regulatory responsibility, problems of individual bureaucratic influences, and so on. Optimally, the need is for an unbiased regulatory authority that considers the problems of the industry, the EEC, and the individual countries alike. A task, easier said than done.

1.4. Conclusion:

The last few years have witnessed a removal of economic barriers within and between nations. Deregulation is being pursued in planned to market economies. The outcome in these economies is not clear, and the transition is still in it's infancy. This transition, towards a market economy, is undoubtedly not without it's pitfalls and will raise several interesting questions. While some answers (India and England) are visible, the implications of other, the unification of EEC, are nowhere near realization. One can only hypothesize on the results to be generated from the deregulatory process. The efficacy of these approaches will depend on social, economic, and political factors. How fast, and how bumpy the ride to privatization will only be answered with time.

Chapter-2

The Impact of Regulatory Controls on Industry Structure: A Study of The Car and Scooter Industry in India

2.1. Introduction

This chapter studies the historical development of the regulatory process and its effect upon some of the industries in India. It concludes with a study of the gainers and the losers in the Indian regulatory-deregulatory experience.

The Indian planning ideology emerged much before India gained independence in 1947. The Congress party sponsored the National Planning Committee (NPC) with Jawaharlal Nehru[1] as it's Chairman. The NPC was formed at the initiative of the national leaders at that time. One thing notable about this committee was that it represented ideas of the Congress party, the provincial governments and the private businesses. Evidence suggests that private business in India took a major role in the formulation of the IDR[2] Act[3,4].

---

[1] India's first Prime Minister.

[2] The Industries Development (and Regulation) Act.

[3] In 1944, some prominent private industrialists also prepared a plan known as the 'Bombay Plan'. D. Amarchand, Promotion and Control of Private Industry in India, p.46, 1976, Department of Commerce, Annamalai University.

[4] Nehru (Discovery of India) talking about the policy formulation for India says:
"...But I was agreeably surprised at the large measure of unanimity achieved by us in spite of the incongruous elements in our committee. The big-business element was

The intention of the planners, from the start, was to pursue a socialist pattern of society. Nehru was visibly impressed with what he saw in Russia and decided that this was the only way to remove income inequalities prevalent in India[5]. The intent was to base planning on equality of income and not by the profit motive. Thus, it was decided to keep the scope of free enterprise severely restricted.[6]

As far as international trade is concerned, the planners avoided being dependent upon international economies. The paranoia can be explained by looking at the Indian experience with the British corporations. Indian industry was systematically decimated because of the cheap imports from England (produced at large scale and much cheaper than the, primarily, hand made Indian goods). As a result, the Indian leaders (at that time[7]) were fearful of the industrial giants[8]. Out of this fear sprouted the planning

---

the biggest single group, and it's outlook on many matters, especially financial and commercial, was definitely conservative.." p. 404.

At another instance Nehru comments that big business joined the NPC as they realized that they could serve their interests better from within the NPC than outside it. This seems to lend support to the hypotheses presented by Stigler (A theory of Economic Regulation, B.J.E., 1971). Stigler proposed that self interested private groups may pursue regulation in their self interest.

[5] Economic Ideas of Jawaharlal Nehru, Janardan Audichya, 1977.

[6] "So, though we did not start with a well-defined social theory, our social objectives were clear enough and afforded a common basis. The very essence of this planning was a large measure of regulation and co-ordination. Thus while free enterprise was not ruled out as such, it's scope was severely restricted" Nehru, Discovery of India, p.403.

[7] Nehru (p.403, Discovery of India) says:

"International trade was certainly not excluded, but we were anxious to avoid being drawn into the whirlwind of economic imperialism. We wanted neither to be victims of an imperialist power nor to develop such tendencies ourselves. The first charge

ideology of the (Indian) leaders. To quote Nehru:

"Political democracy has no meaning if it does not embrace economic democracy. And economic democracy is nothing but socialism." Address to the AICC session, Jaipur-AICC, Economic Review, 9-1, 1964, p.46 (in D. Amarchand, see above).

Thus we see that the tight regulatory controls both on Imports and internal production has their roots in India's experience with the British.

2.2. Industrial Regulation

There are two documents that provide the guidelines for industrial development. The first document is the IDR (Industries Development and Regulation) Act and the second document is the Economic Objectives Resolution (EOR). The IDR Act provided the guidelines for industrial development, while EOR re-stated the socialistic objective of the Indian Government.

The IDR Act came into effect on May 8, 1952. As stated in the document," it lays stress on development of industries and provides for an effective machinery for the purpose". It provided for the registration of existing industrial undertakings and licensing of new industrial undertakings. Sub clause (1) of clause 11 states:

---

on the countries should be to meet the domestic needs of food, raw materials, and manufactured goods. Surplus production would not be dumped abroad but be used for exchange of such commodities as we might require. To base our national economy on export markets might lead to conflicts with the other nations and to sudden upsets when those markets were closed to us."

[8] "That huge combine, the Imperial Chemical Industries, has been repeatedly favored at the expense of the Indian industry.."
Nehru, p.408, Discovery of India.

"..no person or authority other than the central government shall, after the commencement of the Act establish any new industrial undertaking, except under and in accordance with the license issued in that behalf by the Central Government, with the previous permission of the Central Government... Substantial expansion of industrial undertakings will also be subject to the same licensing provisions as the new industrial undertakings."

We see that all undertakings were required to obtain a license, either to expand capacity or to enter the market.

The industries to be regulated were placed under two categories, Schedule A and Schedule-B (Table 2.7). The industries under Schedule A were the exclusive responsibility of the state, while schedule B industries would be progressively state owned. However, the State's efforts in the industries in Schedule B were expected to be supplemented by private enterprise. Future development of the industries falling outside these schedules was (in general) left to the initiative and enterprise of the private sector.

The IDR Act focussed attention on pricing. The right prices for planning purposes were defined as:

"...those that under all existing conditions, including full range of government policies, would give entrepreneurs and, more generally, producers, traders and consumers and savers incentives to act according to a particular development plan... Planning will be realistic when prices conform to the expectations of the planners."[9]

The prices of the products related to the scheduled industries came under Section 15 of the IDR Act.

The IDR Act also provided for overseeing the price or the quality of the good. Prices could be further controlled by declaring goods as essential commodities under the

---

[9] Gunnar Myrdal, Asian Drama, Vol. III, p.2037, in D.Amarchand (1976).

Essential Commodities Act (ECA). The ECA provided for the control of production, supply, and distribution in certain commodities, declared as 'essential' under Sec. 2(a) of the Act, in the public interest.

We thus see that the IDR Act provided the government broad powers to interfere in the functioning of any industry. It should be noted that, in spite of the demarcation (for scheduled industries) , the state could undertake industrial production in any aspect of the economy.

2.2.1. Modifications to the IDR Act

There were several modifications to the IDR Act (of 1952). The major modifications were made in 1956[10], 1970, 1981 and 1984.[11]

The first major change in the industrial policy came in 1981 where 29 medium sector industries were allowed fuller utilization of installed capacities. Diversification was also allowed in passenger cars and power driven two-wheeler industry. An undertaking could diversify within it's overall licensed capacity. The second major change came about in 1984. Here the government decided to exempt entrepreneurs of medium sized firms from the normal industrial procedure to enable them to set up industrial capacities based

---

[10] In 1955-1956 the Parliament accepted a socialist pattern of society as the objective. Thus a fresh statement of the industrial policy was necessitated to conform to the socialist objectives and a fresh statement of the policy was thus announced on April 30, 1956. This policy did not deviate much from the IDR Act (1952).

[11] Most of these changes involved changing of the laws regarding licensing, recognition of capacities (in excess of licensed capacities), diversification (in output), capacity utilization and automatic expansion (annually or over a period of five years) of current facilities.

on indigenous equipment and local raw materials and, to utilize to a fuller extent the existing installed capacities.[12] Automatic growth was allowed to 24 groups of industries which are open for larger industrial houses and foreign concerns along with other applicants and, 15 export oriented engineering industries.[13] To be eligible for this expansion the undertaking should not be a dominant unit in the particular line of manufacture within the meaning of the MRTP (Monopolies and Restrictive Trade Practices) Act.[14]

Another modification in the licensing policy was that the components sector was delicensed (except for the firms coming under FERA (Foreign Exchange Regulatory Act)

---

[12] 24 medium sized industries came under this scheme.

[13] These were allowed to grow at the rate of 5% per annum or upto a ceiling of 25% in five years in one or more steps over their licensed capacity provided the item was not reserved for Small Scale Industries or the Public Sector. The maximum capacity achieved over the last five years (over the licensed capacity) was recognized by the government.

[14] The recognition of installed capacities in excess of licensed capacities had a peculiar feature to it. That is, this scheme was only applicable to the industries where the expansion of a firm does not lead to dominance in that industry. I think a Catch-22 situation exists here. That is, through licensing, the government has created market concentration and as a result, if capacity expansion leads to a dominance of a firm, an incumbent firm would find it difficult to be granted the privilege to expand it's capacity. This seems to be a big hurdle if economies in production are to realized. This tradeoff between economic efficiency and market is not recognized in any of the documents I have looked or in the World Bank document (see above). We see that there exists a self defeating clause which would make the realization of economies of scale difficult. The car industry would be specifically affected where the incumbent firms were operating well below the MES. However, it is not clear whether the automobile industry made any attempt to expand capacity which was not allowed under this provision of the IDR Act.

Also, in cases where an industry was not allowed to expand as it already had a semi-monopoly, controlled prices were worked out to provide for replacement costs only.

and the MRTP Act).

The second document, the Economic Objective Resolution was passed by the parliament in December, 1954. The resolution declared a socialistic pattern of society as the primary objective of the country. It states:

"the basic criterion for determining lines of advance must not be private profit, but social gain." (p. 50, D. Amarchand)

We see that both of these documents were influenced by Nehru's thinking. That is, to achieve the socialistic economic objectives, private industry should be tightly regulated.

2.2.2. The MRTP Act

The MRTP Act was instituted in 1969. This Act imposes severe restrictions upon the growth of large industrial houses.[15] The Act could be broadly divided into two parts. The first part dealing with concentration[16] and the second, dealing with restrictive trade

---

[15] The bias in India against large private industrial houses is evident from this quote:

"....unlike the Americans, Europeans, and Japanese, we do not worship giant private enterprises as guardians of modern civilization and instruments of national power. We only fear them and promote their growth as inevitable accompaniments of developments." R. K. Hazari, (Rapporteur), Indian Economic Conference, Monopolies and their regulation in India, p. viii, in D. Amarchand (1976).

[16] Concentration of economic power vis-a-vis a monopoly was sought to be controlled by:

(i) Providing under Sec. 21 a procedure for seeking permission from the Central Government for expansion of the undertaking.

(ii) Restricting establishment of a new undertaking without the permission of the Central Government.

(iii) Prohibiting mergers and amalgamations without the approval of the Central Government. (Sec. 23)

These provisions applied to undertakings which have individually or along with

practices. The concepts of 'monopoly' and 'concentration of wealth' were not defined till 1970. In 1970 official interpretation was given to these terms. From the point of licensing, concentration of wealth is referred to in terms of large industrial houses. Large industrial houses were defined as a single unit or a group with assets exceeding Rs. 100[17] crores. Also, all industrial houses with assets of over Rs. 100 crores came under the MRTP Act. The definition of monopoly is not clear and the Act lays emphasis on avoidance (not abolition) of monopoly and prevention of concentration of wealth. To clarify some of the issues within the MRTP Act the Monopolies Enquiry Commission was set up and it made some recommendations. First, it measured monopoly in terms of concentration of production and sale or, sale and concentration of economic power in terms of industrial wealth. Second, it recommended the establishment of a permanent MRTP Commission. These recommendations were incorporated into the MRTP Act which came into force from June, 1970.

The MRTP Act defines industry dominance in terms of the licensed capacity (of the undertaking) and the proportion of the goods supplied by the undertaking. That is, if the licensed capacity of an undertaking, including interconnected undertakings, is one-fourth of the total licensed capacity than the undertaking is considered "dominant". If the

---

interconnected undertakings assets of the value of no less than Rs. 20 crores and dominant undertakings which produce, supply or otherwise control not less than one-third of the total goods that are produced, supplied or distributed in the country. An undertaking to which these provisions apply is required to register with the Government under Sec. 26. D. Amarchand (1976).

[17] MRTP (Amendment) Act 1982, Chapter III, part A.

total amount of goods supplied by the undertaking, including interconnected subsidiaries, is greater than one-third of the total goods of any description that are produced, supplied or distributed in India, then it is considered dominant.[18]

2.2.3. Control over the capital market

The capital market in India was controlled too. Control over the issues of capital were enforced as early as 1943 through the CIC Act[19]. The CIC Act was made a permanent legislation in 1956.[20] We find that the government had imposed constraints on raising capital.

"Control over capital issues was first issued in 1943 (the Capital Issues (Control) Act), largely as a war-time temporary measure ..... In 1956, the Act was made a permanent legislation," to ensure, as far as possible, that investible funds did not find an outlet for investment in non-essential projects and to prevent them from being invested in a manner which ran counter to the policy of the government".[21]

According to the Act, a consent from the Controller of Capital issues is necessary in all cases where a company wants to raise capital above a certain exempted limit. The Act applies to raising of capital by issue of securities, loans or even by creating a charge

---

[18] MRTP Act, ibid.

[19] This was due to the fact that the British had a selfish motive in not letting the Indian capital market develop. A well development capital market in India would reduce India's dependence upon the British. Subsequently that would weaken the economic control over India.

[20] It is surprising that the Indian government (post independence) carried this legislation through. As the lack of a fully developed capital market is one of the reasons why India could not develop during the British rule.

[21] Finance Minister's speech while introducing the Bill in the Lok Sabha, Lok Sabha Debates, Vol. I, 1952, p. 584, in D. Amarchand (1976).

or lien on assets of the company if they exceed the exemption limit in a particular year.

It was later realized that the stringent provisions of the Act did not serve any purpose. Thus, in November, 1966 certain changes were announced. Under the provision non government public limited companies can issue capital by obtaining a 'no-objection' certificate which will be issued within 30 days of the date of receipt of the application, provided, the application conforms to certain rules.[22] After this the procedure was slightly altered and instead of a 'no-objection' certificate, the applicants following the prescribed rules were allowed to raise capital on receipt of 'acknowledgement of proposal'. Further, to conform to the MRTP Act, all companies registered under Section 26 of the MRTP Act have been disqualified from this exemption (with effect from October 1971). These

---

[22] The operational guidelines for the issue of consents are:

(i) gross over-capitalization or under-capitalization are discouraged;

(ii) ratio between debt and equity is not normally allowed to go beyond 1:2;

(iii) ratio between preference and equity share capital is considered normal at 1:4 though a higher ratio of 1:3 may be agreed upon in exceptional cases;

(iv) unduly high rates of dividend on preference shares and interest rates on debentures are discouraged though no rigid limits are set;

(v) in cases of 'right issues', a condition is stipulated that while making an offer, the company should simultaneously offer to all holders of rights an opportunity for additional shares and that if rights are not taken up, the balance left over should be distributed among applicants for additional shares;

(vi) in cases of bonus shares, the issue is made out of free reserves built from genuine profits and not made in lieu of dividends; not more than two bonus issues will be allowed to a company over a period of five years; there should be a time lag of at least 18 months between two bonus issues and that after the bonus issue, a total amount of not less than 33.3% of the increased paid-up capital is left in the residual reserves;

(vii) with a view to ensure that promoters also should subscribe a minimum amount in newly floated companies a new Rule has been added in 1966 according to which the promoters should subscribe not less than 15% in an issue up to Rs. 1 crore and 10% in an issue exceeding Rs. 2 crore.

D. Amarchand (1976).

companies need to get prior clearance under the MRTP Act before applying for a 'consent' under the Capital Issues Act.[23] 'An appraisal of the working of the Act reveals that it has been very liberal in permitting capital issues.'[24]

There have been modifications to the CIC Act in the mid 1980's. Companies now have greater freedom to raise capital. A recent report in The Economist mentions that companies have now been able to raise a larger amount of capital in the recent years than in the past[25].

2.3. The Regulatory Framework

To look at the effect of the imposition and the removal of regulatory controls upon the car and the scooter industry we will first look at the historical development of the regulatory framework in these industries. Then we will briefly study how the industry structure has changed over the years. Following which, we will analyze how the regulatory framework may have affected the industry structure, prices and, product quality.

2.3.1. Car Industry

---

[23] D. Amarchand (1976), p.126.

[24] D. Amarchand (1976), p.126.

[25] The Economist, Oct.15, 1989. The report mentions that the companies have been able to raise $6 b. (as of Oct., 1989), as against $550 m. in 1981-'82.

The car industry has been regulated from it's inception. Binding price ceilings and quantity controls were imposed upon the car industry from the start. Price controls were removed in 1975[26]. Quantity controls still apply to the car industry.[27,28] The car industry comes under the provision of the IDR Act which provides for monitoring of the prices. If the government feels that the pricing policy of an industry is non optimal, it may interfere under the authority provided to it under Clause 15 of the IDR Act.[29]

2.3.2. Scooter Industry

The scooter industry has also been regulated (both binding price ceiling and quantity restrictions) from it's inception. Price controls for the scooter industry were removed in 1975. Quantity controls were substantially reduced in the early 1980's and are virtually non-existent now. The government has been liberal with the issue of licenses to the scooter industry. The reason why the governemnt was due to the socialistic

---

[26] After one of the manufacturers Premier Automobiles Limited contested the price controls in the market. Imprint, Nov. 1984, p.41.

[27] At present the government thinks that the existing licensed capacity is sufficient to meet the current demand.

[28] Guidelines to Industries, Part II, Govt. of India, 1989.

[29] Section 15 of the IDR Act states:
"... This Act empowers the government under clause 15 to cause investigation to be made into scheduled industries or undertakings where the Central Government is of the opinion that there has been or likely to be a substantial fall in the volume of production without justification, or a marked deterioration in the quality of any article or class of articles produced which can be avoided, or a rise in their price for which there is no justification, or where an industrial undertaking is being managed in a manner likely to cause serious injury or damage to the interests of the consumers or it is necessary to take such action in national interest".

objective as stated in the constitution. Under the socialistic objective cars are a luxury and scooters a necessity. Thus, the government policy towards the scooter manufactureres was tolerant from the start. At present, the licensed capacity of the scooter industry is several times the present demand for scooters.[30] Currently the scooter industry is constrained neither by price controls or quantity restrictions.

2.4. Industry Structure

2.4.1. Car Industry

The early entrants into the car industry were Hindustan Motors (HM) (in 1942) and Premier Automobiles (PAL), in 1944. HM started 'production' in 1948 by assembling vehicles and PAL started production in 1947. In 1953 there were 12 firms producing (or assembling) cars and commercial vehicles.[31] Most of these firms assembled units since only a few had a phased manufacturing program. At this stage the government decided to look into the functioning of the automobile sector. The Tariff Commission (1953) recommended that only companies with manufacturing capabilities should be allowed to operate. As a result several companies decided to stop assembly operations in India.[32] The government recognized the manufacturing programs of only five firms, namely,

---

[30] The licensed capacity of BAL and it's subsidiary, MSL, is sufficient to meet the current demand.

[31] Tariff Commission Report, 1953.

[32] The Ford Motor Company and General Motors decided to leave as they considered the demand (in India) to be too small to set up manufacturing facilities in India.

Hindustan Motors Limited (HML), Premier Automobiles Limited (PAL), Automotive Products of India Ltd. (APIL) and Ashok Motors (AM)[33]. Of these five, HML and PAL had a manufacturing program for cars while AM assembled Austin cars. APIL was not able to pursue it's manufacturing program as a result of which the government withdrew it's approval. Thus, at the early stages (as of 1953) in the development of the car industry there were two car manufacturers. Of the earliest entrants in the car industry three firms, HML, PAL and SMPIL, existed prior to 1953. Of these three HML and PAL had already started a manufacturing program while SMPIL[34] assembled car units. At this stage the two dominant[35] units were HML and PAL while, SMPIL was not a major contender[36].

The car industry saw no entry until the late 1970's. In early 1970 Maruti (Private Limited)[37] entered the car industry with a small three-wheeled car. The second entrant was SAL (in 1976)and the third entrant was Maruti Udyog Limited (MUL) (nationalised in 1980 and started production in 1983).[38] The initial intent of MUL was to manufacture

---

[33] Ashok Motors manufactured commercial vehicles.

[34] Standard Motors Product of India Limited.

[35] A firm is referred to as dominant on the basis of it's market share.

[36] SMPIL had market shares similar to PAL from 1950 till 1954.

[37] Maruti (initially) was a private limited company started by Sanjay Gandhi (son of (late) Mrs. Indira Gandhi). The car was not well accepted and the company stopped production. Maruti was nationalized (in 1980) after the death of Sanjay Gandhi (in a plane crash).

[38] "In the 1956 IPR automobiles (excluding road transport services) were not classified under either Schedule A or Schedule B industries - which meant that the future

a car (a small car) within the reach of the common man. A technological collaboration was set up with Suzuki of Japan to manufacture small (796cc) cars.[39] The car was well accepted as it was fuel efficient and within the grasp of a 'larger' number of Indian's. A large number of bookings were made, in-fact in 1990 MUL is still meeting bookings made in 1986. Recently, Maruti has introduced a new, slightly larger (1000 cc), car aimed at competing with the car manufactured by PAL. Meanwhile, SMPIL has always been in the picture, though barely noticeable.

One notices that between 1950-1953 (data on car industry starts from 1950) production in the car industry increased by 12.2% (from 2221 to 2492). Between 1953 and 1970, car production increased by a relatively large amount, from 2492 cars in 1953 to 35205 cars in 1970 (an in increase of 1412%). However, the car market was dominated by two major car makers, HML and PAL, while the third incumbent (SMPI) commanded a measely 1.2% of the market (see table-2.3). SMPI's market share declined considerably from 12.3% in 1950 to 1.2% in 1970. (One should point out that while HML and PAL sold larger cars, SMPI manufactured a smaller car. SMPI was not competing in the same market as the other two car makers.)

Currently the Indian car industry has five incumbents, namely, HML, PAL,

---

development of the automobile industry would be left, in general, to the initiative and enterprise of the private sector." Kathuria, S (1987).

It is interesting that the government decided to enter the car industry. As, in principle (according to the IPR resolution of 1956) the government had decided not to enter the car industry.

[39] Bookings were stopped after 1986.

SMPIL, MUL and SAL. The oldest incumbents are PAL, HML and SMPIL, with MUL and SAL having entered the fray much later. Capacity utilization in the car industry is quite high, around 80%. The production in 1987 was 148,495. For individual market shares see table-2.1.

To sum up, the car industry is characterized by five incumbents. Only one incumbent, MUL, enjoys a waiting list for it's product. The industry has seen significant technological changes in the last decade and is fast developing into a market with greater and, better (quality) product choice.

2.4..2. Scooter Industry

The scooter industry started production in 1955. At present it has seven incumbents. Over time it has witnessed a total of sixteen incumbents.[40] API (Automotive Products of India) was the first entrant in the Indian scooter industry. It started production in 1955. API was followed by BAL (Bajaj Auto Limited) in 1960. Over time the scooter industry witnessed several changes and saw entry and exit by several firms.

The total number of licensed[41] producers in the scooter industry, as of 1989, is seventeen (entrants are listed chronologically in Table-2.2). Many of these, as can be

---

[40] Possibly more, the data sources list small incumbents as 'others'. I have been able to locate only sixteen 'active' (i.e, active at one time or another) producers since 1955.

[41] Licensed producers does not imply that the have set up production facilities. Seventeen producers are listed in the yearly booklet brought out by Automotive Component Manufacturers Association (ACMA). However, looking at the production figures we see that the number of active producers, as of 1987, is seven.

Licensed capacities may differ from installed capacity, in that installed capacity should not exceed licensed capacity.

seen by their capacities, have licenses to produce very small and, economically un-feasible amounts of scooters.[42]

One interesting feature of the scooter industry is the utilization of licensed capacity. The ratio of output to licensed capacity was 40% in 1987.[43] Interestingly, BAL (with it's subsidiary Maharashtra Scooters Limited (MSL)) has sufficient licensed capacity to meet the industries current total output. Of the present incumbents BAL is the largest, followed by Lohia Motors Limited (LML), Kinetic Honda (KH) and, MSL.

Looking at the technology in the scooter industry we see that technologically the industry is progressive. There exists a large choice between products and product diversification exists (at least) for the large manufacturers. Product diversification was facilitated by the government's policy of allowing broad banding in the car and the scooter industry. Under this policy producers can use the current installed capacity to produce differentiated products. Technological collaborations exist with Honda Motor Company and Piaggio of Japan and Italy, respectively. These companies are competing with brands

---

[42] The minimum economic scale for scooters is around 250,000 units. Some of the licenses are for a couple of thousand units. One of the possible reasons is that these licenses could be given under the governments small scale industry policy. As a small scale unit, functioning in backward areas, obtaining licenses is extremely easy. This could have resulted in the issue of (several) licenses to these units.

[43] Very low in comparison to the car industry where it is around 80%. Also, licensed capacity does not mean that the capacity is also installed. Licensed capacity is always greater than or equal to the installed capacity.

manufactured and developed in India.[44]

To sum up, the scooter industry has seven active incumbents. Only one manufacturer, BAL, enjoys a waiting list for the delivery of it's vehicles. The industry has three dominant firms and several fringe manufacturers. The environment is competitive among the three dominant firms and product diversification exists. The industry structure has changed substantially (from the initial two incumbents to the present seven).

2.5. Effect Upon Technology Used

This section does not give a detailed analysis of the capital structure of the individual. We will only study how the capital structure was affected by the regulatory controls. The two factors that may affect the capital structure[45] of the car and the scooter industry are quotas and the tax structure. Tax structure seems to affect the capital structure directly, while the effect of the quotas can be traced to the choice of capital and through the effect upon competition (of the quotas).

The tax structure (prevalent in India) before the reforms was cascading. That is, intermediate goods were being taxed at every stage of production. As a result the car manufacturers were vertically integrated (to avoid being taxed at each stage of

---

[44] It should be acknowledged that Piaggio had a production agreement with BAL. This agreement expired in the 70's and has since not been renewed.

[45] The term capital and capital structure is used synonymously with the nature of the technology used.

production). Thus, the manufacturers were unable to use their available capital in the most efficient manner. For example, India had an under-developed capital market. As a result firms did not have access to capital. Thus, the limited resources available were not efficienlty used. The tax structure has subsequently been modified. The new tax structure is called is called MODVAT (Modified Value Added Tax). The impact of MODVAT is evident as recently there has been an increase in the parts manufacturers (sub contracting with the manufacturers).

The effect of quotas upon the capital structure depends upon the choice of the available technology and the competition prevalent in the market. That is, quotas may limit one to a given plant size and not enable one to reap economies of scale. The minimum economic scale (MES) for the car industry is 50,000 units and 250,000 for the scooter industry. Also, the lack of competition (quotas blocking entry) may take away the incentive to improve the existing technology. We will address these questions while looking at the impact of the regulatory controls upon the car and scooter industry.

2.5.1. Car Industry

The car industry started production with technological collaborations with foreign manufacturers. HML collaborated with Morris and PAL with Fiat. They had no in built research and development (R&D) and, the Indian economy was closed to technological imports (at the time of independence). Thus, the car makers had no choice but to upgrade the technology they inherited. One may say that price controls (effective until 1975) may have limited the amount of capital available to the manufacturers and as a result no in

house R&D was attempted. However, one sees that even after the controls were removed (in 1976) no serious attempt was made by the manufacturers to set up R&D facilities. Thus, one can conclude that the intent to set up R&D facilities was not there.

We also see that the MES for the car industry is 250,000 units per year.[46] The total output of the car makers was well under 250,000 (see table-2.3 on sales) until 1983. The willingness to expand capacity did not seem to exist as we notice that the ratio of sales to licensed capacity (for the years the data is available) is around 0.5. That is, the output was nearly one-half that of the licensed capacity. During this time the car makers commanded a waiting time for delivery of around three years. Thus sales are equal to output for every year until the manufacturers commanded a waiting list.

One reason the manufacturers did not expand capacity may have been due to the lack of competition. Also, by maintaining the waiting list they may be generating a buffer (against competition) in case entry occurs. It is worthwhile to note that explicit price controls were removed in 1975. Even after the removal of these market one sees that the manufaturers commanded a waiting period before delivery. Even though, the between 1974 and 1975 prices increased by 33% for HML and 30% for PAL, the price increase was not sufficient to remove the delivery lag.

Thus we see that tight regulation (no domestic or foreign competition) may have resulted in a market with outdated and inefficient technology. The choice of the capital structure was not efficient and no subsequent improvements were made due to the lack

[46] Karmokolias, Y, International Finance Corporation, Discussion Paper no.7, 1989.

of competition. This argument is supported by the fact that the car manufacturers decided to upgrade technology and expand capacity soon after entry occurred in the car market.

2.5.2. Scooter Industry

The scooter industry faced more favorable conditions than did the car industry. Scooters are considered a necessity and cars a luxury, thus the government (motivated by it's socialistic objective) was more tolerant towards the scooter industry. Both the manufacturers, BAL and API, had technological collaborations with Italian manufacturers. The effect of the market controls upon the scooter industry is not pronounced in the scooter industry. We see that quotas affected the choice of capacity (or capital) by the scooter manufacturers. That is, capacity was not expanded and a waiting list (two to three years) was maintained by the manufacturers.[47] However, soon after the quotas were relaxed and the market saw substantial entry one notices that BAL expanded capacity in response to the entry of other firms.

About the technology, the scooter industry updated it's technology through indigenous R&D. API was unable to keep pace with the rapidly changing market and eventually stopped production.

Thus we see that for the scooter industry quotas affected the choice of technology more than anything else. Technologically, the scooter industry did better than the car industry in that indigenous technology was developed.

---

[47] The reason for maintaining the waiting list may be the same as was for the car manufacturers, that is, waiting lists were a buffer against competition.

2.6. The Gainers and the Losers

To study the gainers and the losers from the regulatory process we need to identify the factors that provide to us an indicator of who gains and who loses. Of course a producers gain cannot be directly construed as a consumers loss. Thus we will identify specific factors that will serve as indicators in our analysis.

From the viewpoint of the consumer we can say that a consumer is worse off if he is not allowed to benefit from market competition, from the choice of goods, from good quality products, and from the quantity of the goods supplied to it (that is, whether or not there exists (existed) a prolonged shortage of the good in question). For the producers, a producer benefits from barriers to entry if there is an increase in (or, the concentration of) wealth, and if it did not have to invest in R&D (which it would have, with market competition). In the following analysis we will look at the gainers and the losers, before (in sub-section) and after (in sub-section I.b), from the imposition and the removal of the regulatory controls.

2.6.1. Before the Removel of Market Controls

2.6.1.1. The Consumers in the Car and the Scooter Industry

Looking at the consumers we see that the consumers were definitely worse off when the market controls were in effect. Below we will look at the car and the scooter industry separately.

Car Industry:

In the car market one sees that the quota restrictions effectively blocked entry. As a result there was no market competition to stir the incumbent producers into activity. This is highlighted by the fact that in the car industry, until the removal of the market controls, no effort was made to upgrade the models the manufacturers had inherited from Morris (50's technology) and Fiat (early 60's technology) (besides cosmetic changes). The car market had (only) two major incumbents (with a periphery of bungling entrants)[48]. Each producer had only one model to offer (each model had different categories because of the available options). Until the market controls were eased we see that consumers in the car market were limited to a choice of only two models. As far as the product quality is concerned it would suffice to say that technologically the Indian car industry was several decades behind the international standards. Also, the consumer's demand was not being satisfied by the producers. There existed a waiting-list[49] for several years before the car was delivered to the consumers. The excess demand created a parallel market in the car industry (quasi-rents were being extracted).[50] Only after the easing of these market controls one saw a virtual elimination of the excess demand for PAL and HML.

We thus see that the market controls definitely made the consumers worse off.

---

[48] These were peripheral producers who shared an extremely small amount of the small market (see table-2.3).

[49] A waiting list is defined when current demand (the number of units registered by buyers with an in intent to buy) is met at a future date.

[50]Having booked a car was considered a sound investment as the premiums could be as high 40% of the car's selling price.

The consumers were limited to a choice of two (antiquated) car models, there was practically no market competition (the incumbent producers catered to different subsections of the car market, HAL producing the larger car while PAL produced the smaller car) and, there was insufficient supply in the car market (resulting in quasi-rents). Overall, we see that consumers in the car industry did not gain because of the market controls.

Scooter Industry:

The scenario in the scooter industry was relatively healthy (compared to the car industry). One effect of the market controls was quiet clear, that is, the market controls limited entry into the car market (see table-2.5 for list of incumbents). There existed two major producers (BAL and API) and the other scooter manufacturers commanded a small portion of the market (BAL and API dominated the market for three decades). We see that there was some entry after the price controls were removed in the scooter industry (1975), however, most of the entrants left the market (see table-2.4). As the governments attitude towards the scooter industry was more liberal[51] (than the car industry) the scooter industry saw more competition, however, the majority of the competition came after the market controls were relaxed. As far as product choice is concerned the scooter industry also had more to offer, BAL had several scooter models and API had two models to offer. Thus, the consumers in the scooter market had 'some' product choice. As far as the

[51] Scooters were considered a necessity in a socialist economy while, cars are considered a luxury.

quality of the scooters was concerned we see that BAL produced scooters of good quality while API produced scooters of slightly lower quality. (However, none of the scooters were of extremely bad quality.) As far as consumer demand being met, we see that as long as the market controls remained in effect there existed a lag before the scooters were delivered (the lag varied from two to four years depending upon the brand and the make). This (the lag), resulted in the creation of a parallel market where the scooters commanded a premium (the amount one would pay over and above the scooter price, essentially, quasi rent).

We thus see that consumers in the scooter market had 'some' product choice and the product quality was 'tolerable'. The consumers were worse off due to the existence of excess demand, and the consequent quasi-rents, in the scooter market.

2.6.1.2. The Producers in the Car and the Scooter Industry

The producers, both in the car and the scooter industry, were shielded from competition for nearly three decades. The government being more stringent about granting licenses to the car manufacturers created a market that had only two major producers for a long period of time. The scooter industry saw more producers after the price controls were lifted (1975). However, most of the entrants exited the market soon after (see table-2.4). We will now look at the extent to which the producers gained from the market controls.

We will first identify some of the factors that may provide to us an indication of whether the car and the scooter producers benefitted from the imposition of the market

controls. Some of the factors that we can take as an indicators of benefitting from the market controls are, lack of competition, increase in concentration of wealth, attempts at pre-emption and non implementation of licensed capacity (buying licenses to pre-empt entry into the market) and, lack of R&D (which may follow from lack of competition). We will now look at the car and the scooter industry piecemeal.

Car Industry:

The government was quite strict when it came about giving licenses to the car industry. Thus, the car industry saw only two major incumbents for long period of time. These two (major) incumbents, HAL and PAL, catered to two different sections of the market. As a result of the government policy (on quotas to the car industry) the car manufacturers saw no competition until the early eighties. The result, no effort was made to innovate and develop better quality products. Until the entry of MUL the incumbent car manufacturers were producing cars with obsolete technology. It is obvious that an effort to innovate was not made as no competition was forthcoming. Thus the lack of competition definitely benefitted the car industry (the car manufacturers would not have been able to sustain with a similar lackadaisical attitude if the market were competitive).

As far as concentration of wealth is concerned we see that the car producers, being the two major incumbents, shared the benefits of the car market between themselves. One must also point out that studies on the effect of licensing on concentration of wealth showed that the government plans (Five Year Plans) benefitted many top industrial houses

of the country.[52]

Scooter Industry:

The government was more liberal (than the car industry) towards the scooter industry. We see that the scooter industry had two dominant producers, BAL and API, for a long period of time. However, the product quality in the scooter industry, especially BAL, was good. The manufacturers in the scooter industry profited after the removal of the price controls. The scooter market was more competitive than the car market. The scooter manufacturers improved product quality (probably because of the governments 'soft' policy towards the scooter industry which made entry more probable than for the car industry) and consistently sold good quality products.

As far as the incumbents benefiting from the government controls, one can see that the two major incumbents (BAL and API) commanded 80-90% of the market share (the Indian scooter market has expanded consistently). Thus, licensing definitely helped the incumbents increase, or maintain, their market share. One sees a noticeable shift in the market shares (on the basis of sales) after the easing of the quantity restrictions (see table-2.4).

As far as preemption is concerned it is not easy to find specific instances (of pre-emption) or non-implementation of licenses by the car or the scooter industry. However, looking at the overall trend one sees that of the 10,016 licenses issued during 1955-56, 6181 were implemented in time, 672 were partially implemented, and 1732 were

---

[52] D. Amarchand, ibid.

surrendered or revoked by the licensing authority (information was not available on 148 licenses). The large industrial sector implemented about 72% of the licenses granted to it, 16% were revoked or surrendered and, 12% were not implemented.[53]

Looking at pre-emption we see that (from the information available about 933 cases, where large industrial houses accounted for 323 licenses). Of these (933) licenses 130 were surrendered, or revoked, within two years of issue, 85 in three years, 44 in four years and, 64 in more than four years.[54] Thus, preemption was being used in the industry and the incumbent was able to deter entry in a market and dominate it.

One can see that the producers in the car industry gained from the lack of competition. As a result we see that minimal effort was made towards R&D and, the consumers were supplied with goods that were consistently of poor quality (decades behind the international quality).

Looking at the scooter industry we see that because of licensing the incumbent producers commanded a large share of a growing market. The product was of average to good quality, however, the consumers suffered as they had to wait for the delivery of the good.

2.6.2. After Removal of Regulatory Controls

2.6.2.1. The Consumers in the Car and the Scooter Industry

---

[53] ibid.

[54] ibid.

Car Industry:

After the removal of the market controls one sees that the consumers definitely benefitted from the easing of the market controls. After the easing of the quantity restrictions we see that there was entry into the market (the two major entrants being MUL and SMPIL). In a couple of years MUL commanded 60% of the market share (see table-2.3). (Earlier consumers had to wait two to three years for the delivery of cars made by HML and PAL. Now, these can be obtained with no delivery lags.) As a result we see that both, HML and PAL, decided to diversify and offer more models for sale. The car industry now offers several models and the consumers have the choice of a larger number of better quality models. We thus see that the consumers (as far as product choice and product quality are concerened) benefitted from the removal of the market controls.

Scooter Industry:

The consumers also benefitted in the scooter industry from the removal of the market controls. As a result of the easing of quantity restrictions we see that the consumers now benefit from products of international quality.[55] Lag time before the delivery of a scooter is practically non-existent (except for a couple of BAL models). We thus see that the consumers are definitely better off after the removal of the market controls.

2.6.2.2. The Producers in the Car and the Scooter Industry

---

[55] The car market now has scooters made by Honda (Japan) and Piaggio (Italy).

Car Industry:

In the car industry we see that market competition forced the producers to be competitive and more efficient.[56] Entry into the market indicates that there was room in the market for more manufacturers (most of the incumbents have not exited the market). It seems that the producers also benefitted from the removal of the market controls, as the market controls forced them to be efficient. (Though, the earlier incumbents definitely lost from the easing of the market controls as they lost their market share to the entrants.)

Scooter Industry:

The scooter industry saw large entry due to the easing of the market controls. The earlier incumbents witnessed a percentage decrease in their market share, however, the number of units they sold (except API) did not decrease. The industry now offers several good quality products. Competition has forced the manufacturers to be innovative and competitive (one sees that the scooter prices of all the models are close to each other). Overall, the scooter industry has benefitted from the easing of the market controls.

One interesting question emerging out of all of this is that why would the industrialists, especially in the car industry, support deregulation? This can be looked at from two angles. First, in principle the government had agreed to stay out of the industry. However, the government was the first entrant into the car industry when it restarted the car company of (late) Mr. Sanjay Gandhi. They were not left with much choice as the

---

[56] PAL made profits in the fiscal year 1988-89 after being in red for several years. India Today, Nov. 15, 1989.

new entrant, MUL, quickly stole a large chunk of the market share from the incumbents. Secondly, looking at an economy like India that has grown substantially since independence. We see that India had developed a substantially large middle class. The earlier controls could have been very restrictive such that the incumbents realized that profits would increase with expansion of capacities. Thus, one can argue that deregulation was also sought in their own self interest. The incumbents realized that the demand had shifted to the right substantially over the years.

2.7. Conclusion

We see that the industrial policy in India was molded by the experience (of the Indians) with the British rule. As a result it was decided to erect entry barriers (such as, licensing) on, both internal and external trade. Evidence suggests that the industrialists played a major role in the formulation of the industrial policy and were for the regulation of the Indian industry.

For the car and scooter industry we see that entry barriers (licensing) provided an umbrella for the incumbents. As a result the incumbents made no major effort to innovate or invent. (The scooter industry had better quality products as the threat to entry was credible, sccoters were considered neccesities, relative to the car industry.) After nearly three decades of protection the industry had outmoded products resulting from lack of technological advancement.

After the market controls were eased in both the industries one sees that product

quality and product choice improved in both the industries. Both, the car and the scooter industry, witnessed dramatic technological changes (the latent incumbents were forced to improve upon their technology). Both the car and the scooter industry became competitive due to entry in the markets.3.4. Conclusion

We see that the industrial policy in India was molded by the experience (of the Indians) with the British rule. As a result it was decided to erect entry barriers (such as, licensing) on, both internal and external trade. Evidence suggests that the industrialists played a major role in the formulation of the industrial policy and supported regulation of the Indian industry.

For the car and the scooter industry we see that entry barriers (licensing) provided an umbrella for the incumbents. As a result the incumbents did not make any major effort to innovate or invent. (The scooter entry had better products as the threat to entry was credible (scooters were considered necessities), relative to the car entry.) After nearly three decades of protection the industry had outmoded products resulting from lack of technological advancement.

After the market controls were eased in both the industries one sees that product quality and product choice improved in both the industries. Both the car and the scooter industry witnessed dramatic technological changes (the latent incumbents were forced to improve upon their technology). Both the car and the scooter industry became competitive due to entry in the markets.

Looking at the gainers and the losers from the regulation, and the subsequent

deregulation one sees that the consumers benefitted from the easing of the market controls. That is, product quality improved, product choice increased, and the waiting period for the delivery of the good (which was several years prior to deregulation) practically vanished. This also eliminated the parallel market for the car and scooter bookings (which were transferable). As a result premiums on most of the products have vanished. The consumers have definitely benefitted from the deregulatory process.

As far as the producers are concerned, deregulation removed the entry barriers. This resulted in entry, forcing the incumbents to become efficient. As a result some of the incumbents reduced wastes and improved industry performance. (For example, the PAL group has been in the red for several years. Recently, they made profits, and the turnaround is attributed to "overhaul upgrade and modernization of the key manufacturing facilities and products".)[57]

[57] India Today, Nov. 15, 1989.

TABLE-2.1

EX-FACTORY NET DEALER PRICES FOR CARS

	AMBASSADOR		PADMINI		MUL		MUL*	
	X-NDP	INDEX	X-NDP	INDEX	NDP	INDEX	X-NDP*	INDEX*
1965	11564	100	10068	100	.	.	.	.
1966	12775	110	11636	116	.	.	.	.
1967	13919	120	12664	126	.	.	.	.
1968	14021	121	12679	126	.	.	.	.
1969	14075	122	12660	126	.	.	.	.
1970	14075	122	14862	148	.	.	.	.
1971	15769	136	14862	148	.	.	.	.
1972	15896	137	15046	149	.	.	.	.
1973	15848	137	15556	155	.	.	.	.
1974	17250	149	17080	170	.	.	.	.
1975	22925	198	22211	221	.	.	.	.
1976	21536	186	22011	219	.	.	.	.
1977	22286	193	22895	227	.	.	.	.
1978	23986	207	24057	239	.	.	.	.
1979	27667	239	26397	262	.	.	.	.
1980	30362	263	34803	346	.	.	.	.
1981	38062	329	40815	405	.	.	.	.
1982	48587	420	44577	443	.	.	.	.
1983	48587	420	47583	473	47500	100	41304	100
1984	48587	420	46080	458	49383	104	43141	104
1985	51787	448	49932	496	50325	106	44071	107
1986	59547	515	54300	539	59617	126	47221	114
1987[1]	62709	542	56945	566	72050	152	57069	138
1988	65872	570	59590	592	75235	158	59592	144
1989	73070	632	70414	699	86446	182	63380	153

* The price avaiable from MUL was the net-dealer price (NDP) inclusive of excise. The ex-factory NDP (X-NDP) computed here is an obtained from the NDP less excise duty.

1. 1987 prices for Ambassador and Padmini are average of 1986 and 1988 due to non availibility of NDP for 1987.

TABLE-2.2
EX-FACTORY NET DEALER SCOOTER PRICES

	BAL		API	
YEAR	NDP*	INDEX	NDP*	INDEX
1965	1960	100	1955	100
1966	1968	100	2042	104
1967	2263	115	2275	116
1968	2280	116	2238	114
1969	2280	116	2238	114
1970	2280	116	2230	114
1971	2280	116	2230	114
1972	2280	116	2230	114
1973	2280	116	2304	118
1974	2306	118	2605	133
1975	2880	147	3365	172
1976	2976	152	3565	182
1978	3054	156	3506	182
1979	3077	157	4066	179
1980	3560	182	4926	208
1981	3885	198	5211	252
1982	4560	233	5726	267
1983	5100	260	5726	293
1984	5280	269	5827	293
1985	5540	283	6227	298
1986	6000	306	7250	319
1987	6490	331	7250	371
1988	6960	355	7250	371

* ex-factory net dealer prices.

TABLE-2.3

PRODUCTION OF CARS - BY MAKE

YEAR	HML(P)	PAL(P)	SAL(P)	SMPI(P)	MUL
1950	1469	478	.	274	.
1951	2161	703	.	614	.
1952	1185	522	.	386	.
1953	1847	344	.	301	.
1954	2607	1413	.	975	.
1955	4874	3581	.	1546	.
1956	5781	5722	.	1836	.
1957	5086	4866	.	2251	.
1958	4809	1843	.	1462	.
1959	5745	4459	.	1789	.
1960	9217	6516	.	3364	.
1961	11056	7197	.	3409	.
1962	13438	6247	.	3641	.
1963	8621	3750	.	3340	.
1964	15351	3868	.	4008	.
1965	15558	5673	.	3559	.
1966	19469	7030	.	1098	.
1967	20515	10055	.	2774	.
1968	22687	12276	.	2345	.
1969	21560	12218	.	1405	.
1970	22703	12054	.	448	.
1971	24656	12821	.	827	.
1972	24634	13611	.	583	.
1973	25440	13883	.	614	.
1974	20129	14213	.	1666	.

1975	9322	13630	.	123	.
1976	16422	14973	54	161	.
1977	20256	17481	171	111	.
1978	20987	12931	331	117	.
1979	17523	11550	106	56	.
1980	21752	8729	51	6	.
1981	23197	18874	31	4	.
1982	21836	20711	126	1	.
1983	23631	20929	302	1	175
1984	22127	26620	930	.	11876
1985	22238	29223	523	11	34825
1986	22387	28501	1557	1557	63504
1987	25561	31191	484	484	90909

TABLE-2.4

PRODUCTION OF SCOOTERS BY MANUFACTURER AND BRAND

YEAR	API	MAC	LAMBY	APSL	ASVL	BAL	EIL	EL
1955	.	529	.	.	.	.	.
1956	.	3068	.	.	.	.	.
1957	.	4098	.	.	.	.	.
1958	.	2923	.	.	.	.	.
1959	.	2764	.	.	.	.	.
1960	.	9459	.	.	2535	.	.
1961	.	8071	.	.	4746	.	.
1962	.	9589	.	.	4368	361	.
1963	.	8632	.	.	6148	739	.
1964	.	10412	.	.	8339	1292	.
1965	.	10143	.	.	8376	1795	.
1966	.	8632	.	.	10389	1950	.
1967	.	13270	.	.	15982	1050	.
1968	.	16367	.	.	19040	545	.
1969	.	22372	.	.	26431	377	90
1970	.	25335	.	.	32091	199	767
1971	.	24504	.	.	39798	50	2828
1972	.	20851	.	.	40332	80	3468
1973	1225	23543	.	.	50361	24	2929
1974	5008	24404	.	.	55126	1	1141
1975	.	29754	.	.	54495	.	538
1976	1550	31436	3663	28	76138	.	680
1977	1326	20284	8281	675	68349	.	552
1978	969	25753	9503	884	49003	.	361

1979	1001	25337	9453	.	30289	.	.
1980	874	22531	10564	.	71682	.	.
1981	1579	19705	10580	.	84170	.	.
1982	1248	22834	10394	.	136020	.	.
1983	88	14414	5312	.	167179	.	.
1984	249	9446	5345	.	186773	.	.
1985	51	7053	23353	.	258967	.	.
1986	.	5275	11572	.	366807	.	.
1987	.	209	931	.	415968	.	.

Table-2.4 contd.

LAMBRETTA

YEAR	GSIC	KSL	MSL	PSL	VIJAI	CENTO	WBSL
1971	21	.	.	.	.	.	.
1972	100	.	.	.	.	.	.
1973	.	.	.	.	.	.	.
1974	2	.	.	.	.	.	.
1975	131	.	.	.	10595	.	.
1976	332	137	4434	1	28054	.	7
1977	192	3362	23199	2016	16489	.	720
1978	177	3325	28193	2281	18985	.	.
1979	763	2873	19491	.	32485	.	.
1980	3417	1374	25006	.	36195	.	.
1981	5953	1098	24546	.	32373	.	.
1982	4131	729	32597	.	36813	1061	.
1983	3857	45	53482	.	18443	8480	.
1984	4906	.	56337	.	19554	4471	.
1985	1659	.	58650	.	28865	1324	.
1986	.	.	90739	.	6060	354	.
1987	.	.	92732	.	1288	41	.

Table-2.4 contd.

YEAR	VESPA(LML)	KH
1983	250	.
1984	10222	.
1985	41359	.
1986	101558	12769
1987	72292	21836

TABLE-2.5

ENTRY AND EXIT IN THE SCOOTER INDUSTRY

FIRM	BRAND	ENTRY*	/ EXIT#
[1]Automobile Products of India Ltd.	Lamby	1955	-
[1]Bajaj Auto Limited	Vespa/Bajaj	1960	-
Enfield India Limited	Fantabulus	1962	1975
Escorts Limited	Rajdoot	1969	1979
Girnar Scooters Limited	Girnar	1971	1986
Automobile Products of India Ltd.	Mac.	1973	1986
[1]Scooters India Limited	Vijai	1975	-
[1]Andhra Pradesh Scooters Limited	Pushpak	1976	-
Aravali Svachalit Vahan Limited	Aravali	1976	1979
Karnataka Scooters Limited	Falcon	1976	1984
[1]Maharashtra Scooters Limited	Priya	1976	-
West Bengal Scooters Limited	Digvijai	1976	1978
Punjab Scooters Limited	Kesari	1977	1979
[1]Scooters India Limited	Cento	1982	-
[1]Lohia Motors Limited	XE100cc	1983	-
[1]Kinetic Honda	-	1986	-
[2]Kelvinator of India Limited	-	1984	-
[1] [2]Gujarat Narmada Auto Limited	Narmada 150	1986	-

* Year production started.

Year production stopped. This information is as of 1988.

1 Listed in Automotive Buyers Guide, ACMA, 1989. That is , these companies are currently (as of 1988) producing.

2 No output data currently available.

TABLE-2.6

TOTAL PRODUCTION OF CARS AND SCOOTERS

YEAR	CARS	SCOOTERS
1950	2221	-
1951	3478	-
1952	2093	-
1953	2492	-
1954	4995	-
1955	10001	529
1956	13339	3068
1957	12203	4098
1958	8114	2923
1959	11993	2764
1960	19097	11994
1961	21662	12817
1962	23326	14318
1963	15711	15519
1964	23277	20043
1965	24790	20314
1966	27597	20971
1967	33344	30302
1968	37308	35952
1969	35183	49270
1970	38828	58392
1971	38304	67201
1972	38828	64831
1973	39937	78082
1974	36008	85682

1975	23075	101763
1976	31610	151309
1977	38019	160295
1978	34366	168033
1979	29235	152951
1980	30538	209943
1981	42106	202884
1982	42674	250727
1983	45090	273850
1984	64013	297303
1985	102456	422307
1986	116004	595150
1987	148495	625667
1988	159841	659810

Table-2.7

SCHEDULE OF INDUSTRIES

SCHEDULE-A:

1. Arms and ammunition and allied defense equipment.

2. Atomic Energy.

3. Iron and steel.

4. Heavy castings and forgings of iron and steel.

5. Heavy plant and machinery required for iron and steel production, for mining, for machine tool manufacture, and for such other basic industries as may be specified by the government.

6. Heavy electrical plant including large hydraulic and steam turbines.

7. Coal and lignite.

8. Mineral oils.

9. Mining of iron ore, manganese ore, chrome ore, gypsum, sulphur, gold, and diamond.

10. Mining and processing of copper, lead, zinc, tin, molybdenum, and wolfram.

11. Minerals specified in the schedule to the Atomic Energy (Control of Production and Use) Order, 1953.

12. Aircraft.

13. Air transport.

14. Railway transport.

Table-2.7 continued-

15. Shipbuilding.

16. Telephone and telephone cables, telegraph, and wireless apparatus (excluding radio receiving sets).

17. Generation and distribution of electricity.

SCHEDULE-B:

1. All other minerals except "minor minerals" as defined in Section 3 of the Minerals Concession Rules 1949.

2. Aluminum and other non-ferrous metals not included in Schedule-A.

3. Machine tools.

4. Ferro-alloys and tool steels.

5. Basic and intermediate products required by chemical industries such as the manufacture of drugs, dye-stuffs and, plastics.

6. Antibiotics and other essential drugs.

7. Fertilizers.

8. Synthetic rubber.

9. Carbonization of coal.

10. Chemical pulp.

11. Road transport.

12. Sea transport.

Chapter-3

Firm-Specific Output Limits In A Posted Offer Market: Distributive and Efficiency Effects

3.1. Introduction

This paper looks at the effect of firm-specific quotas in a posted offer market. The effect of firm-specific quotas (binding or non-binding), and their removal, upon market performance has not been examined in experimental markets yet. Quotas are used as a regulatory mechanism in planned and market economies, and as command signals at various levels of organization. Quotas have several uses, amongst them are directing resources according to the plans (in planned economies), and regulating entry into markets, for reasons ranging from the protection of domestic industries to catering to a special interest group.

The only other work involving quantity controls, specifically, in experimental markets has been done by Plott (1983). There has been other experimental work on quantity constraints (see, Kruse et al., Davis et al.), however, the constraints are not in the form of firm-specific quotas, that are subsequently lifted. Now, Plott did not look explicitly at the effect of firm specific quotas, or their removal, upon market performance. Plott used quantity restrictions for the standards approach to pollution. He found that prices show little or no tendency to converge to the competitive equilibrium (CE). However, Plott did not directly control the output of the firms through individual firm

quotas. Only the output of the market as a whole was restricted.

Generally speaking, firm-specific quotas are more common than market quotas. Firm-specific quotas are used in planned economies, where the center directs individual firms to meet output goals. In the U.S.A. examples of producer-specific quotas are used in the market for hops, tobacco, oranges, lemons, grapefruit, and raisins. A new generation of pollution permits will also be firm specific (although, the pollution permits can be traded between firms)[1]. We also see that at the organizational level, messages to individuals are conveyed on the basis of fulfilling individual output targets (work assigned to a group may be divided among the group members). We thus see that firm specific quotas are a prevalent mode of regulatory control at the industry, or at the firm level. Examples of market quotas (Plott, 1983) are not as common. This makes the experimental analysis of firm-specific quantity restrictions, and their removal, interesting.

In this paper we will look at the effect of individual firm quotas, and their removal, upon a posted offer institution. In the posted offer exchange mechanism sellers post prices (offers to sell) at the start of each period. Seller prices are ranked in ascending order, and the buyers are then randomly selected. A buyer may purchase as many units as they want as long as the purchase price is less than (or equal to) their marginal valuation. After all the buyers have finished purchasing, the next period starts with the seller posting the prices. The posted offer institution is examined because it is representative of several common form of exchange, especially in many retail markets.

---

[1] See, Franciosi, Isaac, Pingry, and Reynolds, 1990.

This study seeks to look at the effect of quotas upon:

(i) Price levels and variability:

The average price level of a contract period. The price variability during that period is studied. The impact of the removal of quotas on price ,and price variation, is studied.

With binding quotas, economic theory predicts that the removal of quotas will cause the price to converge to the competitive equilibrium. That is, if the market price (with quotas) is above (at) the CE, then the removal of quotas will result in the price converging to the CE. (Note, that the theory is not clear about the speed, or direction, of convergence.)

(ii) Market Efficiency and Distribution of Total Surplus:

How does the imposition of quotas affect market efficiency? In our design, with binding quotas, the distribution of surplus is biased against the buyers. Thus, given that posted offer markets are known to converge from above the CE, we would expect the sellers' share of the surplus to be greater than their theoretical surplus. Note, that the theoretical distribution of surplus is not affected if the quota is imposed at the CE.

(iii) Output (total contracts) levels:

Do quotas result in an output different than what is given (by the quotas)? The impact of the removal of quotas (binding or non-binding) on market output is also of interest.

In the next section we present an experimental design developed to study these

questions.

3.2. Experimental Design

The experiments use the Plato Posted-Offer exchange mechanism[2]. There are three different experimental designs, the baseline (with no quantity restrictions), non-binding quotas (no excess demand at the competitive equlibrium) and binding quotas (excess demand at the competitive equilibrium). In the second and third categories of experiments the quotas are removed midway ("quotas/no-quotas", or Q/N experiments).

The experiments are designed to look at issues that may arise from the imposition, and the removal of quotas. That is, the impact of the removal of quotas on price and quantity dynamics is studied. The impact of quotas (binding or non- binding) on prices is studied using grouped data. Paired t-tests are used to compare average price, price deviation (from the CE), and contract levels in the experiments. Hopefully, more insight will be gained on the impact of the removal of quotas on the institutional dynamics from the Q/N experiments.

As the focus of this paper is to look at seller (producer) behavior with quantity restrictions and not countervailing power (of buyers) the buyers are simulated. The buyers are perfect revealers and accept zero 'profit'.

3.2.1. Baseline (BSL) Experiments (figure-1)

The baseline design is characterized by four sellers capable of selling five units each and four buyers capable of buying five units each. The surplus is distributed

[2] For detailed instructions see, Ketcham J., Smith V.L., and Williams A., 1984.

symmetrically among the buyers and the sellers. At the CE 12-13[3] units can be traded (for the resale and cost values see table-3.1). Note, that units are expressed as deviations from the low cost unit.

The baseline experiment will help us sort out those outcomes that are due to the structure of costs, or to the institution and from those outcomes that arise out of the removal of binding or non-binding quotas.

3.2.2. Quotas at the CE (Non-Binding Quotas (NBQ)) (figure-3.1)

In this design the sum of the sellers capacities equals thirteen. This leaves the competitive price and quantity outcome unchanged from the baseline experiments.

3.2.3. Quotas below the CE (Binding Quotas (BQ): figure-3.1)

Here the sum of the sellers' capacities equals eight. The competitive outcome is in a 5 cent range, from 15-20 cents above the CE in the NBQ/BSL design.

In the case of binding quotas the surplus distribution is skewed in favor of the sellers. (Also, the separation between the lower bound of the MSN (Mixed Strategy Nash) outcome and the competitive outcome diminishes if the sellers have no extra marginal units (out of equilibrium units).) That is, at consumer surplus of zero and no extra marginal units, the competitive outcome is also the Pure Strategy Nash outcome.[4]

The subjects receive a special announcement that during each trading period

---

[3] From now on we use CE as being at 12 units, as the thirteenth unit is never traded at zero profits. We thus use the lower bound of 12 as the competitive equlibria.

[4] See Kujal, P., University of Arizona-Discussion Paper #16, 1992.

quantity controls will be in effect when appropriate. If any seller attempts to violate the quota restriction, that is, sell more units than their (maximum) production quota, this results in the rejection of the sellers offer until the output constraint (quota) is satisfied. This design is similar to that used by Coursey and Smith (1983), except that firm quotas are used instead of price controls. Subjects are also told that their capacity is determined by a central authority. This announcement is made to all the subjects. They are also given individual announcements that state their capacities. The announcement at the start of the experiment reads:

"Your capacity is determined by a central authority. Your capacity is ____. Please make sure that the number on the screen coincides with the capacity stated."

One period prior to the removal of the quotas, an announcement is again made in regards to the change in capacity. Subjects are told individually what their "new" capacities are. Note, that everyone knows that the individual capacities have been changed, however, individual capacity changes are private information. The announcement reads as follows:

"The central authority has now decided to change your capacities. You now have a capacity of FIVE units. Please make sure that the monitor screen shows the correct amount."

The purpose behind the announcements is to emulate an environment where capacities are announced by a central authority. That is, authorities announce their intention to increase (or, decrease) the quota limits set upon firms.

Each trading period starts with a seller posting the price, and the total number of units he is willing to sell at that price. Once all the sellers have made their final offers,

they are notified about the other sellers' offer prices. The buyers are then randomly queued to initiate the buying procedure. If the units available from a particular seller have been exhausted, they are given the message "out of stock". After all the buyers have completed their purchasing the trading period ends.

Each experiment consists of twenty trading periods. The trading periods are split into groups of ten each. For the Q/N experiments quantity controls are in effect for the first ten periods, and removed for the remaining ten periods.

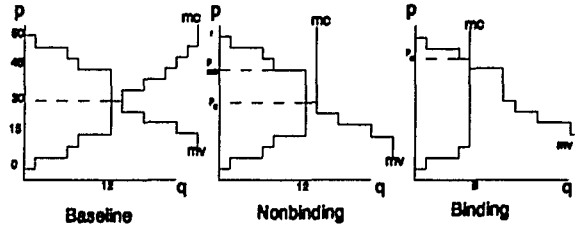
The rationale behind the quotas at the CE is that, we want to see how much distortion 'mere' quotas can cause. That is, with quotas at the CE do we get the same outcome as the theoretical competitive (price and quantity) outcome (with and without quotas)? We can thus test whether quotas alone, or their removal, can the market outcome to change.

The experiments are conducted with no quotas (baseline experiment), with quotas at the competitive equilibrium (non-binding), and with quotas below the competitive level of output (binding quotas).

With non-binding quotas each individual firm can sell at most three units each (the same as at the CE). However, seller 1 has an additional unit at the CE. (The competitive outcome of 12 (and not 13) is realized as we do not give commissions for the units traded.) With the binding quotas each individual firm can sell at most two units.

3.3. Experimental Results

Figure-3.1



Marginal Cost and Marginal Valuations

We report results from five experiments each for the baseline, binding quotas, and non-binding quotas.

In our experiments we get two interesting results out of the non-binding and binding quota experiments. In the non-binding quota experiments the number of contracts remains well below the competitive level of 12 (the number of contracts is also less than in the baseline experiments). After the (non-binding) quotas are removed, output in the subsequent periods remains depressed and slowly starts to converge towards the competitive outcome (similar results are obtained for binding-quota experiments). The impact of non-binding quotas on contracts in subsequent periods is evident (This result

duplicates similar results obtained in price control experiments (see, Coursey-Smith, Isacc-Plott, and Smith-Williams)).

In the binding quota experiments, the average price converges from below the CE when the quotas are in effect. This result is in contrast to the well known artifact that average price in the posted offer experiments converges from above. Also, this result is contrary to the convergence behaviour suggested by Davis and Williams (1986). That is, the convergence path of contract prices is not affected by surplus distribution.[5] (The upper support of the CE price with binding quotas is $5.50, and the lower support is $5.45).

Paired t-tests are used to test for the impact of quotas upon contracts and price. Paired t-tests are also used to compare deviations from the CE for the BQ-NBQ, and BQ-BSL, pairings. That is, the number of contracts in each experiment is paired (pair-wise) against the contracts in the non-binding quota and the baseline experiments.[6]

The paired t-tests on contracts show that non-binding quotas tend to depress the number of contracts significantly. For the NBQ-BSL (see table-3.2a below) pair we see that 15 (of 25) pairs are significantly different at the 95% confidence level (cl), and 21 at the 90% cl. We thus see that non-binding quotas have a marked impact on the number

---

[5] For a discussion on asymmetric surplus distribution and the price convergence path see Kujal, P, "Asymmetric Surplus distribution and the Price Convergence Path in Posted-Offer Markets: A Note," 39, 1992, Economics Letters..

[6] Non-parametric test are also used to test population differences (for contracts) between the NBQ and the BSL experiments. For details see Appendix-1.

of units contracted.

Paired t-tests on posted and contracted prices are also done. For contracted prices we see that for the NBQ-BSL (see table-3.3a below) 2 pairs are are significantly different at the 95% cl, and 5 at the 90% cl. For the BQ-NBQ (table-3.3b below) 8 pairs are significantly different at the 95% cl, and 12 at the 90% cl. Similarly, for the BSL-BQ (table-3.3a) 5 pairs are different at the 95% cl, and 6 at the 90% cl.[7]

For the posted prices (table-3.3a) we see that the results are slightly different. That is, the BSL-BQ comparison has 5 significantly different pairs at the 95% cl, and 6 at the 90% cl. For the BSL-NBQ pairing we see that 2 are significantly different at the 95% cl, and 5 at the 90% cl. Similarly, the BQ-NBQ comparisons (table-3.3b) show that 8 pairs are significantly different at both 95% cl and 12 at 90% cl.[8,9]

---

[7] Tests are also run to test for equality of variances. The F-tests show that the variances are significantly different for most cases. F-tests indicate that variances are significantly different in all the designs. In the BSL-NBQ pair 19 are significantly different at the 95% cl, in the NBQ-BQ pair 17 are significantly different at the 95% cl (18 at 90% cl), and 20 are significantly different at 95% cl (21 at the 90% cl) in the BSL-BQ pair. We thus see that variances are significantly different in all the pairings.

[8]The following equation is also estimated to test for the impact of quotas, binding or non-binding, on prices. The equation estimated is $P_{it}=a+b\ P_{it-1}+c\ D_{it+}u_{it}$. Where, P_{it} is the posted price in the t^{th} period for the i^{th} seller, P_{it-1} is the sellers' price, lagged once, and the D_{it} is the dummy for the imposition (one) and the removal (zero) of quotas. We see that for the aggregate results price are significantly affected by quotas. For results see table-3.6.

[9] The equation estimated to look at the impact of quotas binding/non-binding on price adjustment is, $dvP_{it}=a+d\ D_{it}+c\ P_{it}+u_{it}$. Where, dvP_{it} is the price deviation from the CE in the last period for the last period for the t_{th} period and the i_{it} seller, D is the dummy for the imposition and the removal of quotas, and dP_{it} is the last periods' price deviation from the highest contracted price. We see that for the aggregate model (cross section-

We thus present conclusive evidence in favor of the impact of quotas on the number of units contracted. However, the impact on prices is mixed for individual experiments, though conclusive for the estimates run on pooled data (cross section-time series). Also, price adjustment is significantly affected by quotas.

Below, we discuss the outcomes for each experimental design.

3.3.1. Baseline Experiments

In these experiments price converges from above the CE. The average price decreases as the experiment progresses, however, price convergence is slow (figure-2a, -2b). In all the (five) experiments contracts converge to the CE outcome (12) between the seventh period and the twelfth period (figure-3). In the experiments that converge late, contracts converge within one unit of the CE around period eight or nine. The average efficiency levels in the five experiments converge to high 80th percentile by the 12th period (figure-4). No experiments reached efficiency levels in the high nineties[10].

Slow price convergence (to the CE) can be explained by the fact that at the CE the demand and supply steps (supports) are separated by 30 cents. Thus, the CE is not the Nash equilibria. For example, let three sellers post prices at the competitive equilibrium ($5.30). This implies that each one of them can sell three units at the CE.

---

time series, 20 periods x 4 sellers x 5 experiments) quotas significantly affect price adjustment, both for the NBQ and the BQ treatment. For results see table-3.7.

[10] All the experiments exhibit relatively low efficiency levels compared to the posted offer price control experiments in Coursey and Smith. Possible reasons are discussed below.

Let the sellers be sellers 2-4, this implies that seller 1 can make an offer of $5.35 (sell all his units) and make a larger profit. However, any price greater than $5.35 will allow sellers 2 and 3 to sell their extra-marginal units. Thus, CE is not a Pure Strategy Nash equlibria. If all sellers price in this fashion, we will get price cycles between the lower and upper bounds of the MSN. As a result we may not get convergence to the CE. This may explain the slow (or no) convergence to the CE.

Also, it is clear that market power[11] exists in this design. Any seller can unilaterally raise the price (till $5.35). Thus we see that given market power (and that the buyers are simulated) sellers may be able to raise the contracted price.

Now, looking at efficiency levels we see that the average efficiency levels are relatively low. Efficiency levels of 100% are never reached in any of the experiments (almost all experiments reach efficiency levels in the high eighties). This may also have to do with experimental design where one gets Edgeworth cycles. That is, we may observe price cycles whereby sellers may price themselves out of the market, and then subsequently lower prices. Price cycles as these may result in contracts less than the CE (12 units), and hence lower efficiencies. Also, if one seller posts a higher price other sellers can trade their higher cost units. Thus we may still contract 12 units, however, 100% efficiency levels will not be attained.

Also, at the quantity levels of 12 we have a step size of 15 cents below and above

---

[11] We define market power in the Holt-Villamil context. That is, the ability of the seller to unilaterally raise the price above the competitive equilibrium.

the competitive equlibrium. As a result if a seller posts a relatively high price some sellers may be able to sell their (out of equilibrium) high cost units, thus lowering the efficiency levels.

All surplus measures are defined relative to the buyer (or seller) theoretical surplus in the baseline design. The surplus distribution is symmetric in the baseline design. In the baseline experiments, on an average, buyers share of the surplus starts low (12.69%) and climbs to 47%, that is, the buyers realize half of their potential surplus (figure-4). The sellers meanwhile, start at 96.15% and climb to 137.31%.

As far as distribution of surplus is concerned the institutional characteristics favor surplus distribution towards the seller. That is, posted offer institution favors the seller as average price converges from above the CE. Also, because the buyers are simulated there exists no countervailing power. Hence, surplus distribution is expected to be biased in favor of the sellers.

3.3.2. Non-Binding Quotas (NBQ)

Five experiments are run with non-binding quotas. In all the experiments no noticeable change in the average contracted price is observed after the (non-binding) controls are removed. As far as price convergence is concerned (see figure-2a, -2b), one can see that the average price decreases across periods, however, it does not converge to the CE.

It is quite evident that non-binding quotas affect the units contracted. In the five experiments quantity sold is substantially less than the CE quantity of 12 (see figure-3).

Units contracted converge to the CE in period 14 in one experiment, period 13 in the second, period 17 in the third, period 18 in the fourth, and period 14 in the fifth experiment. Curiously, in the fourth and fifth experiments the competitive outcome is achieved in the first and second period ; however, in subsequent periods contracts decline and finally converge to the competitive outcome in period 18 and period 14, respectively. Comparing this with the baseline we see that units contracted are less than under the baseline and remain so even after quotas are removed (see figure-3.4).

We thus see that non-binding controls tend to depress the units contracted, and also affect the contracts in the subsequent periods. It is also evident that the effect of non-binding controls is carried over to the regime without controls.

Once again, slow price convergence can be explained using the argument used earlier. That is, with non-binding quotas seller 1 has a capacity of four units (one at the CE), and sellers 2-4 have a capacity of 3 each. Non-binding quotas do not change the CE outcome. We can thus expect the price to be higher than the competitive outcome. Also, the horizontal overlap of demand and supply across one unit lowers the Mixed Strategy Nash (MSN) (relative to the case if the extra unit was not there), thus there is no separation between the lower and upper bounds of the MSN outcome for the NBQ and the BSL treatment.

Now, looking at average (contracted) prices we see that the average price in the NBQ design (for all five experiments) is slightly above the average price in the baseline

Baseline vs. Non-Binding Quota

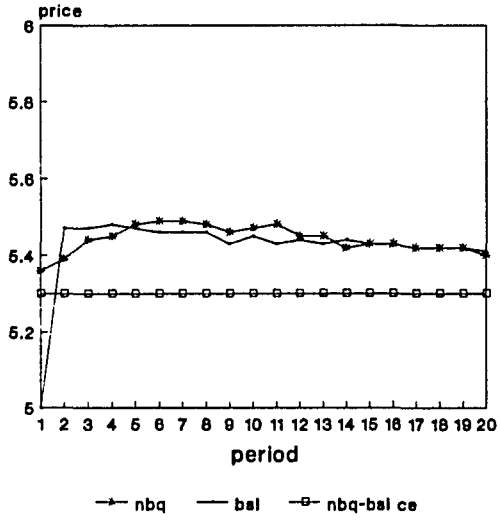
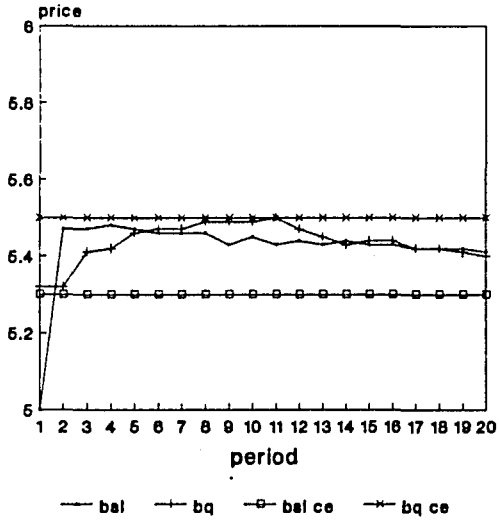


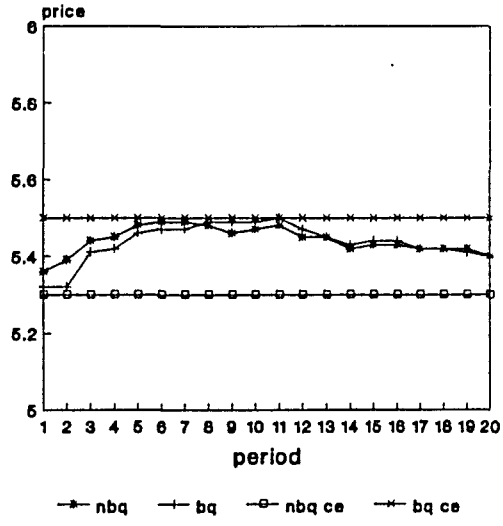
Figure-3.2

Contracted Prices

Baseline vs. Binding Quota



Non-Binding vs. Binding Quota



Baseline vs. Non-Binding Quotas

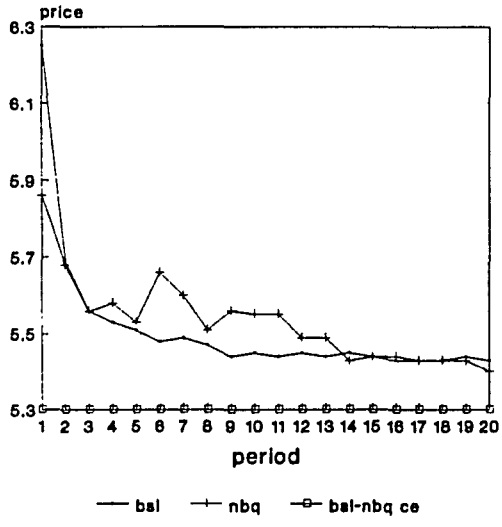
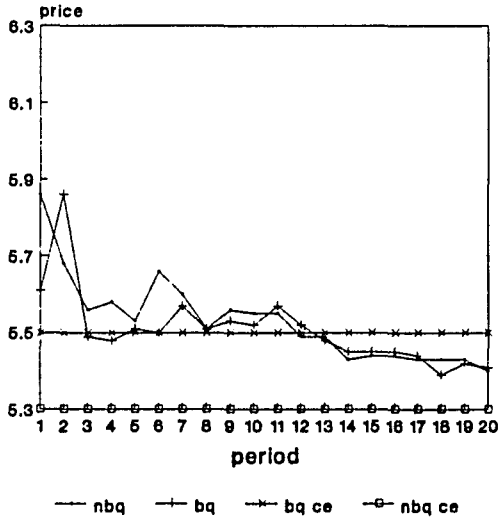


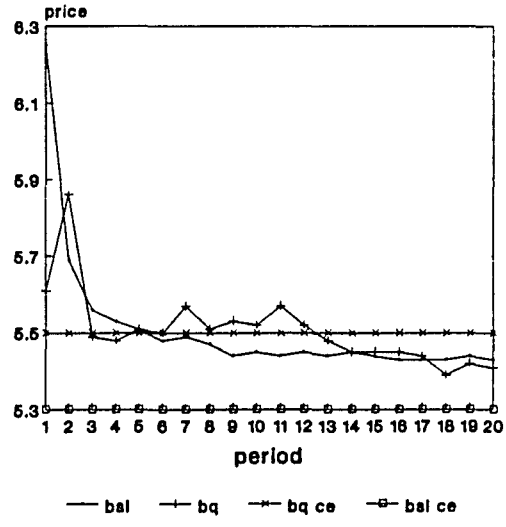
Figure-3.3

Posted Prices

Non-Binding vs. Binding Quotas



Baseline vs Binding Quotas



experiment from period five to fourteen (see figure-3.2). Interestingly, if we look at the posted prices (figure-3.3) we see that when non-binding quotas are in effect average prices are slightly above the baseline prices, and show higher variation (relative to the CE) compared to the (average) prices in the baseline experiments. Thus, posted prices seem to have a larger variation while non-binding controls are in effect[12].

From the data available so far we see that non-binding quotas cause units contracted to be below the CE, and contracts remain depressed even after the removal of non-binding controls. Both posted and contracted prices seem to be slightly higher than prices in the baseline experiments. Also, posted prices exhibit higher variation when non-binding quotas are in effect (compared to the baseline experiments).

The impact of non-binding quotas on buyer and seller surplus share is best studied by comparing it with the baseline. Buyers start relatively high (compared to the baseline). Buyers' share (percentage of the theoretical buyer surplus) of the surplus is 46.92% in the first period. However, midway through the experiment it declines and then rises again towards the end to 53.31%. Thus, although no difference is expected, surprisingly non-binding quotas cause buyers' share to be larger than their share in the initial periods of the baseline experiments (see figure-3.5). However, a paired t-test suggests that the two, buyer efficiency under NBQ and buyer efficiency under BSL, are not significantly different.

Comparing sellers share of the total surplus we see that the realization in the first

---

[12] see Kujal, ibid.

period is at 80.77% eventually it climbs to 127.46% (figure-3.5). Though, this realization is 10% lower than the baseline it follows a similar trend. That is, that the Posted-Offer institution distributes surplus in favor of the sellers. In this case a t-test suggests that seller realization of surplus under the baseline design is significantly different than (seller) realization of surplus in the non-binding quota design.

3.3.3. Binding Quotas-Below the Competitive Equilibrium (BQ)

Five experiments are run with binding controls. With binding controls all sellers can sell at most two units. After the controls are removed they can sell three units each at the CE.

An interesting result arising from these experiments is that average contracted price converges (figure-3.2) from below the CE (CE has a spread of five cents) while thebinding quotas are in effect. (The upper and lower support of the CE are $5.50 and $5.45, respectively.) The average contract price in the first period of the (five) BQ experiments is lower than the average contracted price in the NBQ experiment for the first seven periods. The average contracted price is also below the first five periods of the BSL experiments. This price convergence from below the CE is unlike price convergence in other posted offer experiments.[13]

Comparing the average posted price we see that the average posted price for all the experiments starts above the CE. The average posted price in the BQ experiments is less than the posted price in the BSL experiments for the three (out) of the first four

[13] see Kujal, ibid.

Baseline vs Non-Binding Quotas

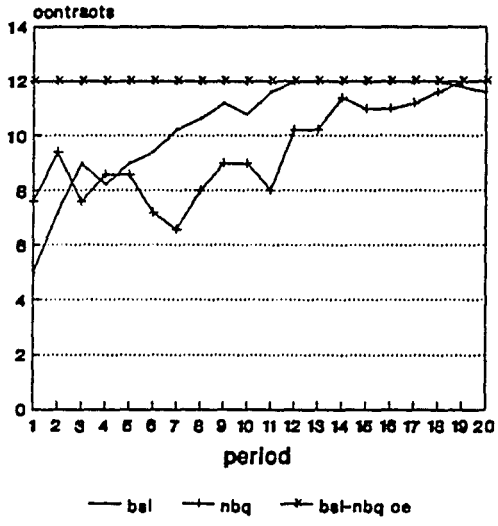
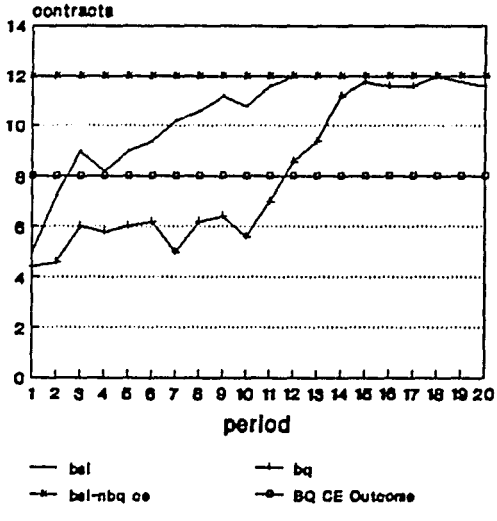


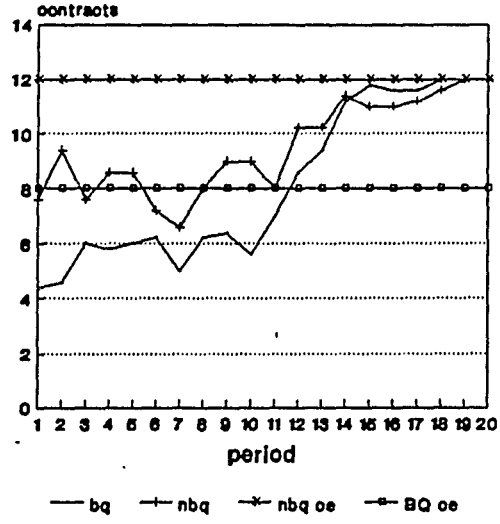
Figure-3.4

Average Contracts

Baseline vs Binding Quota



Binding vs. Non-Binding Quota



periods and, for first nine periods against the NBQ experiments. We thus see that the average price, posted or contracted, is depressed in the initial periods of the BQ treatment.

Another interesting feature observed in the BQ experiments is the speed with which the contracted prices converge to the CE. In almost all replications price had converged to, or above, the upper bound of the CE ($5.50).

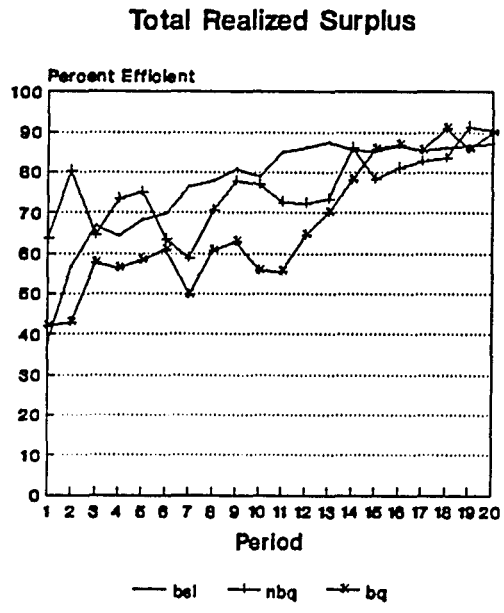
One can argue that convergence from below may be observed whenever one has distribution of surplus favoring the sellers. That is, in the limit, if the consumer surplus is zero (and the resale values of the buyers is the same as CE) one will observe price convergence from below the CE. A question that arises out of this is, "What distribution of asymmetric surplus will switch the convergence from above CE to below it?" To answer this question empirically, experiments can be run to see when this happens. Also, the effect of quotas upon the post-quota regime is evident. That is, contracts in periods 11-14 (figure-3.4) tend to remain below the CE. The impact of quotas (binding or non-binding) into the post-quota regime is also observed in the NBQ experiments.

Now, looking at the surplus distribution we see that (surprisingly) the binding quota design seems to favor the seller least of the three designs. That is, the sellers have substantially more theoretical surplus compared to the buyers in the BQ design. However, the average realization for the sellers in this design is 103.14%. (Note, this measure has an upward bias. As surplus is expressed relative to the baseline experiments.) This is less than the average realization of 126.19% in the BSL, and of 116.52% in the NBQ design. (T-tests here show that the pairing BSL-BQ is significantly different at the 1%

cl, BSL-NBQ at the 5% cl and, BQ-NBQ at the 1% cl.) Thus, it seems that the imposition and removal of quotas affects surplus distribution. Average buyers share of the surplus, 30.37%, (buyers share of the surplus will have a downward bias for the same reasons as mentioned above) is also less than the buyer share in the BSL, 34.09%, and NBQ, 34.65%. (A t-test comparing efficiencies for the three designs shows the buyer pairing in the BQ-NB pair is significantly different at 1% cl.) Another surprising outcome is that in the BQ experiments buyers share of the surplus starts higher and then declines. This result is the same as the one obtained in the NBQ experiments, i.e., in the initial periods buyer surplus started relatively higher than the BQ experiments.

Now, comparing the total realization we see that (note, all BQ efficiencies are relative to the BSL design) binding quota design is the least efficient of all at 66.98%. The other two designs show average total realization at 76.97% and 75.86%, for the BSL and NBQ design respectively. Also, t-tests confirm that the pairs, BSL-BQ and BQ-NBQ, are significantly different at the 1% cl.

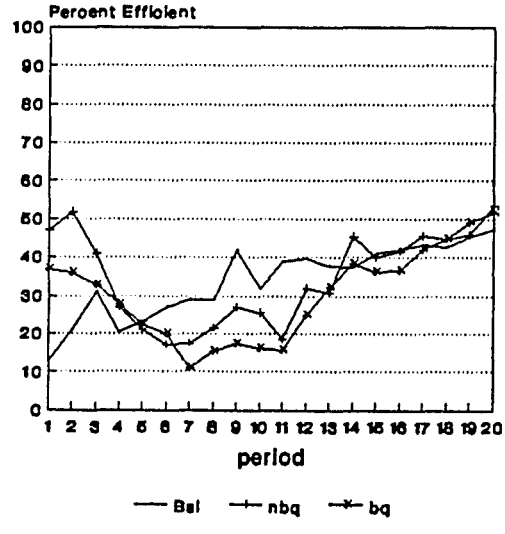
We thus see that non-binding quotas significantly affect the number of contracts. The impact on prices using t-tests is not significant, however, regressions run on the aggregate data indicate that non-binding quotas affect prices, and price adjustment significantly. F-tests also indicate that price variation in most of the treatments is significantly different.



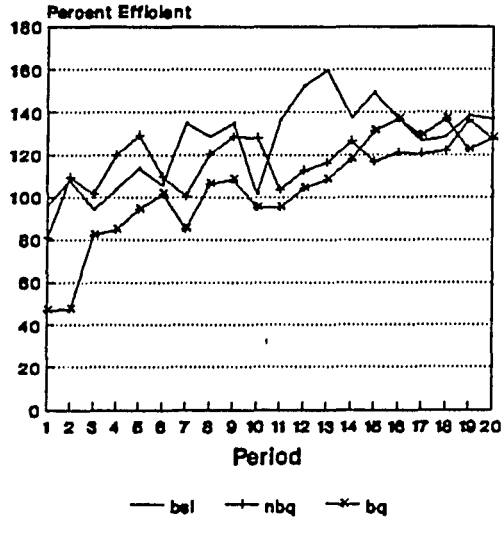
Eff. relative to BSL/NBQ seller surplus.

Figure-3.5

Average Realized Surplus



Eff. relative to BSL/NBQ surplus.



3.4. Conclusion

Two interesting results arise from the experiments run above. First, as has been observed in the price control experiments, non-binding price controls tend to substantially affect institutional performance. One sees that the institutional effects of non-binding quotas are carried over to periods without the quantity constraints. Thus, past regulatory controls affect institutional performance in the future (as has also been observed in the price control experiments).

Second, with binding quotas (average) price convergence is observed from below the CE. As mentioned, this is unlike the results observed in other posted offer experiments done and is contrary to the claim by Davis Williams (1986) that convergence path of prices is not affected by surplus distribution. This may be due to the impact of binding quotas (that is, sellers may 'react' to the announcement that a central authority determines capacity). To sort out the ratio of consumer-producer surplus at which the convergence path swithches more experiments need to be run with asymmetric surplus, and with binding quotas (with both designs having the same price and quantity outcome).

We also see no jump (or overshooting of the CE) in price is after the quotas, binding or non-binding, are removed. This overshooting, prevalent in all the price control experiments (both in the posted offer and the double oral auctions), does not seem to carry over to the quota experiments. For the aggregate model (cross section-time series) estimates we observe that prices seem to be significantly affected by the non-binding quotas. This is not affirmed by the individual experiment estimates. Also, from the price

adjustment model we see that price adjustment seems to be significantly affected by the binding and non-binding quotas. Again, these results are not unanimously supported by the individual experiment estimates. The average price converges towards the CE after the binding quotas are removed. The evidence suggests that the removal of quotas in experimental markets may not cause abrupt changes in the average (contracted or posted) price as has been observed in the price control experiments.

As far as distribution of surplus is concerned, surprisingly, binding quotas favor surplus distribution towards the buyers (relative to the BSL and the NBQ treatments) in the early periods of the experiments. All experiments are characterized by relatively low efficiency levels. Surprisingly the sellers have low efficiency levels in the binding quota design. This may also be due to price cycles where sellers may price themselves out of the market. This may be due to 'noise' because of the removal of binding quotas. Sellers may have to search more, subsequently pricing themselves out of the market.

In our experiments binding quotas were removed after the tenth period. Thus, we cannot say how well the sellers could sustain the higher price they seem to achieve as the experiment progresses. Longer experiments with binding quotas will have to be run to clarify this question.

A fixed-effects random-effects model is run to test the impact of quotas on prices, price deviation, and contracts, in the aggregate, we can say that quotas, binding or non-binding, affect all these variables in the aggregate. Individual responses vary, and some individual sellers behavior is not consistent with the aggregate results. However, what

is evident is that market controls, binding or non-binding, affect market performance. Also, the effect of the market controls is evident in the post quota regime. We observe that our non-parametric tests on the latter half pairs of contracts for the BSL-NBQ pair, show that 10 pairs (of 25) (and most for the paired t-tests) are significantly different (see Appendix-1 for non-parametric tests). The number of (significantly) different pairs goes up in the latter half. Thus, we have some support for the conjecture that non-binding affect market performance in the post quota regime.

Table-3.1
Marginal Cost and Marginal Valuations

Baseline:

	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5
Buyer 1	5.60	5.55	5.45	5.30	5.20
Buyer 2	5.55	5.50	5.45	5.25	5.15
Buyer 3	5.55	5.50	5.45	5.25	5.15
Buyer 4	5.60	5.55	5.45	5.30	5.20
Seller 1	5.00	5.05	5.15	5.30	5.40
Seller 2	5.05	5.10	5.15	5.35	5.45
Seller 3	5.00	5.05	5.15	5.35	5.55
Seller 4	5.05	5.10	5.15	5.40	5.50

Nonbinding Quotas:

	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5
Buyer 1	5.60	5.55	5.45	5.30	5.20
Buyer 2	5.55	5.50	5.45	5.25	5.15
Buyer 3	5.55	5.50	5.45	5.25	5.15
Buyer 4	5.60	5.55	5.45	5.30	5.20
Seller 1	5.00	5.05	5.15	5.30	0.00
Seller 2	5.05	5.10	5.15	0.00	0.00
Seller 3	5.00	5.05	5.15	0.00	0.00
Seller 4	5.05	5.10	5.15	0.00	0.00

table-3.1 continued:

Binding Quotas:

	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5
Buyer 1	5.60	5.55	5.45	5.30	5.20
Buyer 2	5.55	5.50	5.45	5.25	5.15
Buyer 3	5.55	5.50	5.45	5.25	5.15
Buyer 4	5.60	5.55	5.45	5.30	5.20
Seller 1	5.00	5.05	0.00	0.00	0.00
Seller 2	5.05	5.10	0.00	0.00	0.00
Seller 3	5.00	5.05	0.00	0.00	0.00
Seller 4	5.05	5.10	0.00	0.00	0.00

Table-3.2a
Paired T-Tests: Contracts
BSL vs, NBQ Experiments[14]

BSL1 vs_	T-Value	Prob.		T-Value	Prob.
NQB1	3.49	0.00	BQ1	5.03	0.00
NBQ2	2.76	0.01	BQ2	4.32	0.00
NBQ3	2.60	0.01	BQ3	4.48	0.00
NBQ4	1.68	0.11	BQ4	5.35	0.00
NBQ5	2.16	0.04	BQ5	5.32	0.00

BSL2 vs_

NBQ1	3.32	0.00	BQ1	4.31	0.00
NBQ2	2.70	0.01	BQ2	4.37	0.00
NBQ3	3.14	0.05	BQ3	4.03	0.00
NBQ4	1.52	0.14	BQ4	5.21	0.00
NBQ5	2.09	0.05	BQ5	5.43	0.00

BSL3 vs_

NBQ1	3.74	0.00	BQ1	4.71	0.00
NBQ2	3.27	0.00	BQ2	4.34	0.00
NBQ3	1.28	0.21	BQ3	4.34	0.00
NBQ4	1.22	0.24	BQ4	5.39	0.00
NBQ5	2.13	0.05	BQ5	5.59	0.00

[14] Baseline (BSL), Non-Binding Quota (NBQ), and Binding Quota (BQ).

Table-3.2a Continued:

BSL4 vs_

NBQ1	1.41	0.18	BQ1	2.47	0.02
NBQ2	0.69	0.50	BQ2	2.60	0.02
NBQ3	0.62	0.54	BQ3	2.56	0.02
NBQ4	0.52	0.61	BQ4	3.64	0.00
NBQ5	0.85	0.40	BQ5	3.45	0.00

BSL5 vs_

NBQ1	3.21	0.01	BQ1	4.48	0.00
NBQ2	2.63	0.02	BQ2	3.97	0.00
NBQ3	4.10	0.00	BQ3	4.01	0.00
NBQ4	1.77	0.09	BQ4	5.11	0.00
NBQ5	2.12	0.05	BQ5	5.48	0.00

Table-3.2b
Paired T-tests: Contracts
BQ vs NBQ Experiments

BQ1 vs_	T-Value	Prob.	BQ2 vs_	T-Value	Prob.
NBQ1	1.10	0.29	NBQ1	1.05	0.31
NBQ2	2.93	0.01	NBQ2	2.88	0.01
NBQ3	3.10	0.01	NBQ3	3.13	0.01
NBQ4	1.58	0.13	NBQ4	1.52	0.15
NBQ5	1.60	0.13	NBQ5	2.32	0.04

BQ3 vs_

NBQ1	1.92	0.07	NBQ1	2.46	0.02
NBQ2	3.51	0.00	NBQ2	4.45	0.00
NBQ3	2.95	0.01	NBQ3	4.36	0.00
NBQ4	2.19	0.04	NBQ4	2.51	0.02
NBQ5	2.56	0.02	NBQ5	3.16	0.01

BQ5 vs_

NBQ1	2.70	0.01	NBQ4	2.46	0.02
NBQ2	4.97	0.00	NBQ5	3.35	0.00
NBQ3	4.56	0.00			

Table-3.3a
Paired T-Tests: Prices
BSL vs NBQ Experiments

BSL1 vs_	T-Value	Prob.		T-Value	Prob.
NBQ1	-0.40	0.69	BQ1	-0.78	0.44
NBQ2	-1.23	0.23	BQ2	-1.81	0.09
NBQ3	-1.52	0.15	BQ3	0.20	0.84
NBQ4	-0.21	0.84	BQ4	-2.52	0.02
NBQ5	-1.54	0.14	BQ5	1.38	0.18

BSL2 vs_

NBQ1	1.95	0.07	BQ1	0.23	0.82
NBQ2	0.49	0.63	BQ2	-0.97	0.35
NBQ3	0.35	0.73	BQ3	1.41	0.17
NBQ4	1.28	0.22	BQ4	-1.65	0.12
NBQ5	-0.48	0.64	BQ5	2.82	0.01

BSL3 vs_

NBQ1	-1.45	0.16	BQ1	-1.23	0.23
NBQ2	-2.10	0.05	BQ2	-2.45	0.02
NBQ3	-3.65	0.00	BQ3	-0.27	0.79
NBQ4	-0.97	0.34	BQ4	-3.19	0.01
NBQ5	-2.02	0.06	BQ5	0.64	0.53

BSL4 vs_

NBQ1	1.03	0.32	BQ1	1.01	0.33
NBQ2	1.01	0.33	BQ2	0.94	0.36
NBQ3	1.00	0.33	BQ3	1.08	0.29
NBQ4	1.05	0.31	BQ4	0.86	0.40
NBQ5	0.96	0.35	BQ5	1.08	0.29

Table-3.3a continued:

BSL5 vs_

NBQ1	1.90	0.07	BQ1	-0.44	0.67
NBQ2	0.77	0.45	BQ2	0.62	0.54
NBQ3	0.64	0.53	BQ3	-1.40	0.18
NBQ4	1.33	0.20	BQ4	-1.32	0.20
NBQ5	-0.15	0.88	BQ5	3.02	0.01

Table-3.3b
Paired T-Tests: Prices
BQ vs NBQ Experiments

BQ1 vs_ BQ2 vs_

NBQ1	0.71	0.48	NBQ1	1.93	0.07
NBQ2	0.08	0.93	NBQ2	1.31	0.21
NBQ3	-0.04	0.97	NBQ3	1.64	0.12
NBQ4	1.06	0.30	NBQ4	2.94	0.00
NBQ5	-1.73	0.10	NBQ5	1.19	0.25

BQ3 vs_ BQ4 vs_

NBQ1	-0.44	0.66	NBQ1	2.99	0.01
NBQ2	-1.47	0.16	NBQ2	1.87	0.08
NBQ3	-1.75	0.10	NBQ3	2.48	0.02
NBQ4	-0.54	0.59	NBQ4	3.90	0.00
NBQ5	-2.59	0.02	NBQ5	1.33	0.20

BQ5 vs_

NBQ1	-1.52	0.15	NBQ4	-1.16	0.26
NBQ2	-2.96	0.01	NBQ5	-2.09	0.05
NBQ3	-2.26	0.04			

Table-3.4a
T-Tests: Price Deviations From The Competitive Equlibrium

BQ1 vs_	T-Value	Prob.	BQ2 vs_	T-Value	Prob.
NBQ1	-4.02	0.00	NBQ1	-3.93	0.00
NBQ2	-2.47	0.02	NBQ2	-2.66	0.02
NBQ3	-2.33	0.03	NBQ3	-2.31	0.03
NBQ4	-2.73	0.01	NBQ4	-3.28	0.00
NBQ5	-2.70	0.01	NBQ5	-3.48	0.00

BQ3 vs_			BQ4 vs_		
NBQ1	-4.15	0.00	NBQ1	-4.00	0.00
NBQ2	-2.47	0.02	NBQ2	-2.23	0.04
NBQ3	-1.75	0.10	NBQ3	-2.24	0.04
NBQ4	-3.19	0.01	NBQ4	-2.14	0.05
NBQ5	-1.97	0.06	NBQ5	-2.10	0.05

BQ5 vs_			BQ1 vs_		
NBQ1	-1.08	0.29	BSL1	-3.02	0.01
NBQ2	0.42	0.68	BSL2	-2.21	0.04
NBQ3	-0.78	0.45	BSL3	-3.20	0.01
NBQ4	0.76	0.45	BSL4	-2.17	0.04
NBQ5	0.57	0.58	BSL5	-2.42	0.03

BQ2 vs_			BQ3 vs_		
BSL1	-2.98	0.01	BSL1	-2.35	0.03
BSL2	-2.45	0.02	BSL2	-1.50	0.15
BSL3	-3.00	0.01	BSL3	-2.49	0.02
BSL4	-2.21	0.04	BSL4	-1.44	0.17
BSL5	-2.36	0.03	BSL5	-1.45	0.16

Table-3.4a continued:

BQ4 vs_			BQ5 vs_		
BSL1	-2.74	0.01	BSL1	0.71	0.49
BSL2	-1.83	0.08	BSL2	0.94	0.36
BSL3	-3.22	0.01	BSL3	-0.42	0.68
BSL4	-1.98	0.06	BSL4	0.05	0.96
BSL5	-2.18	0.04	BSL5	0.92	0.37

Table-3.4b
First Half (Period 1-10) Nonparametric T-Tests: NBQ vs BSL

NBQ1_	P-Value	NBQ2_	P-Value	NBQ3_	P-Value
BSL1	0.026	BSL1	0.026	BSL1	0.480
BSL2	0.084	BSL2	0.210	BSL2	0.480
BSL3	0.700	BSL3	0.210	BSL3	0.700
BSL4	0.026	BSL4	0.026	BSL4	0.210
BSL5	0.026	BSL5	0.026	BSL5	0.026

NBQ4_		NBQ5_			
BSL1	0.900	BSL5	0.480	BSL2	0.210
BSL2	0.800			BSL3	0.480
BSL3	0.600	NQB5_	0.210	BSL4	0.084
BSL4	0.600	BSL1	0.210	BSL5	0.084

Table-3.4c
Second Half (Period 11-20) Nonparametric Tests-NBQ vs BSL

NBQ1_	P-Value	NBQ2_	P-Value	NBQ3_	P-Value
BSL1	0.006	BSL1	0.600	BSL1	0.600
BSL2	0.026	BSL2	0.700	BSL2	0.600
BSL3	0.006	BSL3	0.700	BSL3	0.480
BSL4	0.021	BSL4	0.700	BSL4	0.900
BSL5	0.006	BSL5	0.900	BSL5	0.700

NBQ4_					
BSL1	0.006	BSL5	0.006	BSL2	0.700
BSL2	0.006			BSL3	0.600
BSL3	0.02	NQB5_		BSL4	0.800
BSL4	0.084	BSL1	0.700	BSL5	0.480

Table-3.5[15]

Pooled (5 (experiments) x 4 (time series)) Estimates:

Model: $P_{it} = a + b\ D_{it} + c\ P_{i\ t-1} + u_{it}$

Binding Quotas:

FE Model:

	Coeff. (se)	T-Value	Prob.
D	0.05 (.01)	4.21	0.00
P(-1)	0.11 (.02)	6.29	0.00
P(-2)	-0.31 (.01)	-1.98	0.05

RE Model:

One	4.99 (.09)	53.96	0.00
D	0.05 (.01)	4.16	0.00
P(-1)	0.12 (.02)	6.49	0.00
P(-2)	-0.03 (.01)	-1.81	0.07

Non-Binding Quotas:

FE Model:

D	0.08 (.02)	3.63	0.00
P(-1)	0.35 (.03)	11.15	0.00

RE Model:

One	3.34 (.17)	20.13	0.00
D	0.07 (.02)	3.39	0.00
P(-1)	0.39 (.03)	12.86	0.00

[15] For the pooled data, 5 (experiments)× 4 (sellers) × 20 (periods).

Table-3.6

Model: $dvP_{it} = a + b\ D_{it} + c\ dP_{it}$, for the i^{th} time series, and the t_{th} time series $t=1,2,3,4,5$.

Pooled Data Regressions:[16]

Binding Quota Experiments Results:

Binding Quota Experiments*:

FE Model:

Variable	Coeff. (se)	T-Ratio	P-Value
dvPPool	0.38 (.04)	9.19	0.00
D	-0.11 (.03)	-3.36	0.00

Non-Binding Quota Experiments:

FE Model:

Variable	Coefficient	T-Ratio	P-Value
dvPPool	0.34 (.03)	10.79	0.00
D	0.09 (.02)	4.23	0.00

RE Model:

dvPPool	0.37 (.03)	12.30	0.00
D	0.09 (.02)	4.06	0.00
One	0.15 (.02)	7.28	0.00

Individual Experiment Results:

Binding Quota Experiments:

FE Model:

dvP_1	0.23 (.05)	4.65	0.00
D	-0.15 (.02)	-7.50	0.00

[16] Data across 20 subjects from one treatment (binding or non-binding quota) is pooled (20 time series).

table-3.6 continued:

_ RE Model:

dvP_1	0.24 (.05)	4.82	0.00
D	-0.15 (.02)	-7.52	0.00
One	0.16 (.02)	7.30	0.00

FE Model:

dvP_2	-0.08 (.08)	-0.99	0.33
D	-0.15 (.03)	-5.22	0.00

RE Model:

Variable	Coefficient	T-Value	P-Value
dvP_2	-0.67 (.08)	-0.88	0.38
D	-0.15 (.03)	-5.21	0.00
One	0.14 (.04)	3.63	0.00

FE Model*:

dvP_3	0.07 (.11)	-0.63	0.53
D	-0.61 (.03)	-2.26	0.03

FE Model:

dvP_4	0.22 (.04)	3.62	0.33
D	-0.15 (.03)	-5.02	0.00

RE Model:

dvP_4	0.23 (.06)	3.78	0.00
D	-0.15 (.03)	-5.04	0.00
One	0.17 (.06)	2.86	0.00

FE Model*:

dvP_5	0.42 (.10)	4.46	0.00
D	-0.59 (.16)	-0.38	0.71

table-3.6 continued:

Non-Binding Quota Experiment Results:

FE Model:

dvP_1	0.33 (.11)	3.05	0.00
D	0.25 (.09)	2.92	0.00

RE Model:

dvP_1	0.38 (.10)	3.67	0.00
D	0.24 (.09)	2.80	0.01
One	0.16 (.11)	1.40	0.16

FE Model:

dvP_2	-0.12 (.12)	-1.02	0.31
D	0.15 (.04)	3.40	0.00

RE Model:

dvP_2	-0.10 (.11)	-0.87	0.39
D	0.15 (.04)	3.37	0.00
One	0.12 (.05)	2.59	0.01

FE Model:

dvP_3	0.38 (.02)	16.05	0.00
D	0.01 (.03)	0.44	0.66

FE Model:

dvP_4	0.24 (.11)	2.11	0.04
D	0.26 (.00)	0.20	0.83

RE Model:

dvP_4	0.25 (.11)	2.22	0.03
D	0.003 (.01)	0.23	0.82
One	0.18 (.01)	17.92	0.00

table-3.6 continued

FE Model:

dvP_5	0.20 (.12)	1.64	0.105
D	0.08 (.03)	2.39	0.02

RE Model:

dvP_5	0.22 (.12)	1.82	0.07
D	0.08 (.03)	2.47	0.01
One	0.16 (.02)	7.32	0.00

* Could not estimate RE model.

Chapter-4

Price Controls vs Firm-Specific Quantity Restrictions in a Posted-Offer Market

4.1. Introduction

In this chapter we compare the effect of price controls and firm-specific quantity restrictions in experimental Posted-Offer markets. There has been a substantial amount of experimental work on price controls (see, Smith and Williams (A.E.R., 1983) Coursey and Smith (A.E.R., 1981), Isaac and Plott (A.E.R., 1981)). One of the major results from these experiments is that non-binding price controls affect institutional performance. However, there has not been much experimental work on quantity restrictions. The only other work that looks at the effect of firm-specific quotas (chapter-3) also reinforces the results from the price-controls experiments. That is, non-binding market controls do affect institutional performance.

Now, a natural extension of this work would be to compare the two modes, price and quantity, of control. Not distinguishing between the specific nature of the controls, the equivalence between prices and quantities is clear. That is, given all the continuity assumptions, we can write the demand equation as;

(1) $Q=f(P)$, or the inverse $P=f^{-1}(Q)$.

Of course, the result is independent of any institutional framework and may not be valid in market environments. For example, we can have two different kinds of quotas, firm-specific (where the individual firms' capacity is constrained, say, licensing

individual firm capacities) and market (where the total trades in the market are limited). It has been shown that if we consider the equivalence in an environment with posted-prices then the non-cooperative equilibrium price distribution under firm specific quantity limits stochastically dominates equilibrium price distribution under market quotas. We thus see that the price outcomes and welfare implications are determined by the institutional characteristics (rules) and the nature of the market controls.[1]

In this chapter we compare the (posted-offer) institutional performance between firm-specific quotas, binding and non-binding, and price ceilings, binding and non-binding. We also look at the effect of the controls and market design on total contract and total surplus realization. To test for the effect of differences in market design we compare our results with the posted-offer price control experiments done by Coursey and Smith (1983).

The chapter is structured as follows. We first discuss issues relevant to the forthcoming comparison (between price and quantity controls). Then we discuss the experimental design(s) followed by a discussion of the results and the conclusion.

4.2. Data Analysis

Before elaborating on the analysis we first discuss the problems that one faces while making a (straightforward) comparison between price and quantity controls. That is, given that the (price and quantity) outcomes are institutional dependent, the welfare

[1] For a discussion on this see Smith 1982.

implications of any control will be determined by the institutional rules (and the nature of controls). Also, the disciplining effect of market quotas is different than the (disciplining) effect of firm-specific quotas. That is, limiting individual firm capacities (firm-specific quotas) may give outcomes that favor the producer (high prices) relative to limiting total trades (market quotas). As market quotas may favor competitive outcomes relative to firm-specific quotas. Also, binding price ceilings tend to benefit consumers and binding floors tend to benefit the producers. We thus see that (consumer) welfare implications will vary across the nature of the controls which is not taken into account in (1).

Furthermore, we see that in market environments the manner in which the controls 'censor' the (market participants) search space is different. That is, price and quantity controls, binding or non-binding, place artificial bounds on the search space. Price controls let the market participants search in the quantity space while limiting the price search space (note, in a posted-offer market price choice determines the (maximum) quantity choice). Similarly, quantity restrictions do not affect the price search space but, but limit the quantity search space. We thus see that the data generated from these two processes may not be directly comparable. For example, in a posted-offer environment the sellers make price choices, which then determines the maximum quantity they can sell. The institutional rules are such that it will not allow the seller to make negative profits on a unit.

Thus, to facilitate comparison it becomes important to reduce the observations to

a common denominator. We look at the total (percent) contracts realized, and only compare institutional efficiency levels. We only look at the total realized surplus, and not the individual buyer and seller share of it. This is because the buyers were simulated in our experiments (not in the Coursey-Smith experiments). Given, that with human buyers the posted-offer institution favors the sellers we would expect the seller share in our experiments to be upwardly skewed due to the absence of the buyer countervailing power.

4.3. Experimental Design

The experiments use the Plato Posted-Offer exchange mechanism[2]. The following designs are used for the quota and price control experiments.

4.3.1. Quota Experiments

There are three different experimental designs, the baseline (with no quantity restrictions), non-binding quotas (no excess demand at the competitive equilibrium) and binding quotas (excess demand at the competitive equilibrium). In the second and third categories of experiments the quotas are removed midway ("quotas/no-quotas", or Q/N experiments).

In our experiments the buyers are simulated. The buyers are perfect revealers and accept zero 'profit'.

4.3.1.1. Baseline (BSL) Experiments (figure-4.1)

The baseline design is characterized by four sellers capable of selling five units

---

[2] For detailed instructions see, Ketcham J., Smith V.L., and Williams A., 1984.

each and four buyers capable of buying five units each. The surplus is distributed symmetrically among the buyers and the sellers. At the CE 12-13[3] units can be traded (for the resale and cost values see table-1). Note, that units are expressed as deviations from the low cost unit.

4.3.1.2. Quotas at the CE (Non-Binding Quotas (NBQ)) (figure-4.1)

In this design the sum of the sellers capacities equals thirteen. This leaves the competitive price and quantity outcome unchanged from the baseline experiments.

4.3.1.3. Quotas below the CE (Binding Quotas (BQ)) (figure-4.1)

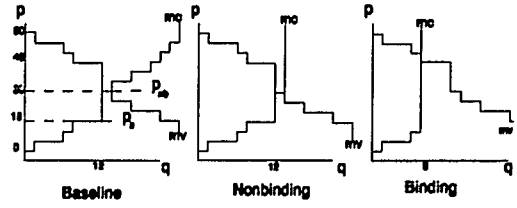
Here the sum of the sellers' capacities equals eight. The competitive outcome is in a 5 cent range, from 15-20 cents above the CE in the NBQ/BSL design.

The subjects receive a special announcement that during each trading period quantity controls will be in effect when appropriate. If any seller attempts to violate the quota restriction, that is, sell more units than their (maximum) production quota, this results in the rejection of the sellers offer until the output constraint (quota) is satisfied. This design is similar to that used by Coursey and Smith (1983),
except that firm quotas are used instead of price controls. Subjects are also told that their capacity is determined by a central authority. This announcement is made to all the subjects. They are also given individual announcements that state their capacities. The announcement at the start of the experiment reads:

---

[3] From now on we use CE as being at 12 units, as the thirteenth unit is never traded at zero profits. We thus use the lower bound of 12 as the competitive equilibria.

Figure-4.1



Marginal Cost and Marginal Valuations

"Your capacity is determined by a central authority. Your capacity is ____. Please make sure that the number on the screen coincides with the capacity stated."

One period prior to the removal of the quotas, an announcement is again made in regards to the change in capacity. Subjects are told individually what their "new" capacities are. Note, that everyone knows that the individual capacities have been changed, however, individual capacity changes are private information. The announcement reads as follows:

"The central authority has now decided to change your capacities. You now have a capacity of FIVE units. Please make sure that the monitor screen shows the correct amount."

Each trading period starts with a seller posting the price, and the total number of units he is willing to sell at that price. Once all the sellers have made their final offers, they are notified about the other sellers' offer prices. The buyers are then randomly queued to initiate the buying procedure. If the units available from a particular seller have been exhausted, they are given the message "out of stock". After all the buyers have completed their purchasing the trading period ends.

Each experiment consists of twenty trading periods. The trading periods are split into groups of ten each. For the Q/N experiments quantity controls are in effect for the first ten periods, and removed for the remaining ten periods.

The experiments are conducted with no quotas (baseline experiment), with quotas at the competitive equilibrium (non-binding), and with quotas below the competitive level of output (binding quotas).

With non-binding quotas each individual firm can sell at most three units each (the same as at the CE). However, seller 1 has an additional unit at the CE. (The competitive outcome of 12 (and not 13) is realized as we do not give commissions for the units traded.) With the binding quotas each individual firm can sell at most two units.

4.3.2. Price Control Experiments

In these experiments the sellers are told that price controls are in effect and specifies the maximum price for which they can sell the units. We run experiments with binding (ceiling (p_b) < competitive Outcome) and non-binding price ceilings (ceiling (p_{nb}) = competitive outcome) (see figure-4.1). The price controls are set such that they are

consistent with the quantity controls (as we have horizontal overlap in the quantity space we get unique prices). Midway through the experiments we remove the price controls. The buyers are simulated in these experiments. This procedure is similar to the CS-pc1 experiments. Both the, binding and non-binding, price controls in our experiments are the same as in CS-pc1 experiments.

4.4. Experimental Results

We compare our results for the effect of contract realization, total surplus realization and, price deviation. We use report t-, F- and, the Wilcoxon sign test to look for population differences.

4.4.1. Non-Binding Controls-At the Competitive Equilibrium

4.4.1.1. Percent Contract Realization (figure-4.2a)

We see that with non-binding quotas (henceforth, nbq) the percent contracts realized (percent of the competitive equilibrium) are significantly below our price control experiments (henceforth, pc2) and the Coursey-Smith experiments (henceforth, pc-1). Looking at the (contract) convergence path we see that contracts in the nbq experiments stay well below the contracts in the pc-2 and pc-1 experiments till around the eleventh period. The results of the paired t-, F- , and the Wilcoxon test (in parenthesis) in table-4.1.

Figure-4.2a
Percent Contracts Realized
Non-Binding Controls

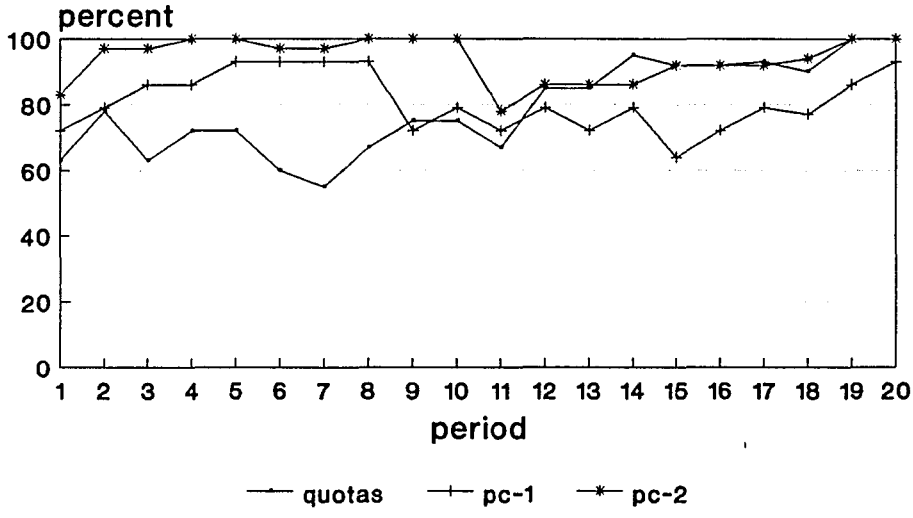


Figure-4.2b
Total Efficiency
Non-Binding Controls

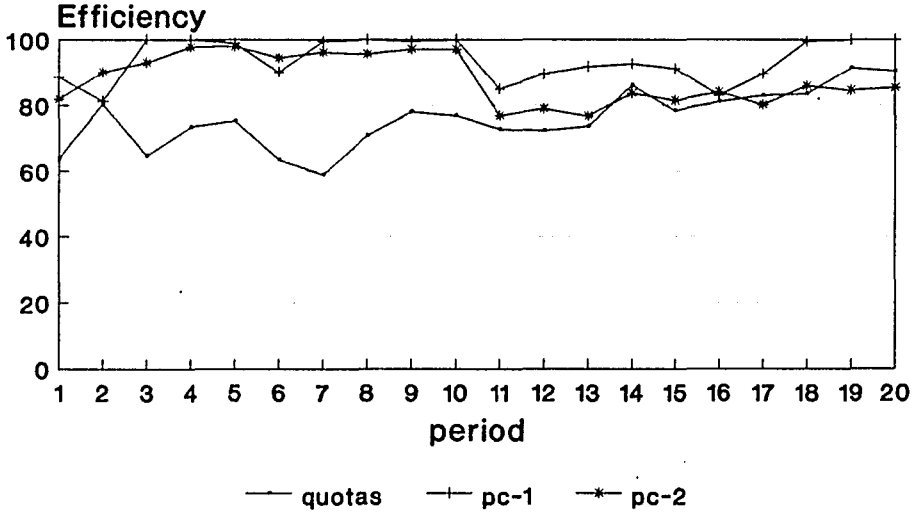


Table-4.1

	T-Stats	P-Value (Wilcoxon)	F-Stats	P-Value
nbq vs pc-1	-0.45	0.64 (0.50)	2.45	0.03
nbq vs pc-2	-4.15	0.00 (0.00)	4.26	0.00
pc-1 vs pc-2	-7.90	0.00 (0.00)	1.74	0.12

4.4.1.2. Surplus Realization (figure-4.2b)

The nbq experiments exhibit lower surplus realization in the early periods relative to the pc-1,-2 experiments in the early periods. However, surplus realization never converges to a 100%. The t-, F-, and Wilcoxon tests are in Table-4.2.

Table-4.2

	T-Stat	P-Value (Wilcoxon)	F-Stat	P-Value
nbq vs pc-1	-7.46	0.00 (0.00)	1.87	0.09
nbq vs pc-2	-4.06	0.00 (0.17)	1.36	0.25
pc-1 vs pc-2	4.13	0.00 (0.05)	1.37	0.25

We thus see that non-binding quotas do affect institutional performance adversely relative to price controls in the early stages of the experiments. One reason could be that the two controls impose different search characteristics on the two institutions. With greater freedom in the price search space, with quantity restrictions, the sellers may tend to price themselves out of the market.

4.4.2. Controls Below the Competitive Equlibrium

Figure-4.3a
Percent Contracts Realized
Binding Controls

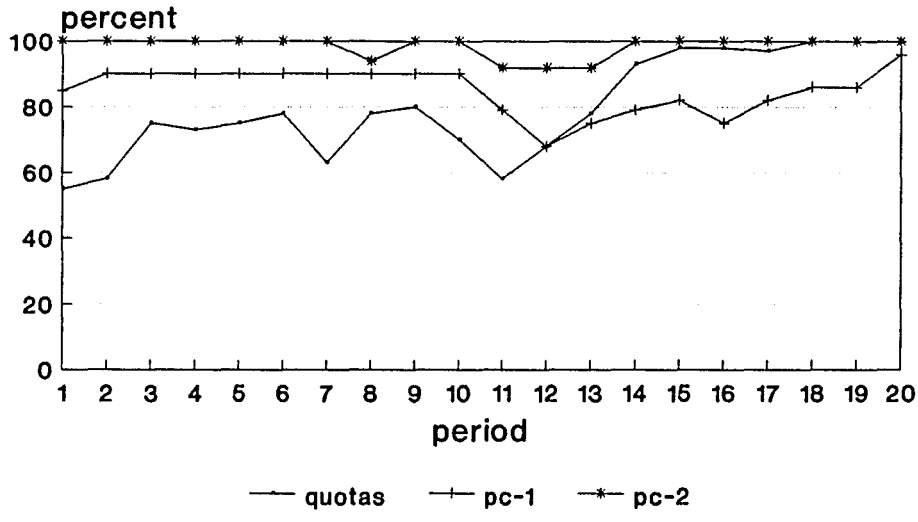
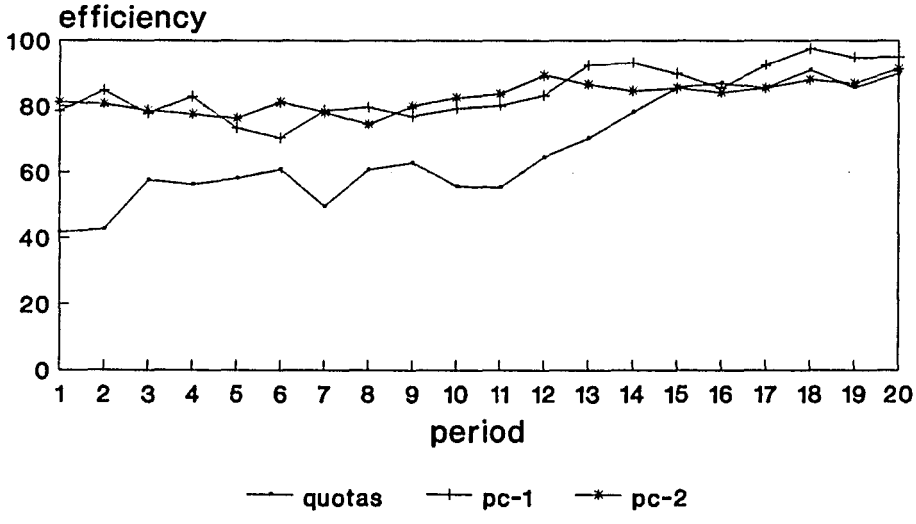


Figure-4.3b
Total Efficiency
Binding Quotas



4.4.2.1. Percent Contract Realization (figure-4.3a)

A result consistent with the nbq and binding quota (bq) experiments is that the contracts realized in experiments with quantity restrictions start well below the pc-1 and pc-2 experiments. All experiments show a fall in the contracts realized after the controls are removed. The results for the t-, F-, and Wilcoxon tests are reported in Table-4.3.

Table-4.3

	T-Stat	P-Value (Wilcoxon)	F-Stat	P-Value
bq vs pc-1	-1.40	0.18 (0.27)	4.90	0.00
bq vs pc-2	-5.68	0.00 (0.00)	24.82	0.00
pc-1 vs pc-2	3.05	0.00 (0.00)	1.42	0.23

4.4.2.2. Total Surplus Realization (figure-4.3b)

Although, surplus realized in the bq/pc-2 experiments started low. Once again, surplus realization in the binding quota experiments was well below both the price control experiments for most part of the experiment. The pc-1 experiments started relatively high (79%) than the pc-2 and bq (61%) experiments. This may, however, be due to the disciplining effect of the market design. Below we report the t-, F-, and Wilcoxon tests in Table-4.4.

Table-4.4

	T-Stat	P-Value (Wilcoxon)	F-Stat	P-Value
bq vs pc-1	-6.89	0.00 (0.00)	3.66	0.00
bq vs pc-2	-3.05	0.00 (0.00)	1.42	0.23
pc-1 vs pc-2	5.66	0.00 (0.00)	2.44	0.03

4.5. Conclusion

We thus see that quantity restrictions, binding or non-binding, affect institutional performance adversely relative to price controls. One reason, as stated earlier may be that the two controls censor information in different ways. Thus, allowing for freedom of search in the price space we may observe sellers pricing themselves out of the market in the initial stages of the experiment. As a result lower contracts realized, and hence lower efficiency levels (at least in the earlier stages of the experiments).

Our statistical results confirm the results that quantity controls affect institutional performance adversely relative to price controls. This is reflected by lower contract and (total) surplus realization in the early stages of all the experiments.

Chapter-5

Removal of Firm Specific Output Limits and Dynamic Market Power

5.1. Introduction

The impact of binding quotas on market prices and market performance has not been studied by experimental economists. Firm specific output limits may actually change price outcomes in a market and also affect market performance.[1]

Holt et. al. have looked at supracompetitive prices in several papers and the issue of dynamic market power[2] in a recent paper (May, 1991). They show that if the incumbent firms have market power then we get supracompetitive prices. However, Holt et. al. look at the issue of supracompetitive prices arising due to mergers in a posted offer market. They show that if market power is created, due to mergers, then the sellers can raise the market price. If, however, with mergers market power does not change there is no resultant effect on prices. The focus of their paper is to look at issues where a merger may, or may not, create market power.

Now, the creation of market power due to mergers is one way to look at the issue. In market economies, of course, it is a relevant issue and the regulatory authorities need to be concerned about this. However, in economies where quantity

---

[1] Kujal, P, "Firm-Specific vs. Market Quotas: The Non-Equivalence of Price Outcomes."

[2] Our definition of market power follows Holt (1989). Holt defines unilateral market power as, "..a unilateral deviation from a competitive equlibrium is profitable for that seller, assuming that all other buyers and sellers behave competitively." p.108.

restrictions are imposed we may get market power due to the change in the fundamental structure of the market. That is, with the removal of firm-specific output limits we expand individual firm capacities keeping the number of incumbent firms constant (Note, in the Holt et. al. capacities are kept constant with the number of firms declining due to mergers).

In this paper, we look at dynamic market power as a result of the removal of firm-specific quotas. Market power is dynamic in the sense that after the firm-specific quanity restrictions are removed market power can be created (diminished) and the price predictions change due to the removal of firm-specific quantity limits. Creation of market power is associated with the (increased) ability of the sellers to (unilaterally) raise their posted (and contracted) prices. We look at the interesting case where the creation of market power results in an increased ability of the sellers to unilaterally raise the price relative to the competitive equlibrium, however, the lower bound of the equlibrium mixed strategy distribution is below the competitive outcome before the quantity limits are removed. That is, with the removal of quotas we show a case where no market power may result in higher prices than with market power.[3]

The outline of rest of the paper is as follows. In Section 2 we describe the market design and the (market) procedures. The theoretical equilibrium price distributions are discussed in Section 3. Section 4 is the conclusion.

---

[3] Such a situation can be misleadingly viewed as a decrease in prices due to diminished market power.

5.2. Market Design and Experimental Procedures

We define market power in the Holt (1989) sense. That is, market power exists if at least one seller can profit from an unilateral price deviation above the competitive price. This definition implies that the competitive equilibrium is not the non-cooperative equilibrium (see Holt 1989, Davis and Holt 1991, Davis, Holt, and Villamil, 1990).

If the sellers are able to increase market prices in the above sense then the existence of market should give us supracompetitive prices. We will also distinguish between price decreases due to tacit collusion and due to market power (a la Davis and Holt (1991). That is, if prices exceed the level determined by the unique non-cooperative equilibrium we attribute that to tacit collusion.

The experiments use the Posted-Offer exchange mechanism. The experimental designs are illustrated in Figure-1. All experiments have four sellers. The first panel is the baseline design. The second panel illustrates binding quotas.[4]

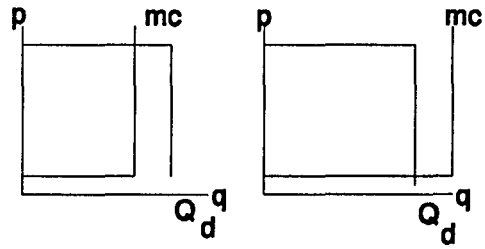
In the experiments buyers are simulated and are perfect revealers. As the focus of this paper is to look at the seller behavior, perfectly revealing (simulated) buyers should not present a problem. All experiments will be run for forty periods.

In this paper we present a simultaneous-move pricing oligopoly model. This is analogous to the Posted-Offer (henceforth PO) auction trading institution in market experiments. In a PO institution sellers first choose prices simultaneously, and the

[4] Each seller has a capacity of two due to the binding quotas.

buyers are randomly selected and make purchases. The sellers make price and

Figure-5.1



Marginal Cost and Marginal Valuations

quantity choices. At the beginning of the period a seller makes price choices and then chooses the number of units it wants to sell at the selected price. If the buyer purchases the good the trade occurs at the posted prices. The period ends when all the buyers have finished purchasing the good.

We focus attention on the removal of firm-specific (binding)[5] market quotas and the subsequent effect on market power. We will show that due to the removal of

[5] We define binding quotas such that total seller capacity is less than total demand.

binding quotas (and subsequent capacity expansion) we create market power, however, the resulting lower bound of the symmetric equilibrium mixed-strategy price distribtion lies below the competitive outcome with binding quotas. This result is contrary to the conception that creation of market power results in raising observed prices.

The paper is organized as follows. In Section-II we develop our model and present the calculation of the equlibrium distribution function for firm-specific and market quantity restrictions. In Section-III we look at the experimental design, and Section-IV is the conclusion.

5.3. The Model

We consider an oligopoly model; the firms are symmetric and produce a homogenous good. Sellers select price simultaneously and share demand in the event of a tie. Sellers have constant marginal costs up to capacity, and the intersection of the total seller capacities and the demand curve determines the competitive price.

We have firm-specific output limits in our model. With firm specific quotas we can limit the firms' capacities (licensing), or we can specify the maximum amount they can sell (quotas allocated for oranges, grapes, milk, etc.., in U.S.A. are of this kind). We thus see that with firm specific quotas we limit firms capacity (or the maximum they can sell).

Now, let there be n sellers, each with capacity X_i, i=1,2,...,n[6]. Let the constant

[6] We drop the subscript 'i' as the sellers are symmetric.

marginal cost be c up to capacity, and let the constant buyer marginal valuation be m, such that $m > c$. If $m \leq c$ then no trades would occur, and hence we constrain m to be strictly greater than c. Let the (total) quantity demanded be Q_d at any price less than or equal to m. Also, let the total sellers' capacity (or sales) permissible under firm-specific binding quotas be Q_f, such that each seller has an equal share of q_f, $nq_f = Q_f$. Also assume that the quotas are specified such that the total amount of the quotas is less than the competitive outcome Q_d.

Now, two cases arise as a result of capacity expansion due to the removal of firm-specific quantity limits. First, after capacity expansion there still exists excess demand in the system. Second, at the competitive price there exists excess supply in the system. In the first case we can easily show if excess demand exists at the competitive price then the competitive outcome will be the pure strategy outcome (That is, if excess demand exists at the competitive outcome, m, m will the equlibrium outcome in pure strategies). We focus attention on the (more) interesting second case where the resulting equilibrium non-cooperative price distribution function has a lower lower bound with market power.

The market is organized as follows. The firms operate under capacity restrictions that may be imposed on it by the regulatory authority. We assume that the quantity restrictions imposed by the regulatory authority are binding. That is, the sum of the firms capacites is less than the total units the buyers can purchase at the competitive price 'm' (Or, there exists excess demand at the competitive price). Now,

when the firm-specific output limits are lifted we exogenously expand firm capacity. Each firms capacity is expanded by the same amount, at the same marginal cost. We retain the symmetry assumption after the output-limits are removed.

We expand output such that $(N-1)\ X < Q_d < NX$. Where, N is the total number of incumbent firms, X the individual firm capacity and, Q_d the demand at the competitive price. This, restriction eliminates pure-strategy equilibria, or, the incumbent firms have market power. That is, any firm can raise output above the competitive price and sell a positive amount of the (homogenous) good. We thus see that we hold the number of the incumbent firms constant and expand individual firm capacities. This could be the mirror image of the addressing the numbers problem. That is, whether the effect of changing the number of the firms can be treated analogously with changing the individual firm capacities.

We will derive the equlibrium distribution function first. We can define the profit function for the high price and the low price seller. A high price seller would sell the residual demand, while all low price sellers sell all their units X. We can thus define the high and low price sellers profit function,

(1) $$\Pi_{Hi}(p_i) = [p_i - c]\ [Q - (n-1)\ X]$$

(2) $$\Pi_{Li}(p_i) = [p_i - c]\ X.$$

Now, we need to determine the upper and lower bound of the region in which

the sellers will randomize. That is done by calculating the range in which their expected profits remain the same. The upper bound can be easily shown to be m (buyer marginal valuation) as the profit function Π_{Hi} is maximized at m. Thus, denoting V_i to be the supremum of expected profits of seller i, we can write, $V_i = G_{Hi}(m)$ and (V_i) is decreasing in n. Now, assuming that all the other sellers use a common equilibrium pricing distribution, $G_j(p)$, we can write the probability that seller i has the highest price as

(3) $$G_{Hi}(p_i) = [G_j(p_i)]^{(n-1)}, \text{ thus, } G_j = [G_{Hi}]^{1/(n-1)}.$$

Now, calculating the sellers expected profit function V_i for two sellers we get:

(4) $$V_i = G_{Hi}(p_i)\,\Pi_{Hi}(p) + [1 - G_{Hi}(p)]\,\Pi_{Li}(p) \qquad \text{for } i=1,2.$$

Solving (3) for the probability function and substitute $V_i = G_{Hi}(m)$ (from the boundary condiitons) we get,

(5) $$G_{Hi}(p) = \{\Pi_{Li}(p) - V_i\}/\{\Pi_{Li}(p) - \Pi_{Hi}(p)\}.$$

Substitute $G_{Hi}(p)$ and $G_{Li}(p)$ in (5), and we get,

(6) $$G_{Hi}(p) = [(p-c)\,X - (m-c)\,(Q - (n-1)\,X)]/[(p-c)(nX-Q)].$$

We can thus write $G_j = [G_{Hi}]^{1/(n-1)}$ (from (3)), we get

(7) $$G_j(p) = [\{(p-c)X - (m-c)(Q-(n-1)X)\}/\{(p-c)(nX-Q)\}]^{1/n-1}.$$

Which is our symmetric equilibrium distribution function.

5.3.1. Pure Strategy Outcome

We will first show that the competitive outcome, m, is the pure-strategy outcome with firm-specific (binding) quotas.

This is easily shown; all we need to show is that a seller does not deviate from the competitive outcome by lowering it's price. That is, a unilateral price decrease from the competitive equilibrium, m, is never profitable. With firm specific quotas, q_f ($Q_f < Q_d$), it is easily seen that any unilateral price decrease by a seller will not result in increased sales. As a result m (buyer marginal valuation) will be the Nash equilibrium in pure strategies.

5.3.2. Mixed Distribution Outcomes[7]

To rule out the competitive outcome as a Nash outcome in pure strategies we expand seller capacity to X, such that $q_f < X$, and $X < Q$, and that, $[n-1]\,X < Q < n$

---

[7] For the interested reader see Holt et. al. for detailed discussion about calculating equilibrium non-cooperative price distributions with discontinuities.

X, for n sellers. The inequality implies that a seller can unilaterally raise it's price and still have positive sales. The second inequality implies excess capacity at all prices above c. We retain the assumptions about constant seller costs and constant buyer marginal valuation. We want to show that creation of market power lowers the bound of the mixed-strategy distribution, and as a result we will constrain capacity expansion along the lines explained above.

We can obtain the lower limit of the distribution $G_j(p)$ by setting $G_{Hi}(p) = 0$ at the lower bound. (Note, $G_{Hi}(p) = 1$ at the upper bound $p = m$.) Solving (7) for $G_j(p)=0$ we obtain the lower bound of the non-cooperative price distribution. We get,

(8) $$p_{min} = [(m-c)\, Q_d/X] - (n-1)\,(m-c) + c.$$

We see that p_{min} is decreasing in capacties at a decreasing rate. Thus, due to capacity expansion p_{min} will decrease. Also, looking at (7) and simplifying, we get;

(9) $$G(p) =(1/(nX-Q))\ [(X/(p-c))((p-c)+(n-1)(m-c))-Q((m-c)/(p-c)].$$

We see that G(p) is defined (only) for capacities in the range $nX > Q$, and as nX becomes infinitely large as $G(p) \rightarrow 0$. We also see that p_{min} is decreasing in X, and $\forall$ $(n-1)\ X < Q_d < n\ X$, p_{min} is strictly greater than c for that range of capacities. That is, there exists (unilateral) market power (any seller can deviate from the competitive

price and still have positive sales). Also, $p_{min} \rightarrow m \; \forall \; nX \leq Q_d$, $\forall \; n \in [1,N]$.

Thus, for the range of capacities $nX \leq Q_d$ no seller gains by unilaterally deviating from the competitive price m. That is, no market power exists. However, for a range of capacties $(n-1)\,X < Q_d < n\,X$ we see that a seller can gain from unilaterally devaiting from the compettive price c. That is, market power exists, however, for the above stated range of capacities the lower bound of the equlibrium mixed-strategy distribution $p_{min} < m$. Thus, we create market power and the resulting equlibrium mixed strategy distribution has a smaller lower bound p_{min} (< m).

5.4. Conclusion

We see that for a range of capacities (where excess demand exists in the system), using the (Holt 1989) definition of market power, we have no market power. By expanding capacities (such that, $(n-1)\,X < Q_d < n\,X$) we create market power, however, we decrease the (lower) bound of the equlibrium mixed strategy distribution function, G(p). This result is contrary to the notion that creation of market power results in an upward bias in the contracted/posted prices.

APPENDIX-1

Non-Parametric Tests for Population Difference:

One of the problems faced with paired t-tests is that one encounters lagged dependence in the individual time-series. One way to avoid this is to use 'distribution-independent' non-parametric paired comparisons. One can use these tests to look for population differences using the rank tests[1]. We use these tests to look at the impact of non-binding controls on the contracts in the experiment.

One of the common tests used is the distribution free two- sample test that the populations are equal. This is along the lines of the Kolmagrov-Smirnov Rank test. However, if one has ties in the observations the we have to use a variation of this test. The test proceeds as follows.[2]

Consider two populations x_i and y_i, i=1,2.....,n. Define, $F(x_i)$ and $G(y_i)$, such that $F(x_i)$ is the number of observations less than or equal to the x_i in both the samples. Similarly, $G(y_i)$ is the number of observations less than or equal to the y_i ij both the samples. That is,

$$F(x_i) = (\text{number of } x\text{'s} \leq a)/n$$

$$G(y_i) = (\text{number of } y\text{'s} \leq a)/m.$$

---

[1] The time-series are ordered from the smallest to the largest, or vice-versa.

[2] Hollander, M. and Wolfe, D, Nonparametric Statistical Methods", 1973, John Wiley and Sons.

Define, B(x,y), such that

$$B(x,y) = |F(x_i) - G(y_i)|$$

$$J_2 = m \times \frac{n}{d} \max_{(-\infty<a<\infty)} [F_m(a) - G_n(a)]$$

$$J_3 = m \times \frac{n}{d} \max_{(-\infty<a<\infty)} |F_m(a) - G_n(a)|.$$

Now, if m=n, then J_2 and J_3 reduce to,

$$J_2 = n \times \max_{(-\infty<a<\infty)} [F_n(a) - G_n(a)]$$

$$J_3 = n \times \max_{(-\infty<a<\infty)} |F_n(a) - G_n(a)|$$

The empirical distribution functions $F_m(a)$ and $G_n(a)$ are estimators of the underlying distribution functions $F(a) = P\{x \leq a\}$ and $G\{y \leq a\}$, respectively.[3]

Now, J_2 is used to test whether non-binding quotas depress contracts? That is, if non-binding quotas affect institutional performance, then we would expect the number of contracts to be depressed. Thus, J_2 is a one-sided test to test for whether the number of contracts under non-binding quotas is significantly different than the baseline. (J_3 is a two-sided test. It tests broader alternatives, and sacrifices power (of the test) in the process. That is, besides the depressing effect of non-binding quotas are the two

---

[3] Note, that the two-tailed test is consistent whenever H_o is false.

populations significantly different or not. Thus, all negative and positive deviations from the baseline will be considered.) We report results for both J_2 and J_3.

The data is analyzed in the following manner.

(a) Within experiment and within treatment comparisons:

First, we look at individual experiment data for the NBQ experiments. That is, we compare for population differences within the experiment. We compare the first half (when non-binding quotas are in effect) and the second half (when the non-binding quotas are not in effect).

Then we compare experiments within a design to see if they are significantly different or not. That is, if NBQ and BSL treatments are significantly different and all BSL (and NBQ) experiments (compared against each other) are also significantly different, then the first result (NBQ significantly different than BSL) is questionable.

(b) Between experiment comparisons:

Here we look for population differences between the NBQ and the BSL experiments.

Note, that non-parametric tests are not time dependent. That is, if an observation occurs in period one of a experiment, say experiment A, and the same observation occurs in the last period of the other experiment B. Then these tests will give both the same weightage. Such a system of non-parametric tests will not account for learning, or for

treatment effects.

For example, we compare two experimental groups X and Y, each having n observations. Now, let us assume that for the X experiment we have the treatment for the first n/2 periods, and for the last n/2 periods in the Y design. Now, to illustrate the point let us make a simplifying assumption. That is, with the treatment in effect we get one's and without we get zero's. We can also say that the data obtained from Y is the inverse image of X. Now, using non-parametric rank tests, sign tests, or tests for dispersion we will get the same result. That is, there exist no population differences even when the outcomes are a mirror images of each other. Thus, issues such as learning, or behavior in dynamic environments cannot be captured by such non-parametric tests.

We can overcome this problem if we can, say, splice the observations into comparable (equal) sets. That is, in our experiments if we want to capture the impact of non-binding quotas in the first half, we compare it against the first half of the BSL treatment. Similarly, we do paired comparisons for the latter half of the experiments without the controls. We will see that these tests are specially helpful to sort out ambiguities arising from paired comparisons within populations. These tests have been conducted by dividing the time series into two equal parts. Now, we look at the results obtained.

-(a) Within experiment comparisons:

We find that in the NBQ treatment in four (out of five) experiments the first half

is significantly different (3 at 95% cl and 4 at 90% cl) than the second half for both J_2 and J_3 statistics. Similar results are obtained in the in the baseline experiments. That is, the first half is significantly different than the second in all five cases (at 95% cl).

Thus, we see that this result does not tell us much about any population differences due to non-binding quotas. The experiments design may be such that convergence is slow. Thereby, rendering the two halves significantly different. This issue is resolved by comparing the first half (second half) of each BSL experiments against the first half (second half) of the NBQ treatment (see above).

-(b) Between treatment comparisons:

Comparing the population differences between NBQ and BSL experiments we see that 9 are significantly (different) at the 5% cl and, 11 at the 10% cl for the J_2 statistic. For J_3 we see that 5 are significant (different) 95% cl and 11 at the 90% level. The only difference we see between J_2 and J_3 is that J_2 having greater power has more experiments at the 95% cl. However, the results are consistent for both test statistics.

Now, as mentioned earlier these tests are not dynamic in nature. That is, they do not account for time, or path, dependence. Thus, they treat the same observation in period one the same as the observation in period twenty. To take care of this problem, that is, to look at the impact of non-binding quotas on contracts, we run paired tests on the first, and second, halves of the NB treatment against the BSL experiments. Another

reason is to sort out learning from the effect of these non-binding quotas. That is, as we saw earlier, the first and second halves are significantly different in the BSL experiments also. Now, do non-binding quotas slow down this learning, and result in greater noise in the system? This can be separated by using the non-parametric methods in the manner specified earlier[4].

In the paired (NBQ-BSL) t-tests for the first half (table-4b) (ten periods) we see that 6 are significantly different at the 95% cl, and 9 at the 90% cl. For the latter half (table-4c) we see that 9 are significantly different at the 95% cl, and 10 at the 90% cl[5]. (Note, these tests are one-sided tests. The question asked is, "Do non-binding quotas depress the number of contracts?").

---

[4] This approach, of stratifying data into homogenous subgroups, is also recommended by Gastwirth, J.L. (Non-parametric Statistical Methods, p.191) Time Series & Statistics, ed. Eatwell et. al., The New Palgrave, Macmillan Press Limited, 1990).

[5] The same paired comparisons are also run within the BSL and the NB treatments. Except one, none of the BSL pairs are significantly different. Similarly, for the NB treatment we find that none of the pairings are significantly different. Thus these tests are consistent within treatments.

REFERENCES

Automobile Component Manufacturers Association of India, Automotive Buyers Guide, 1986, 87, 88, 89.

Amarchand, D, "Promotion and Control of Private Industry in India," Department of Commerce, Annamalai University, 1976.

Audichya, Janardan, "Economic Ideas of Jawharlal Nehru," Jain Brothers, Jodhpur, 1977.

Blackman, Kip, "Gorbachev's Economic Gamble," Canadian Business Review, Summer 1988, p.29.

Business Week, August 15, 1988.

Coursey, Don L., and Vernon L. Smith, "Price Controls in a Posted Offer Market," AER, Vol. 73, No.1, March 1983.

Davis, Douglas D., and Charles A. Holt, "Capacity Asymmetries, Market Power, and Mergers in Laboratory Markets with Posted Prices,"1991, University of Virginia.

Davis, Douglas D., Charles A. Holt, and Anne P. Villamil, "Supra- Competitive Prices and Market Power in Posted Offer Auctions,: BBER Discussion paper, University of Illinois, 1990.

Davis, Douglas D., and Arlington A. Williams, "Rent Asymmetries in Posted Offer Markets, "Journal of Economic Behavior and Organization, 7 (1986), 303-316.

Davis, Douglas and Charles A. Holt, "Capacity Asymmetries, Market Power, and Mergers in Laboratory Markets with Posted Prices," May 1991.

Davis Douglas, Charles A. Holt, Anne P. Villamil, "Supra-Competitive Prices and Market Power in Posted-Offer Experiments," May 1990.

The Economist, January 14, 1981.

____, June 4, 1988.

____, January 4, 1989.

____, January 27, 1989.

____, July 15, 1989.

____, August 19, 1989.

____, August 26, 1989.

____, October 15, 1989.

____, November 18, 1989.

____, December 9, 1989.

____, January 9, 1990.

____, April 28, 1990.

____, May 5, 1990.

____, September 15, 1990.

Euromoney, November 1988.

Franciosi, Robert, and Mark Isaac, David Pingry, and Stanley Reynolds, "Marketable Acid Rain Emission Permits: An Investigation of Revenue Neutral Auctions, Journal of Environmental Economics and Management 24, 1-24, 1993.

Gastwirth, J.L., "Non Parametric Statistical Methods," Time Series andStatistics, in The New Palgrave, ed: Eatwell, Murray et. al, Macmillan Press Limited, 1990.

Hollander, M. and D. Wolfe, "Non Parametric Statistical Methods, John Wiley and Sons, 1973.

Government of India, Guideline to Industries, Part II. 1989.

Hoffman, Elizabeth and Gary D. Libecap, "Institutional Choice and the Development of U.S. Agricultural Policies in the 1920's," The Journal of Economic History, Vol. 51, June 1991.

Holt, Charles A., "The Exercise of Market Power in Laboratory Experiments," Journal 6 Law and Economics, 75, 1985, 314-325.

Holt, Charles A., "The Exercise of Market Power in Market Experiments," The Journal

of Law and Economics, Vol. XXXII (2) (Pt. 2), October 1989, p. S107-130.

Holt, Charles A., and Fernando Solis-Soberon, "The Calculation of Mixed Strategy Equilibria in Posted-Offer Markets," in Reseacrch in Experimental Economics, Volume 5, 189-228, 1992.

Isaac, R. Mark, and Plott, Charles R., "Price Controls and Behavior of Auction Markets: An Experimental Examination," AER, June 1981, 71, 449-459.

India Today, November 15, 1989.

___, August 31, 1990.

Jain, Rajiv, "Guide to Industries-Policies and Procedures, 1989-90," India Investment Publication, 1989.

Karmokolias, Y., Discussion Paper 7, International Finance Corporation, 1989.

Ketcham, Jon., Vernon L. Smith, and Arlington W. Williams, "A Comparison of Posted Offer and Double Auction Pricing Institutions," Review of Economic Studies, 167, 1984, 595-614.

Kruse, Jamie., Stephen Rassenti, Stanley S. Reynolds, and Vernon L. Smith, "Bertrand-Edgeworth Competition in Experimental Markets," Econometrica (March), 1994.

Kujal, Praveen, "Firm-Specifc vs. Market Quotas: The Non-Equivalence of Price Outcomes," University of Arizona, January 1992.

Konstatine and Seabright, "Regulation in the European Community," Oxford Economic Review, Volume 5, No.2.

Nehru, Jawaharlal, "Discovery of India," Meridian Books Limited, 1960.

The New York Times, May 19, 1990, p.19 (N), p.33(L).

___, May 30, 1990, p. D4(L).

___, May 30, 1990, p.C3(N).

Noll, Roger and Bruce Owen (eds.), "The Political Economy of Deregulation, Washington D.C., American Enterprise Institute, 1983.

Plott, Charles R., and Vernon L. Smith, "An Experimental Examination of Two Exchange Institutions," Review of Economic Studies 45 (February), 133-153, 1978.

OECD-Observer, April-May, 1988.

Peltzman, Sam, "A General Theory of Economic Regulation," Journal of Law and Economics, August 1976, p.211-40.

Platt's Oilgram News, February 8, 1990.

Smith, Vernon L., "Microeconomic Systems as an Experimental Science," American Economic Review, 72, December 1982, p. 923-55.

Smith, Vernon L., and Arlington W. Williams, "On Non-binding Price Controls in a Competitive Market," American Economic Review, June 1981, 71, 467-74.

Svejnar, Jan, "A Framework for the Economic Transformation of Czechoslovakia," PlanEcon Report, Vol. V, No. 52, December 29, 1989.

The Wall Street Journal, April 5, 1990, p.A1(E).

___, May 19, 1990, p.19(N), p.A3(L).

Travel Weekly, March 12, 1990, p.E34 (2).

Weitzman, Martin L., "Price vs. Quantities," Review of Economic Studies, February 1974, 477-91.

Women's Wear Daily, April 5, 1990.