AGRICULTURAL TRADE AND PROTECTIONISM

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Introduction

1.1 Motivation

Ever since the inception of the World Trade Organization free trade in agricultural goods has been difficult to implement. The developed countries, who are otherwise active proponents of free trade, seem reluctant to remove the subsidies from the agricultural sector, making way for unfair competition against the poor developing nations. The Common Agricultural Program (CAP) spending of around €58 bn each year in the European countries as agricultural subsidy has always been subject to controversy. The U.S. Department of Agriculture (USDA) has also devised a variety of programs to supplement the farmers' income, support commodity market price and manage supply. The main bone of contention in Doha round was an increase in overall subsidy doled out to the multi billionaire producers

in the rich countries, even after promising a cut in the subsidy level at the previous round in Uruguay (Human Development Report, 2005). According to World Development Report, 2008, low-income countries tend to impose relatively high taxes on farmers in the export sector as an important source of fiscal revenue, while developed countries tend to heavily subsidize farmers. These differences often create a policy bias against the poor in both domestic and international markets. However, in 2006, United Nations Development Program (UNDP) has urged the developing countries to emphasize on food security and thereby save the farmers of these countries from competing with the agriculture subsidies in the developed world.

It is often questioned as to why would the 2% or 3% of the populations involved in farming in developed countries keep getting protection. The answer may lie in the asset values of land. Many of the farmers found it profitable to buy land when agriculture was heavily protected, even when agricultural land was highly priced. Now if the protection is removed, then those who are still in agriculture will be affected. Those who are no longer engaged in agriculture will be gaining while the ones owning protected assets will lose. So effectively, those who leave agriculture they gain with the removal of protection, and the losers would be the ones remaining in agriculture, with more recent purchases of land and other associated assets.

However, the European countries cite a completely different reason in defense of their agricultural subsidy. They say that if the export subsidies

are removed then the Sub Saharan nations (which are the net importers of food) will lose as food price will go up. This philanthropic stance of the developed nations, however, fail to explain why their domestic agricultural markets are protected from cheaper supply from less developed nations. Indeed, to meet philanthropic goal, a direct aid would have been a better solution.

Curiously enough, the developing countries also subsidize their agriculture sector. WTO has given these countries some concessions suggesting that they will have to remove agricultural subsidy eventually through phase-wise reduction, while for the advanced countries it is suggested to remove all agricultural support. Therefore, the question is, why are countries inclined to protect their agricultural sectors?

The agricultural sector has several unique features which make it different from the industrial sector. On the supply side, this sector faces uncertainty in various forms. For example, in less developed countries, the agricultural sector is mostly backward and heavily dependent on nature. The uncertainty in the weather conditions of a particular year affects the crop of that year. A small open economy facing international price may also have to experience uncertainty in agricultural prices, which could be an outcome of the world market production level. Typically, an insurance market is supposed to be present in such a scenario. However, the insurance market for the agricultural sector may not exist for a plethora of reasons.

On the demand side, consumption of agricultural good is necessary for survival. It also contributes to human capital. Government of every country would like to enhance the survival probability of the subjects and bail them out with buffer food grains in case of a famine. Unavailability of agricultural goods, especially food grains, results in poverty which also needs to be taken care of through policy making. All these features make the agricultural producers and consumers vulnerable which might be the fundamental reason for protectionism in the agricultural sector.

Added to this, effective lobbying by big players in the agricultural sector can also result in gaining protection.

Another feature of the agricultural sector of a developing country is institutional backwardness. The sector is highly fragmented and often, the farmers are so small in size that they do not have access to the domestic markets, and of course the world market. They have to operate through middlemen in order to have an access to these markets. Hence the introduction of FDI by allowing MNCs to participate in the domestic wholesale and retail market becomes pivotal. The arguments favouring such introduction of FDI seem to be quite promising. It is claimed that the backward agricultural and small scale production sector of the developing countries will be immensely benefited. There will be vertical integration of the supply chain. The exploitative middlemen will be largely bypassed. Direct purchasing from the farmers will ensure that they get better price and there

will be more incentive for agricultural investment. Large retail groups will invest in better storage which will reduce wastage as they already have the infrastructure and the know-how, reducing the traditional warehousing role of the wholesalers. Post liberalization, there has been a change in taste and preference of the urban consumers of the developing countries, and there has been a convergence of taste and preference all over the world. The introduction of FDI will cater to their needs better by ensuring better quality, wider variety of international standard and all these at a lower price.

However, there are some arguments that are against introducing FDI. A large number of small traders may lose their livelihood to the uneven competition with the MNCs. For example, in India, given that retail and wholesale trade is the single largest component of the services sector in terms contribution to GDP at 14%, and that the unorganized retail sector of small and medium retailers employs over 40 million people, by sheer number this will not be insignificant, if true. Also, MNCs can increase price after eliminating competition. Foreign retailers may not set up their manufacturing base in the developing countries because of poor infrastructure, unfriendly labor laws etc. The MNCs need not be interested in buying from the domestic farmers as much as they are interested in selling to the domestic urban consumers. If the MNCs buy from the domestic farmers, the village market price may go up, increasing rural poverty. Agricultural

price may become more uncertain due to higher integration with the world market reducing the incentive for agricultural investment.

The agricultural sectors in the less developed economies are often plagued by interlinkages among land, labor, credit and product markets. It has been seen that in developing countries often the moneylenders are the intermediaries in the product market. The relatively rich farmers or landowners in the village usually have a better access to loans, which they lend to the smaller farmers at a rate of interest that is different from the interest rate these farmers face. Often these farmers are poor enough not to be able to reach the wholesale market on their own. The richer farmers cum moneylenders then offer a price different from the prevailing market, and act as a product market intermediary. The rich farmers may be able to successfully lend the smaller farmers the amount of money they need for the production and buy their output at a price lower than the market price. The contract is devised such that the small farmers' participation constraint is barely satisfied and the moneylenders cum traders maximize their profit. MNCs can exploit the farmers through contract farming.They can act as the moneylender cum intermediaries, as they can have access to the international credit market and the international retail market.

1.2 Existing Literature, Research Gaps and the Contributions of the Thesis

There are two strands of explanation as to why we do not observe free trade in agriculture. The first one is lobbying. It has been seen that in the advanced countries, the agricultural sector has been able to lobby successfully for protection. This is quite striking as in these countries agricultural sector is a minority (2-4% of the total population). The loss incurred from protecting a small group is spread among a larger number of individuals. While the gains are distributed among a handful of agents, the loss incurred by each agent is comparatively less, which prevents the formation of a counter lobby (see Mayer (1984)).

The second one is uncertainty. There are two groups of literature dealing with international trade under uncertainty. The relatively older of the two, consisting of the works of Kemp and Liviatan (1973), Ruffin (1974), Batra and Russell (1974), Turnovsky (1974), Batra (1975), Eaton (1979) and others, asks how uncertainty affects the level of welfare and trade of a country in an uncertain environment. It also looks at the determinants of comparative advantage and the pattern of trade where production or international prices are uncertain. As a sequel, Helpman and Razin (1978) and Grossman and Razin (1985) extended the basic trade model to incorporate trade in securities. Apart from looking into the question of comparative

advantage under uncertainty, these models were concerned with finding out the change in welfare once uncertainty is introduced or the degree of uncertainty goes up, but did not get into a direct comparison of autarky and trade under uncertainty. The second group of research does exactly that. In a partial equilibrium framework, Newbery and Stiglitz (1984) demonstrates the possibility that autarky welfare might be unambiguously higher than that under trade. Shy (1988) has extended the Newbery-Stiglitz partial equilibrium to general equilibrium. The first part of the thesis uses the Newbery-Stiglitz-Shy framework to probe further into autarky-trade comparison with a view to understand the desirability of trade in agricultural goods, the production of which is intrinsically uncertain.

Newbery and Stiglitz considers trade between two countries which are ex ante identical, but ex post different. The difference arises because of different realizations of the ex ante uncertain states in one of the sectors, say, the agricultural sector. Under autarky, due to downward sloping demand, a bad state leading to low agricultural output implies high prices and a good state of high output implies low prices. Hence agricultural income, which is the product of price and quantity, does not fluctuate across states. As trade opens up, the international price remaining constant, fluctuating agricultural output leads to fluctuating agricultural income which makes agriculture less attractive to agents who are risk averse. As a result, investment in agriculture goes down to a sub-optimal level and overall welfare

under free trade becomes lower than that under autarky. Shy has extended this result to a general equilibrium framework, showing that a country with high degree of risk aversion will lose as trade opens up, while a country with a lower degree of risk aversion will gain from trade. Shy extends the paper to a general equilibrium framework. However, if we consider a small country instead, as trade opens up, a country must gain from trade, while will lose from loss of insurance. In the first chapter of the thesis we allow both forces to interact against each other to determine the final effect of trade on welfare. A Pareto improvement can be done through an actuarially fair insurance market. However, systemic risk in agriculture makes the private insurer to bear a higher risk per unit of insurance compared to other property insurance (Miranda and Glauber (1997)). Ahsan et al (1982) demonstrate such markets might fail, leading to more importance on public crop insurance.This leaves the scope for government intervention.

Pareto inferior trade might imply consumers getting hurt. In the context of our thesis, we will consider mostly food consumption, to see if trade improves it. In other words, we would concentrate on the literature of food security. There has been a vast literature on food being a necessary good affecting the survival probability, Coate (1989) being an example. A similar paper by Basu (1996) also discusses about the policy prescription in case of a famine. In these papers, an individual first maximizes his survival probability and then moves on to the consumption of other goods. It

has been found that being net food importer is only a weak signal of food vulnerability (see Diaz-Bonilla (2000)).

The debate on the role of trade on food security is sparse and mostly empirical. In the second chapter of the thesis we propose to look into the issue of food security and trade policies from a theoretical perspective. We build a simple theoretical trade model with labour heterogeneity. We define poverty in terms of food insecurity. Then we proceed to see how trade affects different individuals of different countries. In presence of single voting right, we see the conditions under which trade may take place (See Mitra and Dutt (2002) for an empirical analysis).

Often, in developing countries, the farmers and traders are too small to have access to the international market. It is in this context that the role of multinationals become important. Multinationals facilitate international trade by providing an access to the international market and the goods produced in other countries. The literature on the experience of FDI in retail sector is highly ambiguous, although there is a general observation that asset-poor farmers have been losers (see Killick (2001), Reardon and Berdegu (2007)). Studies on the dairy production of the East European countries show contradictory results as to whether the small farmers are benefitted. While Swinnen et al. (2006) show that small household dairy farms gain from FDI, while Gorton and Guba (2002) show that FDI instituted more formal contracting agreements, promoting the growth of a

select number of medium-sized dairy farms and excluding micro-producers. Growth of supermarkets and fast-food sectors since 1990's in Argentina has resulted in changing pattern of production in favour of medium and large producers, with evidence of exclusion of small farmers (see Ghezan et. al. (2002)). Sarma (2005) emphasizes on the need for considering the constraints that would be faced by the retailers in the supply chain.

The third chapter is an attempt to examine the necessity or redundancy of such caution in a theoretical framework. Although there have been empirical studies on FDI in the retail sector and its effect on the primary sector, there is a significant dearth of theoretical literature on the same. This chapter is an attempt to see what happens if FDI is allowed in the retail sector. We first begin with a simple model with oligopolistic wholesaling market. Then we focus on certain specific features on both the supply and demand side and extend the basic model.

It is often seen that supermarkets and hypermarkets sell products at significantly higher prices than wet market. These modern retailers offer a different (better) quality at a higher price, targetting mainly the middle to upper income group (See Schipmann and Qaim (2011)). We introduce Gabszewicz-Thisse type utility function. The consumers differentiate between the local goods and that they get through the MNCs vertically. The result depends on the perceived change in the utility. Finally, we see what happens if there is a scope of contract farming. Here we compare between

the case of contract farming and the case where it is absent. Farmers may or may not gain depending on the change in the demand and supply.

Commercialization of the backward agricultural sector also happens through contract farming. Large MNCs often offer contracts to farmers, which may have some positive effects on the farmers. Higher income can be generated through improved market access, there could be some spillover effect (See Glover(1994)). Swinnen (2005) observes that FDI plays a key role in vertical integration through successful contracting. As MNCs come in to the agricultural sectors of the developing countries, they come with better know-how. They can act as the moneylender cum intermediaries, as they can have access to the international credit market and the international retail market.

In the third section of the third chapter, we let the MNCs offer individual contract to the farmers. Rural credit market is often isolated often due to absence of arbitrage and migration (see Basu (1983) and Bhaduri (1977)) and farmers face different interest rates. Small farmers have to pay a higher rate of interest if they take loan from the market, making way for contract farming. In our model, the contract involves both the product and the credit market (see Gangopadhyay and Sengupta (1987)). The MNC can take any amount of loan from the international credit market. It can lend the farmer at a lower interest rate. In return, the farmer is to sell his entire output to the MNC at a price lower than or at most equal

to the international product market price. Our focus here is on the welfare of the farmers with or without contract and the consumers with respect to the case when the MNCs are not allowed to offer contract.

1.3 Plan of the Thesis

In this thesis we explore the causes behind the agricultural protection in different types of country even when subsidies, especially export subsidies, defy common sense. First, we look into the supply side of the agricultural sector by examining the aspect of uncertainty in agricultural production Then we move on to the demand side and try to explore the question of food security and poverty in presence of labour heterogeneity. Finally we see how allowing FDI in the retail sector along with the unique features of agricultural sector can affect the farmers and the consumers of a developing country.

1.4 Summary of the Chapters

1.4.1 Chapter 2

Agricultural Trade and Production Uncertainty

In the second chapter we examine the effect of uncertainty on a small open economy. While the small open economy assumption talks about the

comparative advantage issue, the uncertainty in production reflects the loss of insurance. We begin with a small open economy producing two goods, one industrial good and one agricultural good using labour alone. There in no uncertainty in the production of the industrial good. One unit of labour is required to produce one unit of the industrial good. One unit of labour can produce high output of the agricultural good in the good state and in the bad state it can produce low output. Wage is given in accordance with the value of marginal productivity. For the industrial good, the wage is fixed. The agricultural wage becomes state dependent. The amount of labour in the economy is normalized to 1. The proportion of labour that goes into each of the two sectors is determined endogenously before the uncertainty is resolved. The labour allocation is made ex ante by equating marginal expected utility in both the sectors. The utility function is CRS Cobb-Douglas type, and individuals are risk averse, with constant relative risk aversion. Here we assume that income comes only from wage earning of the individual. The indirect utility function thus becomes a function of labour allocated in each sector. Individuals maximize the indirect utility function by choosing the proportion of labour that goes to each sector, before the uncertainty in production is resolved.

We then proceed to determine the equilibrium under autarky and that under free trade. Because there is uncertainty, we might observe incomplete specialization. We then introduce an actuarially fair insurance market. In

case there is no insurance market, there is scope for government intervention. The results, we see, are identical.

Results

A small open economy with production uncertainty will always gain from free trade when it specializes in the industrial good. When the country specializes in the industrial good, then uncertainty does not play any role. So there can only be gains from trade, while there will be no loss from uncertainty.

If the relative price of the agricultural good is very high then free trade is better than autarky. The relative price of the agricultural good is very high, i.e., the comparative advantage is very strong. It outweighs the loss from the uncertainty.

A country which incompletely specializes in the free trade equilibrium, will specialize completely in the risky good when there is an actuarially fair private insurance market and the resulting equilibrium will be better than the autarkic equilibrium. In presence of uncertainty we observe incomplete specialization in a Ricardian framework. The insurance market removes the uncertainties and makes complete specialization viable.

When the country specializes completely in the agricultural good, then also insurance will improve the trading equilibrium. As before, the insurance market successfully removes the uncertainty and makes the production

of the risky good more rewarding.

In the agricultural sector, an actuarially fair insurance market may not exist. Such markets can either fail or the insurer may have to take more risk. Hence, the role of government as an insurance provider becomes crucial.

Government intervention will make trade better under a situation where free trade is Pareto Inferior to autarky. Government intervention will improve the trading equilibrium when the country completely specializes in the agricultural good in absence of an insurance market. The logic behind both these results is the same as before.

Overall, we see that some trade is better than no trade at all, although free trade need not be the best option.

1.4.2 Chapter 3

Opening up of Trade in the Presence of Single Voting Rights

We begin with an economy consisting of individuals who own only labour. The two goods in the economy are an industrial good and an agricultural good, both of which are produced using labour. To produce one unit of agricultural good individuals require one unit of labour. However productivity of labour in the industrial sector varies from individual to individual. An individual can produce ϕ units of the industrial good using 1 unit of

labour. We assume that ϕ follows a continuous uniform distribution, with the support $[\underline{\phi}, \bar{\phi}]$. This assumption can be looked at in the lights of the assumption of effective labour in Krishna and Yavas (2005). Price of this good is normalized to 1. Each individual is endowed with 1 unit of labour, which they choose to divide between the two sector. Individuals get satiated in the consumption of food after a certain level. In this chapter, we assume that the consumers reach a saturation in food after consuming a certain level of food. Anybody who is unable to consume that level might be called poor. Irrespective of being poor or non poor, an individual will have to consume some amount of both food and non-food item to have a positive level of utility. Utility function is broadly Cobb-Douglas type which becomes non-homothetic beyond that level of food consumption. Once an individual can afford to consume this quantity of the agricultural good, she starts spending the excess income solely on the industrial good. We loosely characterize those who can consume this level of agricultural good as rich and others as poor. In other words, we define poverty as the inability to consume a certain level of food and hence nutrition. However, since we are in a static model, we assume away the possibility of a subsequent decline in the productivity level due to insufficient consumption of food. Individuals can work in either the agricultural sector or the industrial sector. Individuals with lower productivity in the industrial sector enter the agricultural sector and those with higher industrial productivity enter

the industrial sector. The individual will maximize utility subject to the budget constraint and choose the optimal labour allocation.

The country will open up for trade if the majority of the people vote in favour of opening up. Each individual will vote for trade if and only if his post trade income is higher than the pre trade income.

Results

Under autarky, we see that everyone in the agricultural sector is poor, given the particular assumptions of the model. However, in the industrial sector, there are both poor and non-poor. The level of poverty and inequality of an economy changes when trade opens up. If the international price of food is higher than the domestic price, then more people will join the agricultural sector. We see that in this case poverty increases in the country in terms of both head-count ratio and poverty gap index. However, if the international price is lower than the domestic price of food, implying that the country is more technologically advanced, then more people would specialize in the industrial sector. In this case we see that even though the number of poor goes down, inequality increases in terms of the Gini coefficient.

In a country with comparative advantage in agriculture the number of poor people increase. In a country with comparative advantage in the industry the number of poor people decrease.

We assume that each person has a single voting right. Each person will

vote for opening up of trade if trade betters his own utility. We see that

A country with comparative advantage in agriculture (industry) will open up for trade if the autarkic agricultural price is greater (less) than the average productivity in the industrial sector.

1.4.3 Chapter 4

FDI in Retail: A Theoretical Analysis

This chapter attempts to see what happens if FDI is allowed in the retail sector. Since food and grocery is the largest retail sector worldwide, we focus on the agricultural sector alone. We build theoretical models in this chapter to see the implications of allowing FDI on the farmers and the consumers in a developing country. We first begin with a simple model with oligopolistic wholesaling market. Whether farmers gain or lose will depend on the difference between the international and domestic price. Then we introduce Gabszewicz-Thisse type utility function. The consumers differentiate between the local goods and that they get through the MNCs vertically. The result depends on the perceived change in the utility. Finally, we see what happens if there is a scope of contract farming. Here we compare between the case of contract farming and the case where it is absent. Farmers may or may not gain depending on the change in the demand and supply.

In this chapter we keep the reality of a developing country in mind and propose a theoretical model to see the effects of FDI on the farmers and the consumers. We consider only the agricultural sector, and production and consumption of a single agricultural commodity in a partial equilibrium framework. We try to capture various essential features of the agricultural sector in different sections of the chapter. We start with a basic model with an oligopolistic wholesale market, where the wholesalers buy from the farmers and sell to the retailers in the wholesale market. The retailers in turn sell it to the urban consumers. The farmers, retailers, urban and rural consumers are price takers, while the oligopolistic wholesalers are price-makers. The first part of the chapter tries to capture the effect of introducing FDI in this framework.

We construct a simple model with an oligopolist wholesaling market. The economy consists of farmers, wholesalers, retailers, rural and urban consumers. The farmers are price takers, who produce the agricultural good. They produce a fixed amount of the good and sell their produce in the village market. In this market the buyers are the village consumers and the wholesalers. The wholesaler in turn, sells its purchase, in the wholesale market to the retailers. While the wholesaling market is oligopolistic, the retailers are price-takers. The retailers, in their turn, sell it to the urban consumers in the retail market. In this setup, if we allow MNC to come in and participate, two things can happen simultaneously. First, the MNC

can buy the commodity from the farmers and secondly, sell the commodity in the domestic market. However, MNC has the flexibility to buy the commodity from outside and sell it in the domestic market or buy it from the domestic farmers and sell it to the international retail market. The MNCs and the domestic retailers have different retailing costs. The retaining costs are constant per unit of output. Given this set up we make the following proposition.

Results

Domestic trading activities go down after the entry of the multinationals if and only if the domestic retailers have a higher retailing cost than the MNCs. The urban and rural prices may rise or fall; a sufficient condition for both farmers and the urban consumers to gain after the entry of multinationals is when domestic retailers have a lower retailing cost, however the rural consumers will lose.

Introducing Preferences

Urban retail market consumers are faced with two different products, one that is sold by the MNC and the one sold by the retailers. A consumer believes to receive a higher utility if she buys the product from the MNC. We use a Gabszewicz-Thisse type utility function to capture this. The income of the urban consumers as well as the rural consumers follow two

different uniform distributions.

Each individual consumes exactly one unit of either of the goods.

If the price of the good exceeds the income, then the consumer gets a fixed utility (possibly from government subsidy) which is normalized to 0, and she is called poor.

In the rural market, the consumers can purchase only one good, and hence they cannot differentiate. As before the consumers take exactly one unit of the good. If the price exceeds the income, then the consumers get a fixed utility normalizes to 0, and she is called poor. In other words, the rural poor is defined as the one whose income falls below the village market price.

Farmers produce a fixed output, which is sold in the wholesale market. We abstract from the oligopolistic wholesale market, and introduce a monopolistic wholesaler to simplify the math, although introduction of bigger distortion does not affect the main results of the model.

Results

If the initial price (price before the MNC comes in) is greater than the maximum price after allowing for MNC, then allowing MNC will reduce the price faced by the low-end urban consumers.

If initial price (price before the MNC comes in) is less than the maximum price after allowing for MNC and the difference between the perceived

utility from the two goods is sufficiently low, then the low-end urban consumers might end up paying a higher price and urban poor will increase in number.

Contract Farming

We introduce production function of the farmers. In order to produce the agricultural produce, each farmer needs to take a loan for running the production. Each farmer is denoted by a parameter θ, where θ follows some distribution with distribution function $F(\theta)$ with support $[\underline{\theta}, \bar{\theta}]$. Each farmer faces an interest rate $r(\theta)$. The rural credit market is highly fragmented and isolated and the interest rate is often determined by the personal relation between the lender and the borrower. Production function of the farmer will essentially reduce to be a function of loan amount alone. The cost the farmer incurs is the interest payment. A representative farmer of type θ will maximize his income. The farmer's production function in terms of loan $f(L)$ is a standard neo-classical production function, with $f' > 0$ and $f'' < 0$. The farmer is price taker in the village market and receives a fixed price for each unit that he produces. Here, we assume that the MNCs sell the entire output to the international market at an international price and the domestic wholesalers sell it to the domestic market at a given price. When MNCs offer contract to the farmers individually, they charge a fraction of the international interest rate. In return, the farmers

sell the entire output to the MNCs at a price which is a fraction of the international price. The contracts are designed in a way that the farmers' participation constraints are barely satisfied. The farmers with higher interest rates end up taking the contracts.

In this case we compare between the case where MNC can offer contract and the case where it cannot.

Results

We find out the sufficient condition where the contract equilibrium will hurt the farmers who do not take the contract. If the sufficient condition holds, then the village equilibrium price will be higher in the presence of contract as compared to the case when there is no contract. Under the same sufficient condition, as price will go up village consumers will be hurt when there is no contract.

The farmers who take up the contract are neither better off nor worse off, because the contracts are designed in a way that the farmers' participation constraints are just satisfied.

Chapter 2

Agricultural Trade and Production Uncertainty

2.1 Introduction

Ever since the formation of the World Trade Organization (WTO), free trade in agricultural goods has been the subject of controversy. Indeed, on several occasions, WTO negotiations have broken down primarily because the negotiating nations have failed to reach a consensus regarding the opening up of trade in agricultural goods. The dispute is about the removal of agricultural subsidies. Governments of advanced countries have been showing remarkable reluctance to reduce the huge subsidies they give on their agricultural sectors. This, in turn, has created an unfair competition for potential third world exporters of agricultural goods to first world markets.

In fact, first world agricultural subsidies have not only restricted foreign competition in their home agricultural markets, but sometimes have been so high that the subsidy-ridden agricultural product from the first world is *exported* to the third world. Agricultural sectors of third world countries are also subsidized. These countries, however, are given some concessions by the WTO in the sense that they are allowed to gradually remove their agricultural subsidies and prepare themselves for free world competition in successive stages.

Be that as it may, text book international trade theory suggests that subsidies are usually inefficient and more so, when subsidized products are exported. Subsidies not only distort prices but when subsidy-ridden goods are exported abroad, foreign consumers benefit at the cost of domestic tax payers. How do we then explain the obstinate stance of countries, both developed and less developed, about sticking to their subsidy policies as far as agricultural goods are concerned? One explanation can be provided in terms of lobbying. It is often argued that small groups can lobby more effectively than large groups. When a small group is successfully lobbying with the government, the benefit it extracts is divided among the small number of people belonging to that group so that each member gets a significant amount of benefit. Of course, this benefit must come at the cost of someone else. If this cost is distributed among a large number of people, each shouldering an insignificant amount of the cost and hence almost

unaware of its burden, the lobbying activity has a high chance of success. In North America, Europe and Japan a very small fraction of the labour force, between 2 per cent and 4 per cent, are engaged in the agricultural sector. These small groups can spend resources on lobbying and reap the consequent benefits at the cost of a large number of consumers who are neither organized as groups nor aware of the small costs each is bearing. Mayer (1984) has formalized this aspect of lobbying and protection by using the median voter theorem in a specific factor model of international trade. A follow up model has been constructed in Swinnen (1994). These models do not view protection as an optimal policy from the point of view of the society or consumers and imply that trade restrictions, arising out of lobbying of small groups, as basically undesirable.

There is yet another route of explaining restrictions on the free international flow of agricultural goods. Due to its dependence on uncontrollable natural factors like weather or rainfall, on an average, agricultural production exhibits higher uncertainty than industrial production. Again, there is an established literature on trade and uncertainty which demonstrates the various ways in which gains from free trade can be diminished if uncertainty is present. Here we concentrate mainly on the uncertain nature of production.

There are two groups of literature dealing with international trade under uncertainty. The relatively older of the two, consisting of the works

of Kemp and Liviatan (1973), Ruffin (1974), Batra and Russel (1974), Turnovsky (1974), Eaton (1979) and others, asks how uncertainty affects the level of welfare and trade of a country in an uncertain environment. It also looks at the determinants of comparative advantage and the pattern of trade when production or international prices are uncertain. As a sequel, Helpman and Razin (1978) and Grossman and Razin (1985) extended the basic trade model to incorporate trade in securities. Apart from looking into the question of comparative advantage under uncertainty,these models were concerned with finding out the change in welfare once uncertainty is introduced or the degree of uncertainty goes up, but did not get into a direct comparison of autarky and trade under uncertainty. The second group of research does exactly that. In a partial equilibrium framework, Newbery and Stiglitz (1984) demonstrates the possibility that autarky welfare might be unambiguously higher than that under trade. Shy (1988) has extended the Newbery-Stiglitz partial equilibrium to general equilibrium. This chapter uses the Newbery-Stiglitz-Shy framework to probe further into autarky-trade comparison with a view to understand the desirability of trade in agricultural goods the production of which is intrinsically uncertain.

Newbery and Stiglitz considers trade between two countries which are ex ante identical, but ex post different. The difference arises because of different realizations of the ex ante uncertain states in one of the sectors, say,

the agricultural sector. Under autarky, due to downward sloping demand, a bad state leading to low agricultural output implies high prices and a good state of high output implies low prices. Hence agricultural income, which is the product of price and quantity, does not fluctuate much across states. In fact it remains constant if the demand curve has unit elasticity, as assumed in the Newbery and Stiglitz paper. Therefore, downward sloping demand in the domestic market provides a natural *insurance* to risk averse agents. As trade opens up, the international price remaining constant, fluctuating agricultural output leads to fluctuating agricultural income which makes agriculture less attractive to agents who are risk averse. As a result, investment in agriculture goes down to a sub-optimal level and overall welfare under free trade becomes lower than that under autarky.

From this argument it is, however, not correct to conclude that autarky is better than free trade whenever there is uncertainty in the production of one of the goods. Indeed, the Newbery-Stiglitz framework assumes away any comparative advantage of the trading countries by making them ex ante identical. Thus the standard channels of gains from trade are closed down by assumption. This is done purposefully to focus entirely on the loss of insurance aspect of free trade. But if we wish to examine the desirability of trade in agricultural goods exhibiting significant uncertainty we have to weigh the costs due to insurance loss from trade with natural gains from comparative advantage. If the latter outweighs the former, then there has

got to be positive gains from free trade.

The loss of insurance would be automatically taken care of in the presence of an insurance market, which is actuarially fair.However, the literature on crop insurance does not find the existence of an insurance market to be probable. Systemic risk in agriculture makes the private insurer to bear a higher risk per unit of insurance compared to other property insurance (see Miranda and Glauber, 1997). Ahsan et al (1982) build a theoretical model to demonstrate such markets might fail, leading to more importance on public crop insurance. In this chapter we allow both forces, namely comparative advantage and loss of insurance, to interact against each other to determine the final effect of trade on welfare. We show that if gains due to comparative advantage is strong enough, free trade dominates autarky in terms of utility, which we have taken to be the measure of welfare. Moreover, even when comparative advantage effects are not strong enough so that free trade yields lower welfare than no trade, we find a tax-subsidy scheme which along with trade always makes the country better off than autarky. We also show that if a country gets completely specialized in a good which exhibits no uncertainty, it unambiguously gains from free trade. From all this we conclude that restricted agricultural trade, as it is practised in the world at present, cannot always be justified on grounds of welfare, though some intervention in the agricultural market may be necessary. Our analysis implicitly suggests that lobbying as opposed to uncertainty may be

a better way to understand the lack of agricultural trade in the present day world. In section 2.2 of our chapter we build a formal two sector small open economy with production uncertainty in the agricultural sector. We show that free trade might be Pareto inferior to autarky, which opens up a route for government intervention. In section 2.3 we see the effect on welfare in case there exists a private insurance market. In section 2.4 we introduce government intervention in the form of providing complete insurance to the agricultural sector in the absence of a private insurance market. In section 2.4.1 we compare the different equilibria observed under free trade, under autarky, in presence of insurance market and in presence of government intervention in terms of diagrams. In section 2.5 we compare our model with that of Shy (1988). Section 2.6 concludes the chapter.

2.2 The Model

We begin with a small open economy producing two goods, one industrial good x (safe good) and one agricultural good y (risky good) using labour, unlike Shy (1988), where large open economies are considered. In section 2.5 we will consider a two country framework and compare our findings with those in Shy (1988). The amount of labour in the economy is normalized to 1. Our model differs from Shy (1988) by assuming labour is perfectly divisible. The proportion of labour that goes into the x sector is α, which

is to be determined endogenously before the uncertainty is resolved. α is chosen by equating marginal expected utility in both sectors. The utility function is Cobb-Douglas type, and individuals are risk averse, with constant relative risk aversion. The indirect utility function is, therefore, given by $\frac{1}{1-\rho}\left(wp_x^{-a}p_y^{-b}\right)^{1-\rho}$, where w is the income (here we assume that income comes only from wage earning) of the individual, p_x is the price of good x, p_y is the price of good y, $a+b=1$ and $\rho \neq 1$ is the degree of relative risk aversion. Individuals maximize the indirect utility function by choosing α, the proportion of labour that goes to the safe sector. On the production side, 1 unit of labour is required to produce one unit of good x. However, the production of agricultural good is uncertain depending on the state of nature. 1 unit of labour can produce θ_H units of y in the high state, while 1 unit of labour can produce θ_L units in low state. Therefore, the wage in x sector is 1 and that in y sector is $\theta_H p_y^H$ in high state and $\theta_L p_y^L$ in low state, where p_y^H is the price of good y in high state and p_y^L is the price of the same in the low state. High state occurs with probability π and low state occurs with probability $1-\pi$, and $0 < \pi < 1$. In the following subsections we will compare the welfare under autarky to that under free trade in a static framework with no future.

2.2.1 Autarky

Let us characterize the equilibrium under autarky. Under autarky, the high state wage w_H will be given by $\left(\alpha + (1-\alpha)\theta_H p_y^H\right)$, the low state wage w_L will be given by $\left(\alpha + (1-\alpha)\theta_H p_y^L\right)$. Therefore, the expected indirect utility will be given by

$$\begin{aligned} EV_{AUT} = &\left(\frac{\pi}{1-\rho}\right)\left(p_y^{H^{-b}}\left(\alpha + (1-\alpha)\theta_H p_y^H\right)\right)^{1-\rho} \\ &+ \left(\frac{1-\pi}{1-\rho}\right)\left(p_y^{L^{-b}}\left(\alpha + (1-\alpha)\theta_L p_y^L\right)\right)^{1-\rho} \end{aligned} \tag{2.1}$$

Relative supply is given by $\alpha/(1-\alpha)\theta_H$ in high state and $\alpha/(1-\alpha)\theta_L$ in the low state. Using Roy's identity to the indirect utility function, relative demand is found to be ap_y^H/b in the high state and ap_y^L/b in the low state. At equilibrium, relative demand will be equal to relative supply in each state since market has to clear in each state.

$$\frac{\alpha}{1-\alpha} = \frac{ap_y^H\theta_H}{b}$$

and

$$\frac{\alpha}{1-\alpha} = \frac{ap_y^L\theta_L}{b}$$

in high and low state respectively. Under autarky, both the goods will be produced.

The choice of α is ex ante implying $p_y^H\theta_H = p_y^L\theta_L$. Therefore, equation (2.1) can be written as

$$EV_{AUT} = \left(\frac{\alpha}{a}\right)^{a(1-\rho)} \left(\frac{1-\alpha}{b}\right)^{b(1-\rho)} \left(\frac{\pi\theta_H^{b(1-\rho)}}{1-\rho} + \frac{(1-\pi)\theta_L^{b(1-\rho)}}{1-\rho}\right) \quad (2.2)$$

Differentiating (2.2) w.r.t. α and setting the derivative to 0, we get $\alpha^* = a$, where α^* is the optimal allocation of labour. Therefore, the autarkic expected indirect utility at equilibrium is given by

$$EV_{AUT} = \frac{1}{1-\rho}\left(\pi\theta_H^{b(1-\rho)} + (1-\pi)\theta_L^{b(1-\rho)}\right) \quad (2.3)$$

$\alpha = a$ is a Pareto optimal allocation of resources in the sense that had there been a social planner given the task to allocate resources would have chosen the optimal labour allocation equal to a. This result is identical to the one shown in Shy (1988). A social planner would choose to maximize the welfare subject to the resource constraint. The objective function will be

$$EV_P = \frac{\pi}{1-\rho}(x^a y^b)^{1-\rho} + \frac{1-\pi}{1-\rho}(x^a y^b)^{1-\rho}$$

The amount of x being produced in the economy is α in both states, and amount of y produced is $(1-\alpha)\theta_H$ and $(1-\alpha)\theta_L$ in high and low state respectively. When we substitute for x and y in the objective function, we get back 2.2. Solving, we get the identical result $\alpha = a$.

2.2.2 Free Trade

When trade opens up the small open economy takes the international price to be given exogenously. We assume that there is no price uncertainty. Therefore, price will be equal across the states for a small open economy. Let the world price for the agricultural sector be p_y. The expected indirect utility function can now be written as

$$\begin{aligned} EV_{FT} = & \frac{\pi}{1-\rho} p_y^{-b(1-\rho)} (\alpha + (1-\alpha)\theta_H p_y)^{1-\rho} \\ & + \frac{1-\pi}{1-\rho} p_y^{-b(1-\rho)} (\alpha + (1-\alpha)\theta_L p_y)^{1-\rho} \end{aligned} \tag{2.4}$$

Individuals maximize (2.4) over α, i.e., the labour allocation, as before. Differentiating RHS of equation (2.4) w.r.t. α we get

$$\begin{aligned} \frac{\partial EV_{FT}}{\partial \alpha} = & p_y^{-b(1-\rho)} (\pi(\alpha + (1-\alpha)\theta_H p_y)^{-\rho}(1 - p_y\theta_H) \\ & + (1-\pi)(\alpha + (1-\alpha)\theta_L p_y)^{-\rho}(1 - p_y\theta_L)) \end{aligned} \tag{2.5}$$

Uncertainty in the production structure and ex ante allocation of resources may lead to incomplete specialization rather than the complete specialization we see in standard Ricardian Model. We will maximize the objective function over α, which is the indirect utility function. If we get an interior solution, that would mean that α takes a fractional value, and the country will incompletely specializing, i.e., producing both the goods

in equilibrium. In case there is corner solution, i.e., α takes the value 0 or 1, the country would be completely specializing in y or x respectively in equilibrium.

Incomplete Specialization

When α^* lies between 0 and 1, there will be incomplete specialization. The first order condition will be given by $\partial EV_{FT}/\partial\alpha = 0$. Rewriting the first order condition for maximization, we get

$$\frac{\alpha + (1-\alpha)\theta_L p_y}{\alpha + (1-\alpha)\theta_H p_y} = \left(\left(\frac{1-\pi}{\pi}\right)\left(\frac{1-p_y\theta_L}{p_y\theta_H - 1}\right)\right)^{1/\rho} \tag{2.6}$$

Let $\left(\left(\frac{1-\pi}{\pi}\right)\left(\frac{1-p_y\theta_L}{p_y\theta_H-1}\right)\right)^{1/\rho} = A$.

Since $\theta_H > \theta_L$, $A < 1$ from (2.6). Therefore, $p_y > \frac{1}{\pi\theta_H+(1-\pi)\theta_L}$. Let us define $\underline{p}_y = \frac{1}{\pi\theta_H+(1-\pi)\theta_L}$. Solving (2.6) we get the value of α.

$$\alpha^* = \frac{1}{1 + \frac{1-A}{A\theta_H p_y - \theta_L p_y}} \tag{2.7}$$

We have already seen that $A < 1$. Therefore, for $\alpha^* < 1$ we require $A\theta_H p_y - \theta_L p_y > 0$ from (2.7), i.e., $p_y < \frac{\pi\theta_H^{-\rho}+(1-\pi)\theta_L^{-\rho}}{\pi\theta_H^{1-\rho}+(1-\pi)\theta_L^{1-\rho}}$.

Let us define $\overline{p}_y = \frac{\pi\theta_H^{-\rho}+(1-\pi)\theta_L^{-\rho}}{\pi\theta_H^{1-\rho}+(1-\pi)\theta_L^{1-\rho}}$.

It is easy to show that $1/\theta_H < \underline{p}_y < \overline{p}_y < 1/\theta_L$. Hence if $\underline{p}_y < p_y < \overline{p}_y$ there will exist an interior solution. Therefore, we can say, for an interior solution of α we require $\frac{1}{\theta_H} < p_y < \frac{1}{\theta_L}$ since $[\underline{p}_y, \overline{p}_y] \subset [1/\theta_H, 1/\theta_L]$.

When a risk averse small open economy with production uncertainty specializes incompletely, then the country may or may not lose from trade. We can take numerical examples to see this. If we take $\rho = 5$, $\theta_H = 10\theta_L$, $\theta_L = 0.2$, $\pi = 0.5$, $b = 0.5$, the country will lose from participation in trade. However, if we take $\theta_L = 2$, all the other values remaining unchanged, then free trade is better than autarky.

Complete Specialization

Let us now move on to the zone where incomplete specialization cannot take place. From section 2.2.2, it is clear that when $p_y \notin (\underline{p}_y, \overline{p}_y)$, complete specialization will take place. When $p_y\theta_L < p_y\theta_H < 1$ then $\partial EV_{FT}/\partial\alpha > 0$ for all values of α and when $1 < p_y\theta_L < p_y\theta_H$ then $\partial EV_{FT}/\partial\alpha < 0$ for all values of α. In these two cases there will be no interior solution of α. In the first case, the optimal value of α is 1, while in the second case it is 0. In other words, the country will specialize in x and y sector respectively. This is because of high comparative advantage in the respective sectors. Since we have assumed $\theta_H > \theta_L$, we can safely conclude that $p_y < \frac{1}{\theta_H}$, the country will completely specialize in x and when $p_y > \frac{1}{\theta_L}$, the country will completely specialize in y.

When a country completely specializes in x, all the uncertainties in the economy is removed. Hence it is obvious that the country will gain unconditionally. Though the result is quite intuitive for a country specializing in

the safe industrial good, this result is important in the context of a small open economy specializing in the risky agricultural good. This shows that when there is a high comparative advantage in the Ricardian sense, the gains from trade will outweigh the loss from the uncertainty and risk aversion. However, later in Section 2.4 we will show that in such a case free trade, though better than autarky, is not the best possible outcome.

Proposition 2.2.1. *A small open economy with production uncertainty will always gain from free trade when it specializes in x.*

When a country specializes in x, its indirect utility function will be given by

$$EV_x = \frac{1}{1-\rho} p_y^{-b(1-\rho)}$$

Let us define a price $\widetilde{p_y}$ such that the following equality holds.

$$\frac{1}{1-\rho} \widetilde{p_y}^{-b(1-\rho)} = \left(\frac{\pi \theta_H^{b(1-\rho)}}{1-\rho} + \frac{(1-\pi)\theta_L^{b(1-\rho)}}{1-\rho} \right) \tag{2.8}$$

This would mean that an individual is indifferent between completely specializing in x and remaining under autarky. Rewriting equation (2.8) we get

$$\widetilde{p_y} = \left(\pi \theta_H^{b(1-\rho)} + (1-\pi)\theta_L^{b(1-\rho)} \right)^{-\frac{1}{b(1-\rho)}}$$

We have already seen that

$$\left(\pi\theta_H^{b(1-\rho)} + (1-\pi)\theta_L^{b(1-\rho)}\right) \lessgtr (\pi\theta_H + (1-\pi)\theta_L)^{b(1-\rho)}$$

according as $\rho \lessgtr 1$. Therefore,

$$\widetilde{p_y} > \underline{p}_y$$

for any value of ρ.

Since EV_x is decreasing in p_y, it will mean that EV_x will always be greater than the autarkic utility for any price less than $\underline{p}_y$. When the price is greater than $\underline{p}_y$, the country will enter the zone of incomplete specialization. When a country completely specializes in x, all the uncertainties are removed. Hence the country gains unconditionally.

When a risk averse small open economy specializes in y, which is the risky good, the country may or may not gain from trade. Define a price $\widetilde{\widetilde{p_y}}$ such that the following equality holds.

$$\frac{\widetilde{\widetilde{p_y}}^{(1-b)(1-\rho)}}{1-\rho}\left(\pi\theta_H^{1-\rho} + (1-\pi)\theta_L^{1-\rho}\right) = \left(\frac{\pi\theta_H^{b(1-\rho)}}{1-\rho} + \frac{(1-\pi)\theta_L^{b(1-\rho)}}{1-\rho}\right) \quad (2.9)$$

This equation implies that an individual is indifferent between completely specializing in y and remaining in autarky. Rewriting this equation, we get

$$\widetilde{\widetilde{p_y}} = \left(\frac{\pi\theta_H^{b(1-\rho)} + (1-\pi)\theta_L^{b(1-\rho)}}{\pi\theta_H^{1-\rho} + (1-\pi)\theta_L^{1-\rho}}\right)^{\frac{1}{(1-b)(1-\rho)}}$$

Now, if $\widetilde{\widetilde{p}_y} < \bar{p}_y$, the country will completely specialize in y when the price is greater than $\bar{p}_y$. In that case, utility under free trade will be greater than the utility under autarky, since $EV_y/$ is increasing in price. However, if $\widetilde{\widetilde{p}_y} > \bar{p}_y$, then the country will lose from trade when $p_y \in (\bar{p}_y, \widetilde{\widetilde{p}_y})$ We know that EV_y is increasing in p_y.

Proposition 2.2.2. *If $p_y > 1/\theta_L$ then free trade is better than autarky.*

When $p_y > \frac{1}{\theta_L}$, the country will specialize in y. In this case, as we shall see, that the gains from trade will outweigh the loss. Then

$$EV_y = \frac{p_y^{(1-b)(1-\rho)}}{1-\rho}\left(\pi\theta_H^{1-\rho} + (1-\pi)\theta_L^{1-\rho}\right)$$

This implies

$$EV_y > \frac{\theta_L^{-(1-b)(1-\rho)}}{1-\rho}\left(\pi\theta_H^{1-\rho} + (1-\pi)\theta_L^{1-\rho}\right)$$

We know that $\theta_L^{-(1-b)(1-\rho)} \gtrless \theta_H^{-(1-b)(1-\rho)}$ when $\rho \lessgtr 1$.

Therefore, $\theta_L^{-(1-b)(1-\rho)}/(1-\rho) > \theta_H^{-(1-b)(1-\rho)}/(1-\rho)$ for all positive values of $\rho \neq 1$

$$EV_y > \left(\frac{\pi\theta_H^{b(1-\rho)}}{1-\rho} + \frac{(1-\pi)\theta_L^{b(1-\rho)}}{1-\rho}\right) \tag{2.10}$$

Equation (2.10) means that $EV_y > EV_{AUT}$. With a high comparative advantage in the Ricardian sense, the gains from trade will outweigh the loss from uncertainty and risk aversion. However, we shall see in section 2.3 and section 2.4 that in such a case free trade equilibrium can be improved.

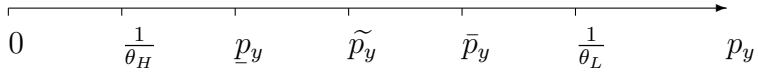


Figure 2.1: Price line

Figure 2.1 shows the range of price given which a country would decide whether to specialize completely or incompletely. If $\widetilde{\widetilde{p}}_y$ is less than $\bar{p}_y$, then the country will gain from specializing in y as compared to autarky. $\widetilde{\widetilde{p}}_y$ will either be less than or greater than $\bar{p}_y$. If $\widetilde{\widetilde{p}}_y$ is greater than $\bar{p}_y$, then the country will lose from specializing in y when $p_y \in (\bar{p}_y, \widetilde{\widetilde{p}}_y)$ as compared to autarky.

2.3 Private Insurance Market

The uncertainty in income in presence of free trade can give rise to a private insurance market. The insurance market will help in reducing the uncertainty in income at different states, which will reduce the loss arising from uncertainty. Let us assume that the insurance provided is actuarially fair. Let the price of one unit insurance be γ. Let q be the units of insurance purchased. The risk averse individual will pay γ units of money for each of q units of insurance. The expected utility will be given by the following equation.

$$EV_{INS} = \frac{\pi}{1-\rho}\left(p_y^{-b(1-\rho)}(\alpha + (1-\alpha)p_y\theta_H - \gamma q)^{1-\rho}\right) + \frac{1-\pi}{1-\rho}\left(p_y^{-b(1-\rho)}\left(\alpha + (1-\alpha)p_y\theta_L + (1-\gamma)q\right)^{1-\rho}\right) \quad (2.11)$$

Fair insurance will imply that the expected income of the insurance provider is equal to the expected cost. In other words,

$$\pi(\alpha + (1-\alpha)p\theta_H) - \gamma q + \alpha + (1-\alpha)p\theta_L + (1-\gamma)q \quad (2.12)$$

Solving (2.12) we get $\gamma = 1-\pi$. Substituting the value of γ in equation (2.11) we get

$$EV_{INS} = \frac{\pi}{1-\rho}\left(p_y^{-b(1-\rho)}(\alpha + (1-\alpha)p_y\theta_H - (1-\pi)q)^{1-\rho}\right) + \frac{1-\pi}{1-\rho}\left(p_y^{-b(1-\rho)}\left(\alpha + (1-\alpha)p_y\theta_L + \pi q\right)^{1-\rho}\right) \quad (2.13)$$

Individuals now have two choice variables, α and q. Given an α an individual maximizes (2.13) w.r.t. q such that $q \geq 0$. The optimality condition is given by

$$\frac{\partial EV_{INS}}{\partial q} = \pi\left(p_y^{-b(1-\rho)}(\alpha + (1-\alpha)p_y\theta_H - (1-\pi)q)^{-\rho}\right)(-(1-\pi)) + (1-\pi)\left(p_y^{-b(1-\rho)}\left(\alpha + (1-\alpha)p_y\theta_L + \pi q\right)^{-\rho}\right)\pi \geq 0 \quad (2.14)$$

When $q = 0$, then $\frac{\partial EV_{INS}}{\partial q} > 0$ and when $q > 0$, then $\frac{\partial EV_{INS}}{\partial q} = 0$. Since $q = 0$ cannot be a solution, $q > 0$ and we have from (2.14)

$$\pi \left(p_y^{-b(1-\rho)}(\alpha + (1-\alpha)p_y\theta_H - (1-\pi)q)^{-\rho}\right)(-(1-\pi)) \\ +(1-\pi)\left(p_y^{-b(1-\rho)}\left(\alpha + (1-\alpha)p_y\theta_L + \pi q\right)^{-\rho}\right)\pi = 0 \tag{2.15}$$

Solving 2.15 we get $q = (1-\alpha)p_y(\theta_H - \theta_L)$. Substituting the value of q in (2.13) we get

$$EV_{INS} = \frac{1}{1-\rho}\left(p_y^{-b(1-\rho)}(\alpha + \pi(1-\alpha)p_y\theta_H + (1-\pi)(1-\alpha)p_y\theta_L)^{1-\rho}\right) \tag{2.16}$$

The first order condition will be given by

$$\frac{\partial EV_{INS}}{\partial \alpha}$$
$$= p_y^{-b(1-\rho)}(\alpha + \pi(1-\alpha)p_y\theta_H + (1-\pi)(1-\alpha)p_y\theta_L)^{-\rho}(1 - \pi p_y\theta_H - (1-\pi)p_y\theta_L) \tag{2.17}$$

We have already seen in section 2.2.2 that $p_y > \frac{1}{\pi\theta_H + (1-\pi)\theta_L}$. Therefore, $\frac{EV_{INS}}{\alpha} < 0$. In other words, the optimal choice of α is 0 and the optimal choice of q is $p_y(\theta_H - \theta_L)$. In presence of an insurance market we see that individuals specialize in the risky agricultural commodity. The utility is given by

$$EV^*_{INS} = \frac{p_y^{(1-b)(1-\rho)}}{1-\rho}(\pi\theta_H + (1-\pi)\theta_L)^{1-\rho} \tag{2.18}$$

Income in both the states will be equal to $p_y(\pi\theta_H + (1-\pi)\theta_L)$ which is greater than 1, from the condition for incomplete specialization.

$EV^*_{INS} > EV_{AUT}$

Proposition 2.3.1. *In the presence of an actuarially fair private insurance market*

1. *country will completely specialize in y, the risky good,*

2. *the resulting trading equilibrium will be better than the autarkic equilibrium.*

The insurance market gives completeness to the otherwise incomplete market. The absence of completeness of market is responsible for trade to be inferior to autarky. Under autarky complete market is guaranteed through the demand curve which has unit price elastic. Under free trade since price is given exogenously, the completeness of the market is not applicable any more, and income is not equal any more between the two states. So insurance market can help in achieving the first best solution. The Ricardian case of complete specialization is achieved through the insurance market.

Now suppose the country is specializing completely in y under free trade. The individuals want to be insured from the income uncertainty. In this case the indirect utility function will be given by

$$EV_{INS} = \frac{p_y^{-b(1-\rho)}}{1-\rho}\left(\pi(\theta_H p_y - \gamma q)^{1-\rho} + (1-\pi)(\theta_L p_y + (1-\gamma)q\right)$$

As before, for actuarially fair insurance, $\gamma = (1-\pi)$.

$$EV_{INS} = \frac{p_y^{-b(1-\rho)}}{1-\rho}\left(\pi(\theta_H p_y - (1-\pi)q)^{1-\rho} + (1-\pi)(\theta_L p_y + \pi q\right) \quad (2.19)$$

Differentiating 2.19 w.r.t. q we get

$$q = (\theta_H - \theta_L)p_y$$

Substituting in equation (2.19) we get back (2.18)

Proposition 2.3.2. *When the country specializes completely in y, insurance will improve the trading equilibrium.*

$$EV_y = \frac{p_y^{(1-b)(1-\rho)}}{1-\rho}\left(\pi\theta_H^{1-\rho} + (1-\pi)\theta_L^{1-\rho}\right)$$

Define a function $f(\theta) = \theta^{1-\rho}$. $f' > 0$ and $f'' < 0$ for $\rho < 1$. This means that

$$(\pi\theta_H + (1-\pi)\theta_L)^{1-\rho} > \pi\theta_H^{1-\rho} + (1-\pi)\theta_L^{1-\rho}$$

i.e.

$$\frac{1}{1-\rho}(\pi\theta_H + (1-\pi)\theta_L)^{1-\rho} > \frac{1}{1-\rho}\pi\theta_H^{1-\rho} + (1-\pi)\theta_L^{1-\rho}$$

$f' < 0$ and $f'' > 0$ for $\rho > 1$. This means that

$$(\pi\theta_H + (1-\pi)\theta_L)^{1-\rho} < \pi\theta_H^{1-\rho} + (1-\pi)\theta_L^{1-\rho}$$

i.e.

$$\frac{1}{1-\rho}(\pi\theta_H + (1-\pi)\theta_L)^{1-\rho} > \frac{1}{1-\rho}\left(\pi\theta_H^{1-\rho} + (1-\pi)\theta_L^{1-\rho}\right)$$

Hence the indirect utility in the presence of a private insurance market will always be greater than the free trade indirect utility when the country completely specializes in y.

2.4 Role of Government

Presence of uncertainty necessitates private insurance market. However, there is no guarantee that an actuarially fair insurance market will exist. The alternative option could be a government intervention. Government is risk neutral and absorbs the uncertainty in the system by providing complete market in each state. Government intervention takes the form of taxing income in the high state and subsidizing in the low state. In our model, government taxes income in the high state and subsidizes income in the low state. Government announces the tax and subsidy scheme in the first stage. In high state government imposes a tax T on income and in low state it offers a subsidy S on income. On the basis of this scheme agents maximize their indirect utility in the second stage. The optimization problem can be solved using the method of backward induction. In the first step the individuals will calculate the optimal value of α given any T and S. In the second step the government will maximize the expected indirect

utility with respect to its choice variables T and S. The expected indirect utility of a representative individual is given by

$$\begin{aligned} EV_{RT} = & \frac{\pi}{1-\rho}(p_y^{-b(1-\rho)}(\alpha + (1-\alpha)p_y\theta_H - T)^{1-\rho}) \\ & + \frac{1-\pi}{1-\rho}(p_y^{-b(1-\rho)}\left(\alpha + (1-\alpha)p_y\theta_L + S\right)^{1-\rho}) \end{aligned} \tag{2.20}$$

Government budget must balance in an expected sense, 1.e., the expected revenue income of the government from taxes must be equal to its expected expenditure on subsidy. [1]

$$\pi T = (1-\pi)S \tag{2.21}$$

Proposition 2.4.1. *Government intervention will make trade better under a situation where free trade is Pareto Inferior to autarky.*

Substituting equation (2.21) in equation (2.20) we can rewrite the indirect expected utility in the following way.

$$\begin{aligned} EV_{RT} = & \frac{\pi}{1-\rho}\left(p_y^{-b(1-\rho)}(\alpha + (1-\alpha)p_y\theta_H - T)^{1-\rho}\right) \\ & + \frac{1-\pi}{1-\rho}\left(p_y^{-b(1-\rho)}\left(\alpha + (1-\alpha)p_y\theta_L + \frac{\pi T}{1-\pi}\right)^{1-\rho}\right) \end{aligned} \tag{2.22}$$

[1] We assume that the government starts with a fund that pays initially in case of bad states. The earnings from the good state gets deposited in the fund.

EV_{RT} is maximized by individuals given any T over α subject to the constraint that $\alpha \geq 0$. This yields an optimal value of α as given by

$$\alpha^* = \begin{cases} \frac{(A\theta_H - \theta_L)p_y - T\left(A + \frac{\pi}{1-\pi}\right)}{1 - A + (A\theta_H - \theta_L)p_y} & \text{if } T < \frac{(A\theta_H - \theta_L)p_y}{\left(A + \frac{\pi}{1-\pi}\right)} \\ 0 & \text{otherwise} \end{cases} \tag{2.23}$$

Now it is government's turn to choose T in order to maximize individuals' welfare. The government maximizes

$$\begin{aligned} EV^*_{RT} &= \frac{p_y^{-b(1-\rho)}\left(\pi^{\frac{1}{\rho}}(\theta_H p_y - 1)^{\frac{1-\rho}{\rho}} + (1-\pi)^{\frac{1}{\rho}}(1 - \theta_L p_y)^{\frac{1-\rho}{\rho}}\right)}{(1-\rho)(1-\theta_L p_y)^{1-\rho}(\theta_H p_y - 1)^{1-\rho}} \\ &\quad . \left((\theta_H - \theta_L)p_y + \frac{T}{1-\pi}(\pi\theta_H p_y + (1-\pi)\theta_L p_y - 1)\right)^{1-\rho} \end{aligned} \tag{2.24}$$

We see that $\frac{\partial EV^*_{RT}}{\partial T} > 0$ for all values of T. Therefore, it is inefficient for government to choose $T \leq T_{max}$ where $T_{max} = \frac{(A\theta_H - \theta_L)p_y}{\left(A + \frac{\pi}{1-\pi}\right)}$. Government announces a tax more than T_{max}. This means the country will completely specialize in y, i.e., $\alpha^* = 0$ since α is dependent on T. Now the government has to maximize the following expected indirect utility function with respect to T:

$$EV^*_{RT} = \frac{p_y^{-b(1-\rho)}}{1-\rho}\left((\pi\theta_H - T)^{1-\rho} + \left((1-\pi)\theta_L + \frac{\pi}{1-\pi}T\right)^{1-\rho}\right) \tag{2.25}$$

The solution to this problem will be given by $T = (1-\pi)p_y(\theta_H - \theta_L)$ In this case the indirect utility will be given by

$$EV^*_{RT} = \frac{p_y^{(1-b)(1-\rho)}}{1-\rho}(\pi\theta_H + (1-\pi)\theta_L)^{1-\rho}$$

Income in both the states will be equal to $p_y(\pi\theta_H + (1-\pi)\theta_L)$ which is greater than 1, from the condition for incomplete specialization.

$EV^*_{RT} > EV_{AUT}$

This shows that there can be an optimal intervention in absence of an actuarially fair insurance market. This is similar to the trading equilibrium in presence of the insurance market.

In this section we have shown that an optimal intervention will make a country in autarky specialize in y, which is the risky agricultural good. Now the question that comes up following is that if an intervention will be optimal when the country completely specializes in y. From our previous proposition we can make the following corollary about that.

Corollary 2.4.1. *Government intervention will improve the trading equilibrium when the country completely specializes in y.*

2.4.1 Comparing the Equilibria

The government intervention and private insurance market provide the identical solution. Our result falls in line with Dixit (1987) and Dixit (1989), in this sense. Since a private insurance market may not be present due to the systemic and non-diversifiable risk, government intervention can

improve the trading equilibrium. If government provides the sector with a state contingent insurance, then the country will definitely be better off. When the country gains from trade while specializing incompletely, there may not be successful government intervention. Consider the example that $\theta_H = 2\theta_L$, $\theta_L = 2$, $\rho = 0.5$, $b = 0.5$, $\pi = 0.5$. In this case free trade is always better than autarky in the zone of incomplete specialization than autarky. Here if we try to introduce government intervention we will see that in the zone of incomplete specialization, free trade will be better. In Figure 2.2 we plot the range of price for incomplete specialization given the aforesaid values of the parameters on the horizontal axis and the restricted trade utility to free trade utility ratio EV_{RT}/EV_{FT} on the vertical axis. It is clear that free trade will always be greater than restricted trade. However, if we have $\theta_H = 10\theta_L$, $\theta_L = 0.2$, the other parameters remaining unchanged, free trade will be better than autarky. Even then we can show that restricted trade will be better than free trade for a range of price within the zone of incomplete specialization. In Figure 2.3 we plot the range of price for incomplete specialization given the changed values of the parameters on the horizontal axis and EV_{RT}/EV_{FT} on the vertical axis as before. Depending on the price free trade may or may not be better than restricted trade.

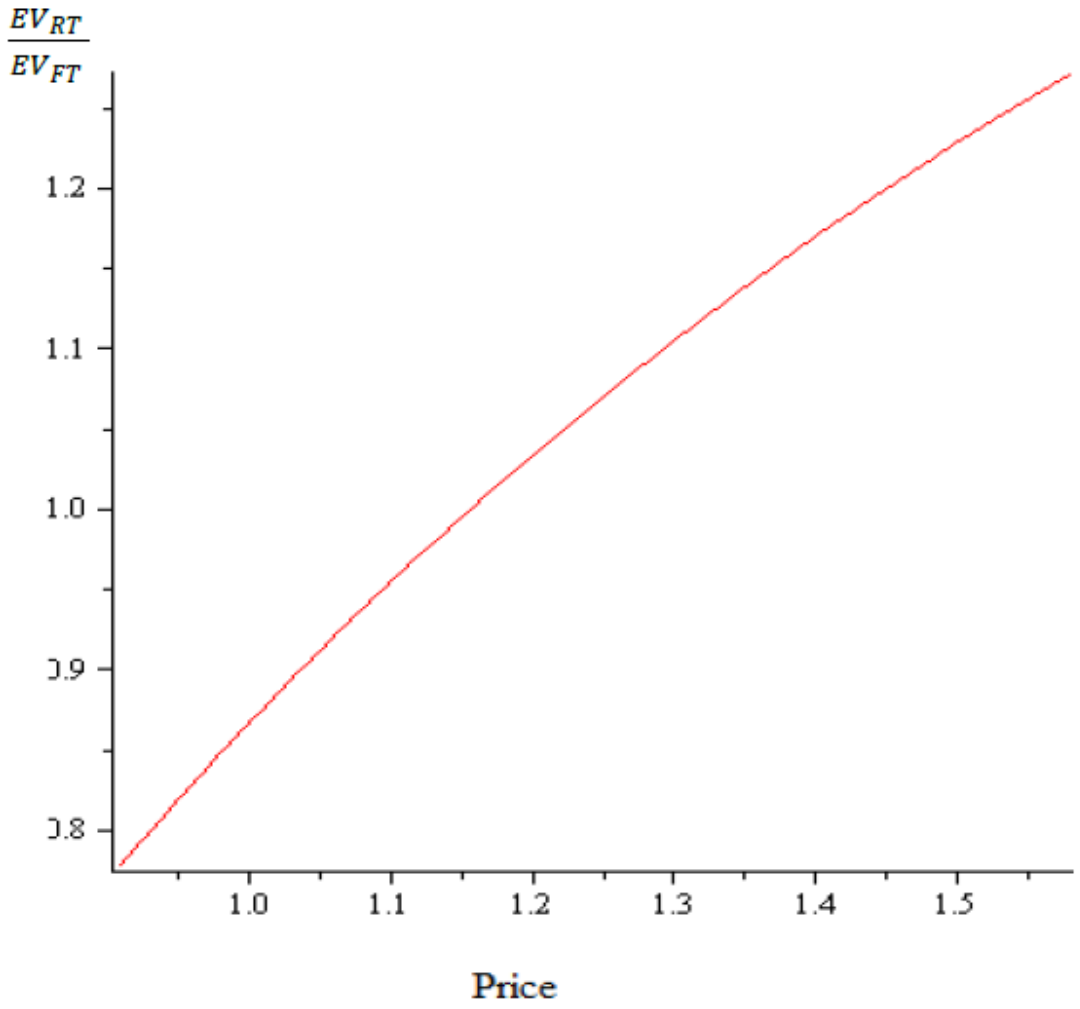


Figure 2.2: Diagram showing that free trade is better than restricted trade throughout the range of incomplete specialization

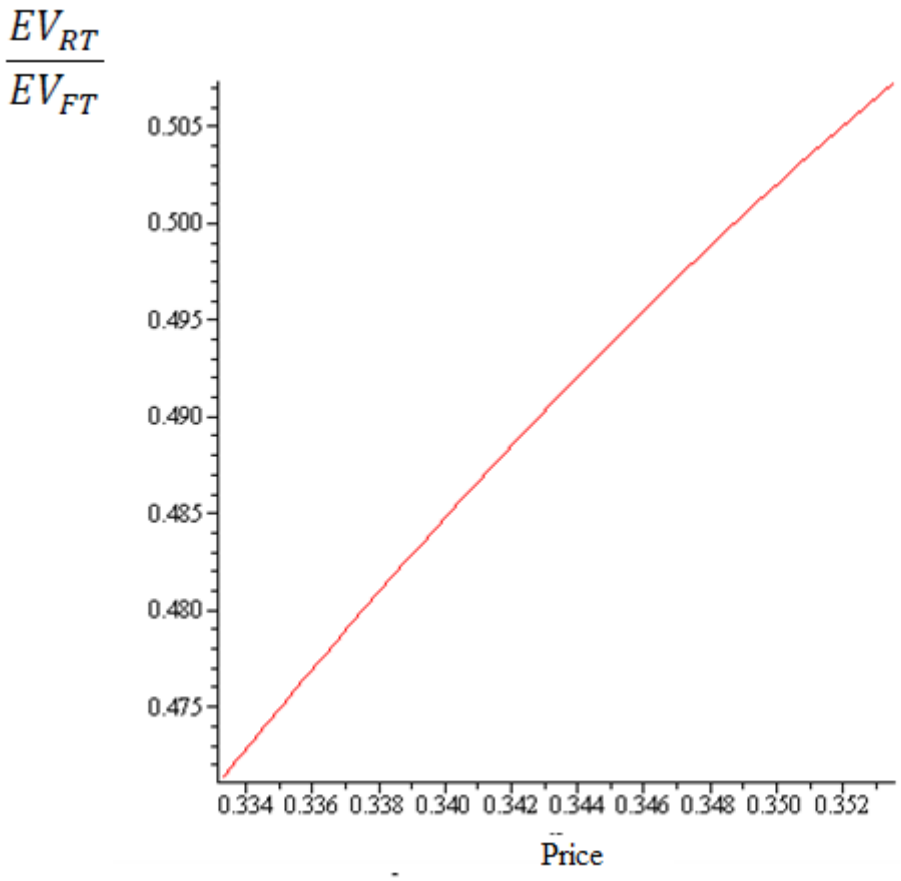


Figure 2.3: Diagram showing that in the initial range of incomplete specialization free trade is better, however in the later part of the range restricted trade is better than free trade

2.5 Two Country Framework

In Shy (1988) as well as in Newbery and Stiglitz (1981) trade takes place according to ex post comparative advantage. Countries are identical ex-ante. If both the countries have a good year or a bad year, then no trade can take place. We assume a two country world where both the countries are identical ex ante, having the same production and consumption structure as given in section 2.2. However, if one country has high output of y good, the other will have low output. Otherwise there cannot be any trade between the two countries. Therefore, the total output in the world market will remain constant in a free trade regime. This will make price independent of the state of nature. This suggests that the utility function under free trade will be given by equation (2.4). Because it is a two country framework and both the countries are identical ex ante, if one country completely specializes in one commodity, the other country will have the same incentive to specialize in that commodity. And hence (2.5) will be equated to 0 in order to maximize expected indirect utility w.r.t. labour allocation. Each individual will take the international price as given because of perfect competition, even though the country as a whole acts as a price maker.

$$\frac{\partial EV_{FT}}{\partial \alpha} = p_y^{-b(1-\rho)}(\pi(\alpha + (1-\alpha)\theta_H p_y)^{-\rho}(1 - p_y\theta_H) + (1-\pi)(\alpha + (1-\alpha)\theta_L p_y)^{-\rho}(1 - p_y\theta_L)) = 0 \tag{2.26}$$

Rewriting equation (2.26)

$$\frac{\alpha + (1-\alpha)\theta_L p_y}{\alpha + (1-\alpha)\theta_H p_y} = A \tag{2.27}$$

$A = \left(\left(\frac{1-\pi}{\pi}\right)\left(\frac{1-p_y\theta_L}{p_y\theta_H - 1}\right)\right)^{1/\rho}$.

The world relative demand will be given by ap_y/b as before, However, the relative supply now will be $2\alpha/((1-\alpha)(\theta_H + \theta_L))$. From the world market clearing condition we get that

$$\frac{2\alpha}{(1-\alpha)(\theta_H + \theta_L)} = \frac{ap_y}{b} \tag{2.28}$$

Rewriting (2.26) we get back equation (2.27), which is nothing but our equation (2.6). Therefore, the optimal value of α denoted by α^* will be given by (2.7) in this case also. Now, from equation (2.28) we get

$$\alpha^{**} = \frac{1}{1 + \frac{2b}{ap_y(\theta_H + \theta_L)}} \tag{2.29}$$

For an equilibrium p_y to exist, α^* must be equal to α^{**}. In other words,

$$\frac{2b}{a(\theta_H + \theta_L)} = \frac{1-A}{A\theta_H - \theta_L} \tag{2.30}$$

We know that $A = \left(\left(\frac{1-\pi}{\pi}\right)\left(\frac{1-p_y\theta_L}{p_y\theta_H - 1}\right)\right)^{1/\rho}$. Therefore, LHS of equation (2.30) is a constant, while the RHS depends on p_y. $p_y \in (1/\theta_H, 1/\theta_L)$ since for p_y outside this range there will not be any interior solution of α. The countries are assumed to be identical ex ante, so the choice of

factor allocation, which is done before the uncertainty is resolved, will be identical in both the countries. Therefore, $A < 1$. It is clear from the fact that $A < 1$ and equation (2.7) that an interior solution will be guaranteed when $A > \theta_L/\theta_H$. It can be shown that A is inversely related to p_y in the range of $1/\theta_H < p_y < 1/\theta_L$. This would mean that RHS is increasing in p_y. Therefore, if we plot RHS against p_y, we will get an upward rising function, while we will get a horizontal straight line if we plot LHS against p_y. This would guarantee the existence of a unique equilibrium. Now we have to see if this equilibrium gives a better utility. In Shy (1988) it was shown that for $\rho > 1$ free trade will definitely be worse than autarky. However, we will show taking numerical examples that even when $\rho > 1$, free trade might be better than autarky, and it might be worse than autarky also under a different set of condition when $\rho > 1$. Hence we can question the result in Shy (1988) and can say that since the assumption of indivisibility of labour is an additional source of inefficiency added to the production uncertainty, they got a strong result as that. In our numerical example we take $b = 0.5$, $\pi = 0.5$, $\theta_H = 2\theta_L$, $\theta_L = 0.2$ and $\rho = 5$. In such a situation, free trade will be worse off than autarky. However, if we change the value of ρ to 2 which is still greater than 1, the result will be reversed.

2.6 Conclusion

This chapter tries to see if government can play a role in improving the trading equilibrium in presence of productivity shock in agriculture. Under autarky, the agricultural sector is naturally insured against the uncertainty in production. The reason is that when output decreases the price increases stabilizing somewhat the agricultural income. It is seen that the outcome under autarky is Pareto optimal. When we consider a small open economy we see that with very high comparative advantage in either of the two sectors the gains from trade outweighs the loss due to uncertainty. When the country completely specializes in industrial good, it is better off under free trade, and the question of insurance or protection is rendered irrelevant. However, in case of incomplete specialization and complete specialization in the agricultural good with moderate comparative advantage, free trade may or may not be better than autarky. It has also been shown that in case of complete specialization in agriculture, whether or not free trade is better, restricted trade gives the best possible outcome. Under incomplete specialization when autarky is better than free trade, restricted trade is better than autarky, but it might not be better when free trade is better than autarky. A private insurance market, if present, yields an equivalent result as the government intervention. When we extend the model to a two country framework, we do not see the result obtained in Shy (1988), where free

trade is always inferior to autarky when degree of risk aversion is greater than unity. In this case also, the result is ambiguous. Advanced countries with strong comparative advantage in industrial goods where production is less uncertain, have no reason to restrict agricultural trade, except perhaps for lobbying. Countries with strong comparative advantage for agricultural goods have reasons for government intervention which provides insurance. For all countries, trade (free or restricted) in agriculture is always better than no trade.

Chapter 3

Opening up of the Agricultural sector in the Presence of Single Voting Rights

3.1 Introduction

Text book international trade theory suggests that gains from trade will outweigh the loss from it, even when it hurts some individuals. Despite that, ever since the formation of the World Trade Organization (WTO), free trade in agricultural goods has been the subject of controversy. Indeed, on several occasions, WTO negotiations have broken down mainly because the negotiating nations have failed to reach a consensus regarding the opening up of trade in agricultural goods. The dispute is mostly about

the removal of agricultural subsidies. Governments of advanced countries have been showing remarkable reluctance to reduce the huge subsidies they give on their agricultural sectors, although they promote free trade in other sectors. This, in turn, has created an unfair competition for potential third world exporters of agricultural goods to first world markets. In fact, first world agricultural subsidies have not only restricted foreign competition in their home agricultural markets, but sometimes have been so high that the subsidy-ridden agricultural product from the first world is exported to the third world. The standard literature on trade finds export subsidy to be highly inefficient. Agricultural sectors of third world countries are also heavily subsidized. These countries, however, are given some concessions by the WTO in the sense that they are allowed to gradually remove their agricultural subsidies and prepare themselves for free world competition in successive stages.

One explanation for the lack of trade in the agricultural sector can be provided in terms of lobbying. It is often argued that small groups can lobby more effectively than large groups. When a small group is successfully lobbying with the government, the benefit it extracts is divided among the small number of people belonging to that group so that each member gets a non-significant amount of benefit. Of course, this benefit must come at the cost of someone else. If this cost is distributed among a large number of people, each shouldering an insignificant amount of the cost and hence

almost unaware of its burden, the lobbying activity has a high chance of success. In North America, Europe and Japan a very small fraction of the labour force, between 2 per cent and 4 per cent, are engaged in the agricultural sector. These small groups can spend resources on lobbying and reap the consequent benefits at the cost of a large number of consumers who are neither organized as groups nor aware of the small costs each is bearing. Mayer (1984) has formalized this aspect of lobbying and protection by using the median voter theorem in a specific factor model of international trade. A follow up model has been constructed in Swinnen (1994). The prevalent protection in agriculture has prompted studies of global model as listed by Tongeren, Meijl and Surry (2001). These models do not view protection as an optimal policy from the point of view of the society or consumers and imply that trade restrictions, arising out of lobbying of small groups, as basically undesirable.

Mitra and Dutt (2002) have taken cross country data to validate the theory that an increase in inequality increases import protection in capital-abundant countries, but reduces trade barriers in capital-scarce economies.

Free trade may often hurt the economy if we move away from the standard neo-classical literature on trade. Newbery and Stiglitz (1981) and Shy (1988) show in presence of production uncertainty and risk averse individuals trade can be Pareto inferior. Krugman and Venables (1995) have shown that trade may hurt when there is increasing returns and transport cost.

Lancaster(1980) shows there will be no agricultural trade in presence of monopolistic competition, there need not be any agricultural trade if it is undifferentiated. Costinot and Vogel (2010) use a matching model to show that trade will increase within group and between group inequality in a skill-abundant country, but will reduce the same in the skill-scarce country. However, whether trade will increase inequality in a skill-abundant country remains a debatable empirical issue. For example, Dollar (2005) shows that increased trade has no effect on inequality. Krishna and Yavas (2005) have shown that in a transition economy in presence of heterogeneous labour and consumption indivisibility, trade might be Pareto inferior. Pareto inferior trade might imply consumers getting hurt. Here, in this chapter, we would focus on the consumers of agricultural good, or food.

There has been a vast literature on food being a necessary good affecting the survival probability, Coate (1989) being an example. A similar paper by Basu (1996) also discusses about the policy prescription in case of a famine. In these papers, an individual first maximizes his survival probability and then moves on to the consumption of other goods. It has been found that being net food importer is only a weak signal of food vulnerability (see Diaz-Bonilla (2000)).

The issue of food security is a prime concern for the policy makers around the world. The debate on the role of trade on food security is sparse and mostly empirical. The aim of this chapter is see the effect

of trade on food security. We would call the food insecure people to be poor. We would also see the effect of trade on inequality. Agricultural commodity is a necessary commodity. Also, there can be indivisibility of consumption. In this chapter, we will consider the effect of trade on food consumption and food security. We build a simple two sector two country Ricardian model addressing the issue of food security and labour heterogeneity. We try to see the effect of trade in agriculture on inequality and poverty. According to Food and Agriculture Organization of the United Nations (FAO), food insecurity is closely related to absolute poverty. We consider a pre-determined food security threshold, as talked about in the report Impacts of Policies on Poverty by FAO. We assume labour to be heterogeneous in terms of productivity. In section 3.2 and 3.3 we build the basic model and see the result under autarky and free trade. We also see the effect of free trade on different countries. Section 3.4 shows under what condition a country might go for trade. Section 3.5 concludes the chapter.

3.2 The Model

3.2.1 The Economy

We begin with an economy consisting of individuals who own only labour. Two goods can be produced in the economy using labour, viz., an industrial good x and an agricultural good y. To produce one unit of agricultural good

individuals require one unit of labour. However productivity of labour in x sector varies from individual to individual. An individual can produce ϕ units of x using 1 unit of labour. We assume that ϕ follows a continuous uniform distribution, with the support $[\underline{\phi}, \bar{\phi}]$. This assumption can be looked at in the lights of the assumption of effective labour in Krishna and Yavas (2005). Price of good x is normalized to 1. Each individual is endowed with 1 unit of labour, which they can decide to employ either in x sector or in y sector. Individuals get satiated in the consumption of food after a certain level $\bar{y}$. Utility function is broadly Cobb-Douglas type which becomes non-homothetic beyond $\bar{y}$. Once an individual can afford to consume $\bar{y}$, she starts spending the excess income solely on the industrial good. We loosely characterize those who can consume $\bar{y}$ level of agricultural good as rich and others as poor. In other words, we define poverty as the inability to consume a minimum level of food and hence get a minimum level of nutrition. However, since we are in a static model, we assume away the possibility of a subsequent decline in the productivity level due to insufficient consumption of food. The following is the utility function:

$$U = \begin{cases} x^a y^{1-a} & \text{if } y < \bar{y} \\ x^a \bar{y}^{1-a} & \text{if } y \geq \bar{y} \end{cases} \tag{3.1}$$

The individual will maximize equation (3.1) subject to the following

budget constraint:

$$x + p_y y = \alpha\phi + p_y(1-\alpha) \tag{3.2}$$

where α is the amount of labour an individual decides to put in the x sector. The demand for the agricultural good then will be given by:

$$y^d = min\{\bar{y}, \frac{1-a}{p_y}(\alpha\phi + (1-\alpha)p_y)\}$$

The indirect utility function (denoted by V) is essentially an increasing function of income.

$$V = \begin{cases} a^a(\frac{1-a}{p_y})^{1-a}(\alpha\phi + p_y(1-\alpha)) & \text{if } y < \bar{y} \\ \bar{y}^{1-a}(\alpha\phi + p_y(1-\alpha) - p_y\bar{y}) & \text{if } y \geq \bar{y} \end{cases} \tag{3.3}$$

Therefore, maximization of the indirect utility function can be achieved by maximizing income by choosing how much labour to allocate in each sector. α is the choice variable. Let I be the income.

$$I = \alpha\phi + (1-\alpha)p_y$$

Maximizing I w.r.t. α we see that

$$\alpha = \begin{cases} 1 & \text{if } p_y < \phi \\ 0 & \text{if } p_y > \phi \end{cases} \tag{3.4}$$

Individuals who specialize in y sector will be able to consume $1-a$ units of food. We assume that $\bar{y} > 1-a$ which would ensure the existence

of poverty in the economy. Otherwise, everyone in the economy will be able to consume $\bar{y}$. Individuals in the x sector consume $(1-a)\phi/p_y$ of the agricultural good. Critical value of ϕ for which an individual in x sector can just consume $\bar{y}$ is given by $\tilde{\phi}$. $\tilde{\phi}$ must satisfy $\bar{y} = \frac{1-a}{p_y}(\tilde{\phi})$. Therefore, we have,

$$\tilde{\phi} = \frac{\bar{y}p_y}{1-a} > p_y = \hat{\phi}$$

where $\hat{\phi}$ is the ϕ for which an individual is indifferent between producing in x sector and y sector. For $\phi > \tilde{\phi}$, individuals will consume $\bar{y}$ amount and hence can be considered as rich. Those who get engaged in agriculture are all poor, while those who are in the industrial sector may or may not be poor, depending on their productivity in the industrial sector.

3.2.2 Equilibrium under Autarky

The equilibrium price under autarky will be obtained by equating demand and supply. We consider only the market for y. Then by virtue of Walras Law, the x market will also be in equilibrium.

Demand for y:

$$\int_{\underline{\phi}}^{p_y} (1-a)d\phi + \int_{p_y}^{\frac{\bar{y}p_y}{1-a}} \frac{(1-a)\phi}{p_y} d\phi + \int_{\frac{\bar{y}p_y}{1-a}}^{\bar{\phi}} \bar{y} d\phi$$

The first term is the demand made by the individuals in the agricultural sector, the second term is the demand made by the poor of the industrial

sector and the third term is the demand made by the non-poor of the industrial sector.

Supply of y:

$$\int_{\underline{\phi}}^{p_y} d\phi$$

Under autarky, supply of y = demand for y. Simplifying we get

$$(1-a)(p_y - \underline{\phi}) + \frac{\bar{y}^2 p_y}{2(1-a)} - \frac{(1-a)p_y}{2} + \bar{y}\bar{\phi} - \frac{\bar{y}^2 p_y}{(1-a)} = (p_y - \underline{\phi}) \quad (3.5)$$

Solving equation (3.5) we get the autarkic price level

$$p_y = \frac{2(1-a)(\bar{y}\bar{\phi} + a\underline{\phi})}{2(1-a) + \bar{y}^2 + (1-a)^2} \quad (3.6)$$

In order to have a meaningful equilibrium (i.e., both the products are produced in equilibrium) we require the following inequality

$$\underline{\phi} < p_y < \tilde{\phi} < \bar{\phi}$$

The above inequality will be guaranteed if we have

$$\frac{\bar{\phi}}{\underline{\phi}} > \frac{(1-a)^2 + \bar{y}^2}{2(1-a)\bar{y}}$$

3.3 Free Trade

We consider two countries A and B. In both the countries the productivity in sector y is unity. In country A, productivity of each individual in sector x is given by ϕ_A, where ϕ_A follows a continuous uniform distribution with

support $[\underline{\phi}_A, \bar{\phi}_A]$. In country B, productivity of each individual in sector x is given by ϕ_B, where ϕ_B follows a continuous uniform distribution with support $[\underline{\phi}_B, \bar{\phi}_B]$. Trade takes between A and B. First we will determine the international price p^* by equating world demand to world supply. We denote the autarkic price of y in country A by p_A and that of country B by p_B. Let us assume that $p_A < p_B$ by suitable choice of parameters. In order to ensure $p_A < p_B$ we simply need to assume $\underline{\phi}_A < \underline{\phi}_B$ and $\bar{\phi}_A < \bar{\phi}_B$.

World demand for the agricultural good is now given by

$$\int_{\underline{\phi}_A}^{p^*} (1-a)d\phi_A + \int_{p_y}^{\frac{\bar{y}p^*}{1-a}} (1-a)\phi_A d\phi_A + \int_{\frac{\bar{y}p^*}{1-a}}^{\bar{\phi}_A} \bar{y} d\phi_A$$
$$+ \int_{\underline{\phi}_B}^{p^*} (1-a)d\phi_B + \int_{p^*}^{\frac{\bar{y}p^*}{1-a}} (1-a)\phi_B d\phi_B + \int_{\frac{\bar{y}p^*}{1-a}}^{\bar{\phi}_B} \bar{y} d\phi_B$$

World supply is given by

$$\int_{\underline{\phi}_A}^{p^*} d\phi_A + \int_{\underline{\phi}_B}^{p^*} d\phi_B$$

Equating world demand for y with the world supply of y and simplifying, we get

$$(1-a)p^* - (1-a)(\underline{\phi}_A + \underline{\phi}_B) + \bar{y}(\bar{\phi}_A + \bar{\phi}_B) - \frac{\bar{y}^2 p^*}{1-a} = 2p^* - (\underline{\phi}_A + \underline{\phi}_B) \quad (3.7)$$

We can solve for p^* from (3.7).

$$p^* = \frac{a(1-a)(\underline{\phi}_A + \underline{\phi}_B) + (1-a)\bar{y}(\bar{\phi}_A + \bar{\phi}_B)}{2(1-a) - (1-a)^2 + \bar{y}^2} \quad (3.8)$$

We can see that $p^* = \frac{1}{2}(p_A + p_B)$ from (3.8). This will mean that $p_B > p^* > p_A$. Therefore, country A has a comparative advantage in

good y and B in good x. Here, each individual chooses either $\alpha = 1$ or $\alpha = 0$. In other words, each individual specializes completely. However, the country as a whole may not specialize completely because of heterogeneous labour. In extreme cases there can be complete specialization. If $p^* > \bar{\phi}_A$, country A might completely specialize in y, or if $p^* < \underline{\phi}_B$, country B might completely specialize in x. However, these can be extended as special cases.

We would like to see the possible effects of a change in price on the two countries. With an increase in agricultural price in country A, the agricultural sector will expand in size while the industrial sector will reduce in size. The agricultural income will increase while the industrial income remains unchanged. Those who shift from industry to agriculture will experience an increase in income. On the other hand, in country B, with a decrease in agricultural price, the industrial sector will expand and agricultural activities will shrink. The agricultural income will decrease and industrial income will remain unchanged. Those who shift from agriculture to industry will see an increase in income.

Let us define $\tilde{\tilde{\phi}}_A$ as that value of ϕ_A such that people in country A with productivity lower than $\tilde{\tilde{\phi}}_A$ will gain from trade and those with higher productivity will lose. Those who continue to remain in the agricultural sector gain from trade as their income rise. Those who shift from the industry to agriculture experience an increase in income at a lower level of productivity while those with higher productivity will experience a loss of

utility as now they pay more for the same amount of food. The autarkic utility level is given by $V_{AUT} = a^a(1-a)^{(1-a)}p_A^{-(1-a)}\phi_A$ and the utility under trade is $V_{FT} = a^a(1-a)^{(1-a)}p^{*a}$. Comparing utility we can see that utility increases till $\phi_A = p_A^{1-a}p^{*a} = \tilde{\tilde{\phi}}_A$, beyond that it decreases.

Let us define $\tilde{\tilde{\phi}}_B$ as that value of ϕ_B such that people in country B with productivity higher than $\tilde{\tilde{\phi}}_B$ will gain from trade and those with lower productivity will lose. Those who relocate from the agricultural sector to the industrial sector lose from trade as their income falls at a lower level of productivity, but at higher productivity the individuals will gain. The autarkic utility level is given by $V_{AUT} = a^a(1-a)^{1-a}p_B^a$ and the utility under trade is $V_{FT} = a^a(1-a)^{1-a}p^{*-(1-a)}\phi_B$. Comparing utility we can see that utility decreases till $\phi_B = p_B^a p^{*1-a} = \tilde{\tilde{\phi}}_B$, beyond that it increases.

Let us now see the effect of change in price on income and consumption in each of these two countries. In table 3.1 we see the effect of an increase in agricultural price on the income and consumption of people with various productivity in country A as the country moves from autarky to free trade. Table 3.2 shows the same for country B when it moves from autarky to free trade and experiences a decrease in the agricultural price by virtue of having comparative advantage in the industrial good.

It is evident from table 3.1 and table 3.2 that in the the country with a comparative advantage in the agricultural good, poverty will increase as the number of people getting to have $\bar{y}$ amount of the agricultural good

reduces under free trade. In the country with comparative advantage in the industrial good, though poverty decreases in terms of food consumption, inequality increases. We measure poverty using head count and inequality using Gini Coefficient.

Lemma 3.3.1. *Gini coefficient decreases as the agricultural price increases.*

Proof. Let us define a variable z such that $z = max\{p_y, \phi\}$, where p_y is the agricultural price, and hence the agricultural income and ϕ the productivity and hence the income in the industrial sector. Therefore, z is the income of a representative individual of the economy described in section 3.2. Let $z \in [\underline{z}, \infty]$, where $\underline{z} = max\{p_y, \underline{\phi}\}$. We can see that $\underline{z}$ is non-decreasing in p_y. Let z follow a distribution function $F(z)$ and density function $f(z)$. The Gini Coefficient is given by

$$G = \frac{1}{\mu} \int_{\underline{z}}^{\infty} F(z)(1 - F(z))dz$$

where μ is the mean of the distribution of z. Clearly, μ is non-decreasing in p_y.

$$G = \frac{1}{\mu} \int_{\underline{z}}^{\infty} (F(z) - F(z)^2)dz \tag{3.9}$$

Differentiating 3.9 w.r.t. $\underline{z}$ we get

$$\frac{\partial G}{\partial \underline{z}} = -\frac{1}{\mu^2} \left(\int_{\underline{z}}^{\infty} (F(z) - F(z)^2)dz \right) \frac{\partial \mu}{\partial \underline{z}} - \frac{1}{\mu} F(\underline{z})(1 - F(\underline{z})) < 0 \tag{3.10}$$

Therefore, an increase in $\underline{z}$ will reduce the Gini. We know that z in non-increasing in p_y. Hence we can conclude that an increase in p_y will reduce the Gini. □

On the basis of the above lemma we make the following proposition.

Proposition 3.3.1. *In country A inequality will decrease while in country B inequality will increase in terms of Gini with opening up of trade.*

Country A with comparative advantage in y will experience in increase in agricultural price while country B with a comparative advantage in x will experience a fall in agricultural price. Then following lemma 3.3.1 we get the above proposition.

Proposition 3.3.2. *In country A the number of poor people increase. In country B the number of poor people decrease.*

Colonial past, exploitation of natural resources through institutions have left many developing countries with majorly unskilled and abundant labour poor and unequal. With the opening up of these economies, the unskilled workers can be benefitted from the gains from trade, which reduces the inequality. Although as the food prices increase, these unskilled workers who cannot very efficiently take advantage of the modern technology etc. will lag behind and may even be rendered poor (see Basu (2006)). We use the following diagrams to see the comparisons of utility and income under autarky and free trade. Figure 3.1 shows the case when the country

has a comparative advantage in the agricultural good, and figure 3.2 shows the case for the industrially advanced country.

Table 3.1: Effect of Trade on Country A, comparative advantage in agricultural good y

Range of ϕ	Change in Specialization	Consumption of y	Consumption of x	Utility
$\underline{\phi}_A$ to p_A	Continues to specialize in y	Remains at $1-a$	Increases from ap_A to ap^*	Increases
p_A to p^*	Changes from x to y	Falls from $\frac{(1-a)\phi_A}{p_A}$ to $1-a$	Increases from $a\phi_A$ to ap^*	Increases till $\tilde{\tilde{\phi}}_A$, then falls
p^* to $\frac{\bar{y}p_A}{1-a}$	Continues to specialize in x	Falls from $\frac{(1-a)\phi_A}{p_A}$ to $\frac{(1-a)\phi_A}{p^*}$	Remains at $a\phi_A$	Decreases
$\frac{\bar{y}p_A}{1-a}$ to $\frac{\bar{y}p^*}{1-a}$	Continues to specialize in x	Falls from $\bar{y}$ to $\frac{a\phi_A}{p^*}$	Falls from $\phi_A - p_A\bar{y}$ to $b\phi_A$	Decreases
$\frac{\bar{y}p^*}{1-a}$ to $\bar{\phi}_A$	Continues to specialize in x	Remains at $\bar{y}$	Falls from $\phi_A - p_A\bar{y}$ to $\phi_A - p^*\bar{y}$	Decreases

Table 3.2: Effect of Trade on Country B, comparative advantage in industrial good x

Range of ϕ	Specialization	Consumption of y	Consumption of x	Utility
$\underline{\phi}_B$ to p^*	Continue to specialize in y	Remains at $1-a$	Decreases from ap_B to ap^*	Decreases
p^* to p_B	Changes from y to x	Rises from $1-a$ to $\frac{(1-a)\phi_B}{p^*}$	Decreases from $a\phi_B$ to ap^*	Decreases till $\tilde{\tilde{\phi}}_B$, then rises
p_B to $\frac{\bar{y}p^*}{1-a}$	Continues to specialize in x	Rises from $\frac{(1-a)\phi_B}{p_B} to \frac{(1-a)\phi_B}{p^*}$	Remains at $a\phi_B$	Increases
$\frac{\bar{y}p^*}{1-a}$ to $\frac{\bar{y}p_B}{1-a}$	Continues to specialize in x	Rises from $\frac{(1-a)\phi_B}{p_B}$ to $\bar{y}$	Rises from $a\phi_B$ to $\phi_B - p_B\bar{y}$	Increases
$\frac{\bar{y}p_B}{1-a}$ to $\bar{\phi}_A$	Continues to specialize in x	Remains at $\bar{y}$	Rises from $\phi_B - p_B\bar{y}$ to $\phi_B - p^*\bar{y}$	Increases

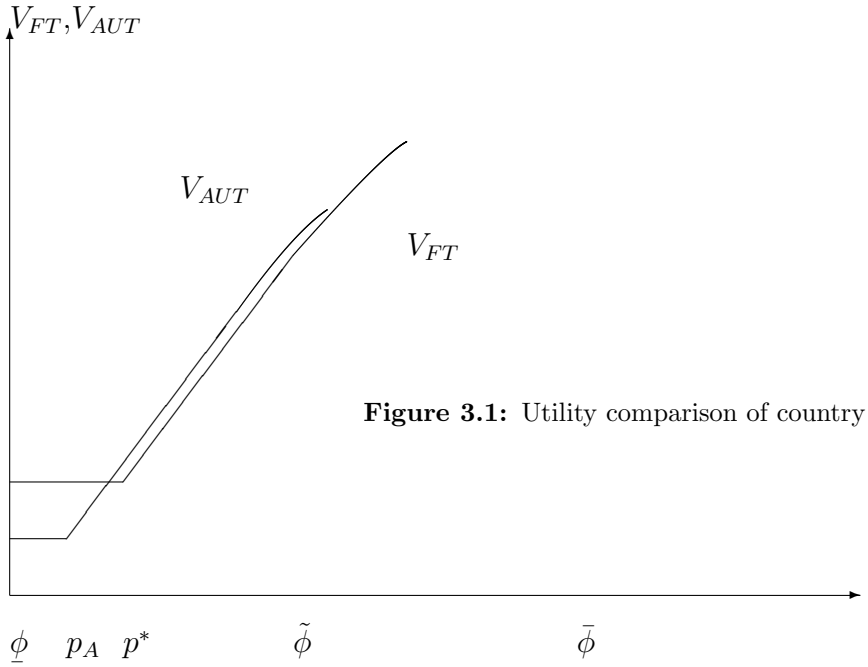


Figure 3.1: Utility comparison of country A

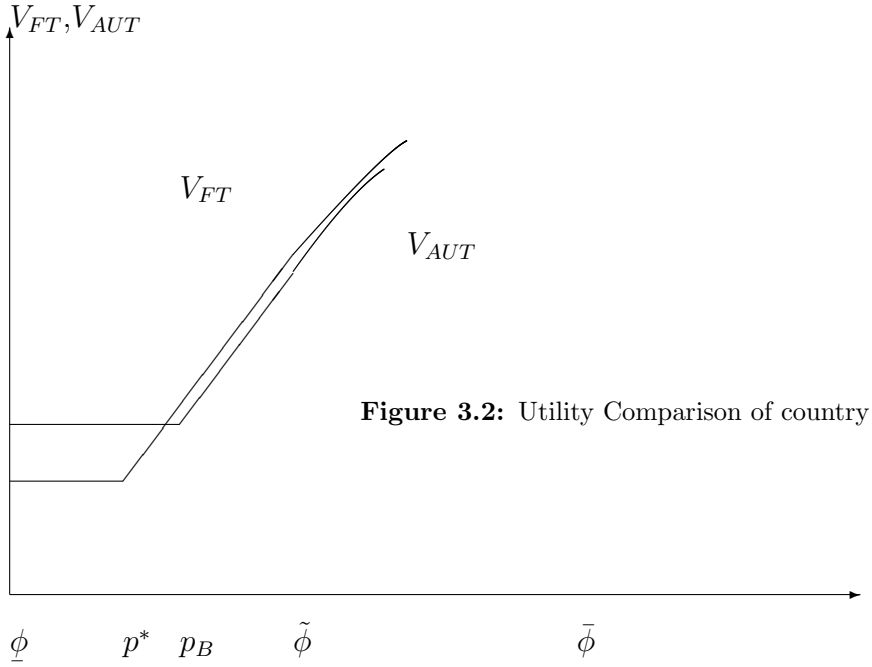


Figure 3.2: Utility Comparison of country B

3.4 When will there be Trade?

In a two country framework trade can take place when both the countries agree to open up. It is seen that in both the countries some people will gain from trade while some will lose. In a voting framework, a country will go for liberalization if the number of people gaining from free trade is greater than the number of people losing. We assume that each individual has a single vote. They will vote for the policy if their utility increases otherwise they will vote against the the policy. Whether or not the country will open up will depend on majority voting. If majority votes against free trade, the country would choose not to open up and vice versa. The number of people which vote for the policy in country A is given by

$$\int_{\underline{\phi}_A}^{\tilde{\tilde{\phi}}_A} \frac{d\phi_A}{\bar{\phi}_A - \underline{\phi}_A}$$

The number of people voting against the policy in country A is given by

$$\int_{\tilde{\tilde{\phi}}_A}^{\bar{\phi}_A} \frac{d\phi_A}{\bar{\phi}_A - \underline{\phi}_A}$$

The country will opt for trade when the first expression is greater than the second one. In other words, country A will go for free trade when $2\tilde{\tilde{\phi}}_A > \bar{\phi}_A + \underline{\phi}_A$. We have seen from equation 3.7 that $p^* = \frac{1}{2}(p_A + p_B)$ and $\tilde{\tilde{\phi}}_A = p_A^{1-a} p^{*a}$. So $p^* > \tilde{\tilde{\phi}}_A > p_A$. Since $\tilde{\tilde{\phi}}_A > p_A$ it is sufficient to show that $2p_A > \bar{\phi}_A + \underline{\phi}_A$ for desirability of trade. Therefore, we can conclude that if

the autarkic price is greater than the average productivity in the industrial sector, the country will open up for trade.

The number of people who vote against the policy in country B is given by

$$\int_{\underline{\phi}_B}^{\tilde{\tilde{\phi}}_B} \frac{d\phi_B}{\bar{\phi}_B - \underline{\phi}_B}$$

The number of people voting for the policy in country B is given by

$$\int_{\tilde{\tilde{\phi}}_B}^{\bar{\phi}_B} \frac{d\phi_B}{\bar{\phi}_B - \underline{\phi}_B}$$

The country will opt for trade when the first expression is less than the second one. In other words, country B will go for free trade when $2\tilde{\tilde{\phi}}_B < \bar{\phi}_B + \underline{\phi}_B$. We know from equation 3.7 that $p^* = \frac{1}{2}(p_A + p_B)$ and $\tilde{\tilde{\phi}}_B = p_B^a p^{*1-a}$. So $p^* < \tilde{\tilde{\phi}}_B < p_B$. Since $\tilde{\tilde{\phi}}_B < p_B$ it is sufficient to show that $2p_B < \bar{\phi}_B + \underline{\phi}_B$ for trade to be desirable. Therefore, we can conclude that if the autarkic price is less than the average productivity in the industrial sector, the country will open up for trade.

On the basis of the discussion above, we make the following proposition.

Proposition 3.4.1. *If the autarkic agricultural price is greater (less) than the average productivity in the industrial sector a country with comparative advantage in agriculture (industry) will open up for trade.*

It is evident that countries need not have any incentive to open up for trade, when the question of food security arises and when all the population is not homogeneous. Since we are in a two-country framework, if one

country prefers to remain in autarky, the other country automatically has to remain in autarky.

3.5 Conclusion

We build a very simple model to see the effect of trade in different countries. In a two country framework with heterogeneous agents we see that poverty, measured in terms of food security, increases in the country with comparative advantage in agriculture, while inequality increases in the country with comparative advantage in industry with the opening up of trade. In a two country framework, if at least one country does not open up, there will be no trade. We even see that both the countries may choose not to participate in trade as it might hurt the majority. This chapter is an attempt to explain lack of free trade in agriculture world wide, without resorting to the literature of lobbying.

Chapter 4

FDI in Retail: A Theoretical Analysis

4.1 Introduction

With the vast changes in the agricultural and food retailing chains over the past quarter century in the low and middle income group countries, foreign direct investment (FDI) in retail has become a controversial issue in many parts of the world. In most of these countries, either the wholesale markets or the retail markets or both were under strict state supervision, which got relaxed with the economic liberalizations that took place*. Along with this came the surge of globalization and the influx of FDI in various sectors. The introduction of FDI to the retail sector and the wholesale market became

*See Swinnen (2007) for an overview

a matter of critical consideration in many countries like India. The retail and wholesale trade in India is the single largest component of the service sector in terms of contribution to GDP at 14%. With a large percentage of the population being dependent on this for their livelihood, whether or not to allow FDI has always remained a question in the democratic setup of India.

Before we get into the arguments favouring or disapproving of FDI in retail, let us first talk about the agricultural sectors of developing countries in general. The agricultural sectors in the developing countries are generally poor and backward. A salient feature is the presence of middlemen in multiple stages, which causes a wide gap between the price the farmer gets and the price that a final consumer pays. The farmers are small with no market power and are often isolated. They seldom have access to the formal credit markets. On the other hand, the middlemen and the rural moneylenders have market power. The consumers are also fragile and they end up paying a higher price due to market imperfection and presence of middlemen in many stages. The farmers and traders are often too small to have an access to the international market and hence are unable to enjoy the gains from trade. So the reforms in the agricultural sector should help to remove these adversities and not to make the situations of the small farmers and consumers worse.

The proponents of FDI in retail place strong arguments favouring the

introduction of FDI to the retail sector. The agricultural sector will get the much needed exposure to the international market. There will be vertical integration of the supply chain. The exploitative middlemen will be largely bypassed. Direct purchasing from the farmers will ensure that they get better price and there will be more incentive for agricultural investment. Large retail groups will invest in better storage which will reduce wastage as they already have the infrastructure and the know-how, reducing the traditional warehousing role of the wholesalers. Post liberalization, there has been a change in taste and preference of the urban consumers of the developing countries, and there has been a convergence of taste and preference all over the world. The introduction of FDI will cater to their needs better by ensuring better quality, wider variety of international standard and all these at a lower price.

However, there are some possible drawbacks, too. A large number of small traders may lose their livelihood to the uneven competition with the MNCs. For example, in India, given that retail and wholesale trade is the single largest component of the services sector in terms contribution to GDP at 14%, and that the unorganized retail sector of small and medium retailers employs over 40 million people, by sheer number this will not be insignificant. MNCs can increase price after eliminating competition. Foreign Retailers have pointed out that setting up of manufacturing base in India is difficult since the infrastructure is poor, labor laws are unfriendly,

etc. This would mean that the MNCs are not interested in buying from the domestic farmers as much as they are interested in selling to the domestic urban consumers. If the MNCs buy from the domestic farmers, the village market price will go up, increasing rural poverty. Agricultural price may become more uncertain due to higher integration with the world market reducing the incentive for agricultural investment.

The literature on the experience of FDI in retail sector sends a highly ambiguous message, although there is a general observation that asset-poor farmers have been losers (see Killick (2001), Reardon and Berdegu (2007)). Studies on the dairy production of the East European countries show contradictory results on whether the small farmers are benefitted. While Swinnen et al. (2006) show that small household dairy farms gain from FDI, while Gorton and Guba (2002) show that FDI instituted more formal contracting agreements, promoting the growth of a select number of medium-sized dairy farms and excluding micro-producers. Growth of supermarkets and fast-food sectors since 1990's in Argentina has resulted in changing pattern of production in favour of medium and large producers, with evidence of exclusion of small farmers (see Ghezan et. al. (2002)). Sarma (2005) emphasizes on the need for considering the constraints that would be faced by the retailers in the supply chain.

In this chapter we propose a theoretical model to see some of the possible effects of allowing FDI to the retail and wholesale markets. We consider

only the agricultural sector, as agro products constitute the maximum of the retail sector. We start with a basic model with an oligopolistic wholesale market, where the wholesalers buy from the farmers and sell to the retailers in the wholesale market. The retailers in turn sell it to the urban consumers. The farmers, retailers, urban and rural consumers are price takers, while the oligopolistic wholesalers are price-makers. Section 4.2 in the chapter tries to capture the effect of introducing FDI in this framework.

Often, supermarkets and hypermarkets sell products at significantly higher prices than the wet markets. These modern retailers offer a different quality, which is often perceived as a better quality by the consumers, at a higher price, targetting mainly the middle to upper income group (See Schipmann and Qaim (2011)). The consumers vertically differentiate between the local goods and those they get through the MNCs. In section 4.3, we focus on the consumers of the agricultural goods, both urban and rural. With the introduction of FDI in the urban retail sector, the urban consumers now perceive to be able to choose from two vertically differentiated products, viz., that coming from the domestic wholesalers sold in the open market and that coming through the malls and supermarkets. We introduce a Gabszewicz-Thisse type utility function to capture this phenomenon (see Gabszewicz and Thisse (1979)). In the urban sector each consumer consumes exactly one unit of either the low-quality or the high-quality good (and never both) depending on her income and price. The

urban poor are the ones whose income falls below the price of the good. They barely get a reservation utility (through, say, government subsidies) normalized to 0. In the village market, the rural consumers face only one type of product, of which they consume exactly one unit. Th rural poor is defined as the one whose income falls below the village market price. The rural poor also receives a reservation utility, normalized to 0. Using this framework, we look at the effect of FDI on urban and rural consumers and urban and rural poverty. We abstract from the oligopolistic wholesale market, and introduce a monopolistic wholesaler to simplify the model, although introduction of oligopoly does not affect the main results of the model.

The agricultural sectors in the less developed economies are often plagued by interlinkages among land, labor, credit and product market. It has been seen that in developing countries often the moneylenders are the intermediaries in the product markets. The relatively rich farmers or landowners in the village usually have a better access to loans, which they lend to the smaller farmers at a rate of interest that is different from the interest rate these farmers face. Often these farmers are poor enough not to be able to reach the wholesale market on their own. The richer farmers cum moneylenders then offer a price different from the prevailing market, and act as a product market intermediary. The rich farmers may be able to successfully lend the smaller farmers the amount of money they need for

the production and buy their output at a price lower than the market price. The contract is devised such that the small farmers' participation constraint is barely satisfied and the moneylenders cum traders maximize their profits. MNCs can exploit the farmers through contract farming.They can act as the moneylender cum intermediaries, as they can have access to the international credit market and the international retail market. Although, it may have some positive impacts on the farmers as commercialization of backward agricultural sector is often done through contract farming (see Glover (1994)). This positive impact comes from a lower opportunity cost of the MNCs.

In section 4.4, we consider the interlinkage between credit market and the product market. We try to analyze the impact of FDI in the retail sector in the presence of such interlinkage. When an MNC comes in to the wholesale and the retail sector, it can act as a moneylender cum trader who lends money to the farmers when the crop is sowed and buys the product from the farmers to sell it to the urban retail market. Basically, the MNC offers a contract, where he charges an interest rate different from the market rate of interest and offers a product price different from prevailing market rate. We assume, as has been assumed in Gangopyadhyay and Sengupta (1987), that there is credit market imperfection, i.e., in order to obtain credit from outside the producer has to pay a higher rate of interest, which in turn renders the product market inaccessible. In such a scenario if FDI

in the retail sector is allowed, we try to analyze the optimal contracts to be offered by the MNC with FDI and the local monopolist. For the sake of simplicity we assume that the local monopolist cannot offer a contract[†]. We compare between the case where the MNC does not offer contract and the case when MNC does offer contract. The MNC would offer a parallel contract because of the existing interlinkage that is being already exploited by the monopolist moneylender cum trader in the village market. The farmers will be given exclusive contracts by the MNC. We consider only the benchmark case of complete information. We then try to compare between the two cases, when MNC can offer contract and when he cannot.

Section 4.5 concludes the chapter.

4.2 A Basic Model with FDI in Retail

We construct a simple model with an oligopolistic wholesaling market. The economy consists of farmers, wholesalers, retailers, rural and urban consumers. The farmers are price takers, who produce an agricultural good y. They produce a fixed amount of the good and sell their produce in the village market. In this market the buyers are the village consumers and the wholesalers. The wholesalers in turn, sell their purchase in the wholesale market to the retailers. While the wholesaling market is oligopolistic, the

[†]Even if he could, the MNC can outcompete him because of its lower opportunity cost of funds.

retailers are price-takers. The retailers, in their turn, sell the product to the urban consumers in the retail market. This setup is schematically described in diagram 4.1 . First we look at the equilibrium without FDI and next we allow this setup to be open to FDI.

4.2.1 Equilibrium without FDI

Before the economy is thrown open to FDI, the structure of the economy is as follows. In the village market, the farmers are price takers and supply a fixed amount $\bar{y}$. The village consumers and the wholesalers purchase the output from this market. The wholesalers are oligopolistic. They play a Cournot game and sell it to the retailers. Finally, the retailers sell it to the urban consumers. For the sake of simplicity we assume linear demand functions for both the urban and the rural markets. The demand function of the urban consumers in the retail market is given by

$$p_u = A - Q_u$$

where p_u is the price prevailing in the retail market and Q_u is the quantity. A is a positive constant.

In the wholesale market, the competitive retailers buy from the oligopolistic wholesalers at price p_w per unit of y. The retailers have a retailing cost per unit of output c. To keep things simple, we assume this retailing cost c is the same for all the retailers, i.e., the retailers are all identical. The

Figure 4.1: Basic Framework

Figure 1a: Before MNC comes in

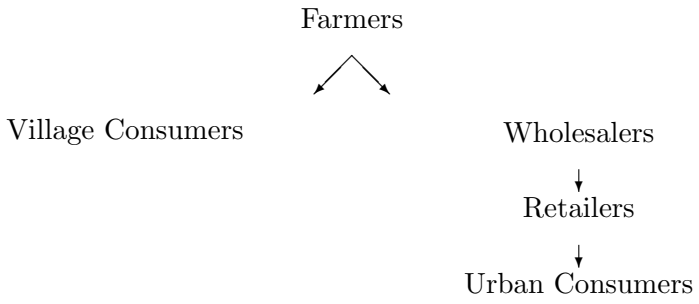
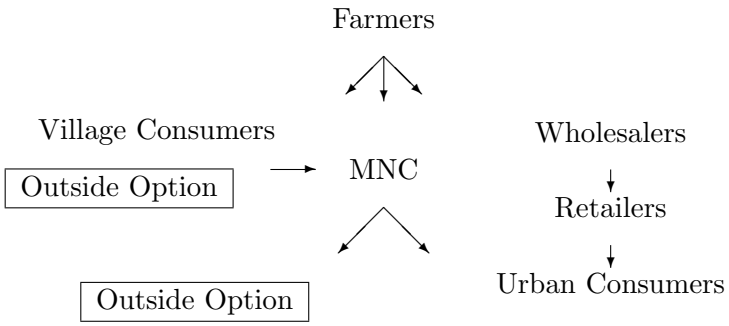


Figure 1b: Before MNC comes in



retailers will equate the price p_u with the marginal cost $c + p_w$. Therefore, the profit maximizing equilibrium for a representative retailer is

$$p_u = p_w + c$$

Rewriting the urban demand function,

$$Q_u = A - p_w - c$$

There are n identical oligopolistic wholesalers in the wholesale market. The i^{th} oligopolistic trader maximizes his profit given the retailers' optimized output and price. The wholesale market clears at all points of time. Hence the oligopolists together buy Q_u amount of the good from the village market. The i^{th} oligopolist buys q_i amount of the commodity with $\sum q_i = Q_u$. The oligopolists play a Cournot game. The i^{th} oligopolist's profit function is given by

$$\pi_i = (p_w - p_v)q_i$$

where, p_v is the price at which the oligopolist buys from the village market. The village demand function is given by

$$p_v = B - Q_v$$

where $Q_v = \bar{y} - Q_u$. Without MNCs buying from or selling to the domestic markets, the total output will be bought by the village consumers and the wholesalers.

Rewriting the i^{th} wholesaler's profit function, we get

$$\pi_i = (A - B - c - \bar{y} - 2Q_u)q_i \tag{4.1}$$

The first order condition for profit maximization will be given by

$$\frac{\partial \pi_i}{\partial q_i} = A - B - C + \bar{y} - 2Q_u - 2q_i = 0 \tag{4.2}$$

Summing both sides for all n wholesalers, we get

$$n(A - B - C + \bar{y}) = 2nQ_u + 2Q_u$$

since, $\sum q_i = Q_u$

Solving, we get the solution to this model. The retail market output will be given by

$$Q_u = \frac{n}{2(n+1)}(A - B - C + \bar{y}) \tag{4.3}$$

Each wholesaler will sell

$$q_i = \frac{1}{2(n+1)}(A - B - C + \bar{y}) \tag{4.4}$$

The urban retail market price will be

$$p_u = \frac{n+2}{2(n+1)}A + \frac{n}{2(n+1)}(B + c + \bar{y}) \tag{4.5}$$

The village market price will be given by

$$p_v = \frac{n+2}{2(n+1)}(B - \bar{y}) + \frac{n}{2(n+1)}(A - c) \tag{4.6}$$

4.2.2 Equilibrium with FDI

Let us now assume that both the rural and urban markets are thrown open to foreign competition. MNCs with market power are allowed to buy the commodity from the farmers and sell in the domestic market. However, MNCs have the flexibility to buy the commodity from the international market and sell it in the domestic market or buy it from the domestic farmers and sell it to the international retail market. In the subsequent paragraphs we will see how the model works both in absence of and in presence of MNC. Suppose, to start with, only one MNC enters both the markets. The MNC can buy from the farmers if the price is lower than the international wholesale market. Indeed, the MNC will buy from the domestic farmers till the marginal cost of buying is equal to the international wholesale price p_w^*. MNC can sell in the domestic urban retail market and will do so if the price in the international retail market is less than the marginal revenue in the domesic market. MNC will sell in the domestic retail market till the marginal revenue from the domestic retail market is equated to the international retail price p_u^*. We define Q_M as MNC's purchase from the domestic market and Q_R as MNC's sale to the domestic market. Revised village market demand is given by:

$$p_v = B - \bar{y} + Q_u + Q_M$$

Revised urban market demand is given by:

$$p_u = A - Q_u - Q_R$$

The total cost incurred by the MNC when he buys from the domestic farmers is given by $p_v Q_M$.

The MNC will consider equating the marginal cost with p_w^*.

$$\frac{\partial p_v Q_M}{\partial Q_M} = B - \bar{y} + Q_u + 2Q_M = p_w^*$$

From that we get the optimal Q_M given Q_u. This optimal Q_M is given by

$$Q_M = \frac{1}{2}(p_w^* - B + \bar{y} - Q_u) \tag{4.7}$$

Similarly, the total revenue earned by the MNC when he sells to the domestic retail market is given by $p_u Q_R$. The MNC will equate the marginal revenue with p_u^*.

$$\frac{\partial p_u Q_R}{\partial Q_R} = A - Q_u - 2Q_R = p_u^*$$

From that we get the optimal Q_R given Q_u as

$$Q_R = \frac{1}{2}(A - Q_u - p_u^*) \tag{4.8}$$

Define $p_u^* - p_w^* \equiv c^*$. c^* can be interpreted as the retailing cost of the MNC. Given Q_R and Q_M, the i^{th} oligopolist maximizes profit Π, which is given by

$$\Pi_i = (A - Q_R - Q_u - c - B + \bar{y} - Q_u - Q_M)q_i \tag{4.9}$$

Solving the maximization problem using (4.7) and (4.8) we get the total retail market output as

$$Q_u = \frac{n}{2(n+1)}\left(A - B - c + \bar{y} - (c - c^*)\right) \tag{4.10}$$

and each wholesaler will sell

$$q_i = \frac{1}{2(n+1)}\left(A - B - c + \bar{y} - (c - c^*)\right) \tag{4.11}$$

The urban market price will be given by

$$p_u = \frac{1}{2}p_u^* + \left(\frac{n+2}{4(n+1)}A + \frac{n}{4(n+1)}(B + c - \bar{y})\right) - \frac{n}{4(n+1)}(c^* - c) \tag{4.12}$$

The rural market price will be

$$p_v = \frac{1}{2}\left(p_w^* + \frac{n+2}{2(n+1)}(B - \bar{y}) + \frac{n}{2(n+1)}(A - c)\right) + \frac{n}{4(n+1)}(c^* - c) \tag{4.13}$$

Proposition 4.2.1. *Domestic retailing activities go down after the entry of the multinationals iff* $c > c^*$.

Let us denote the values of the variables before the MNC comes in with "tilde" and the the variables after the MNC comes in with"hat".

If we compare (4.3) and (4.10), we see that

$$\tilde{Q_u} - \hat{Q_u} = \frac{n}{2(n+1)}(c - c^*) \tag{4.14}$$

We clearly see that the domestic retail sector shrinks with the advent of the MNC, if the retailing cost of the domestic retailers is high.

Proposition 4.2.2. *The urban consumers will gain if $c < c^*$.*

Comparing (4.5) and (4.12),

$$\hat{p_u} = \frac{1}{2}\tilde{p_u} + \frac{1}{2}p_u^* - \frac{n}{4(n+1)}(c^* - c) \tag{4.15}$$

We see that after MNC comes in, the retail market price is the sum of a fraction of the cost difference; and the average of the international retail market price and the domestic retail market price before MNC came in. If the MNC sells in the domestic retail market, presumably p_u^* is less than the domestic retail market price before MNC came in. Therefore, clearly, the retail market price will go down if $c < c^*$, which would mean that the urban consumers would gain.

Proposition 4.2.3. *The rural consumers will lose and farmers will gain if $c < c^*$.*

Comparing (4.6) and (4.13),

$$\hat{p_v} = \frac{1}{2}\tilde{p_v} + \frac{1}{2}p_v^* + \frac{n}{4(n+1)}(c^* - c) \tag{4.16}$$

We see that after MNC comes in, the village market price is the sum of a fraction of the cost difference; and the average of the international wholesale market price and the village market price before MNC showed up. If the MNC buys from the domestic market, then presumably, p_w^* is greater than the domestic village market price. In this case, the village market price

will go up if $c < c^*$. The farmers will receive a higher price and the rural consumers will have to pay a higher price for food.

If the retailing cost of the MNC is less than the retailing cost of the domestic retailers then the domestic retailers will lose out to the MNC on account of higher cost of retailing. If the retailing cost of the MNC is higher than that of the domestic retailers then the MNC would be more interested in buying from the domestic village market than in selling in the domestic retail market. That would increase the village market price, hurting the village consumers and benefitting the farmers. On the other hand, even with $c < c^*$, there would be some trading activity of the MNC in the domestic retail market, that would increase the competitiveness in the domestic retail market, which would bring the price down. Hence the urban consumers would gain.

4.2.3 Equilibrium with more than one FDI

In the previous subsection, only one MNC was allowed to play. In this subsection, we see the equilibrium with more than one MNC playing in both the village market and the urban market. Let us assume m MNCs are allowed to buy good y in the village market from the farmers and sell in the urban retail market. All the MNCs are assumed to be identical. In the village market, each MNC will but q_m amount of the good and in the retail market, each MNC will sell q_r amount of the good. Q_M and Q_R are the

total transaction made by the MNCs in the domestic village market and the domestic retail market respectively. In that case, $Q_M = \sum q_m = mq_m$, and $Q_R = \sum q_r = mq_r$. Each MNC in the village market will buy the good till their marginal costs are equated to p_w^*. The total cost of buying from the domestic village market for a representative MNC is:

$$p_v q_m = (B - \bar{y} + Q_M + Q_u)q_m$$

where Q_u is the quantity purchased by the domestic wholesalers as before. The marginal cost will now be given by

$$\frac{\partial p_v q_m}{\partial q_m} = B - \bar{y} + Q_M + Q_u - q_m = p_w^*$$

Solving, we find the total output bought by the MNCs given Q_u from the village market to be

$$Q_M = \frac{m}{m+1}(p_w^* - B + \bar{y} - Q_u)$$

and the output bought by a single MNC is

$$q_m = \frac{1}{m+1}(p_w^* - B + \bar{y} - Q_u)$$

Similarly, the total revenue earned by a representative MNC when he sells to the domestic retail market is given by $p_u q_r$.

$$p_u q_r = (A - Q_u - Q_R)q_r$$

The MNC will equate the marginal revenue with p_u^*.

$$\frac{\partial p_u q_R}{\partial q_R} = A - Q_u - Q_R - q_r = p_u^*$$

Solving, we find the total output sold by the MNCs given Q_u from the village market to be

$$Q_R = \frac{m}{m+1}(A - Q_u - p_u^*)$$

and the output sold by a single MNC is

$$q_r = \frac{1}{m+1}(A - Q_u - p_u^*)$$

The profit of a representative wholesaler is given by

$$\pi_i = (A - Q_R - Q_u - c - B + \bar{y} - Q_u - Q_M)q_i$$

Substituting for Q_u and Q_M we get

$$\pi_i = \left(\frac{1}{m+1}(A - B - c + \bar{y}) - \frac{2}{m+1}Q_u - \frac{m}{m+1}(c - c^*)\right) q_i \quad (4.17)$$

The representative wholesaler maximises (4.17) with respect to q_i. Solving this we get the total output for the retail market as

$$Q_u = \frac{n}{2(n+1)}(A - B - c + \bar{y}) - \frac{mn}{2(n+1)}(c - c^*) \quad (4.18)$$

And, for a representative wholesaler, the solution will be

$$q_u = \frac{1}{2(n+1)}(A - B - c + \bar{y}) - \frac{m}{2(n+1)}(c - c^*) \quad (4.19)$$

Th retail market price will be given by

$$p_u = \frac{1}{2}p_u^* + \frac{n+2}{4(n+1)}A + \frac{n}{4(n+1)}(B + c - \bar{y}) - \frac{mn}{4(n+1)}(c^* - c) \quad (4.20)$$

The village market price will be given by

$$p_v = \frac{1}{2}\left(p_w^* + \frac{n+2}{2(n+1)}(B - \bar{y}) + \frac{n}{2(n+1)}(A - c)\right) + \frac{nm}{4(n+1)}(c^* - c) \quad (4.21)$$

Proposition 4.2.4. *If more than one MNC is allowed, the domestic retailing activities will go down as compared with the case when only one MNC is allowed iff* $c > c^*$.

Let us denote the values of the variables when more than one MNC is allowed by "bar". If we compare (4.10) and (4.18), we would see that the cost difference is magnified m times, while the other terms are unchanged.

$$\bar{Q_u} - \hat{Q_u} = -(m-1)\frac{n}{4(n+1)}(c - c^*) \tag{4.22}$$

Corollary 4.2.1. *If more than one MNC is allowed, the domestic retailing activities will go down as compared with the case when no MNC is allowed iff* $c > c^*$

If we compare (4.3) and (4.18), we see that

$$\bar{Q_u} - \tilde{Q_u} = -\frac{mn}{4(n+1)}(c - c^*) \tag{4.23}$$

And hence the result.

Proposition 4.2.5. *(i)* $\bar{p_u} > \hat{p_u}$ *iff* $c^* < c$, *and,*

(ii) $\bar{p_v} > \hat{p_v}$ *iff* $c < c^*$

From (4.12) and (4.20), we see that

$$\bar{p_u} - \hat{p_u} = -(m-1)\frac{n}{4(n+1)}(c^* - c)$$

Therefore, the urban retail market price will go up when $c > c^*$ with more FDI coming in. If the retailing cost of the domestic wholesalers is higher

than that of the MNCs, then as FDI comes in, the retailers get crowded out. So even with an increased competition among the MNCs, the retail sector will witness an increase in price. However, if the domestic retailers have a smaller retailing cost, then the domestic retailing sector will increase as more FDI comes in and the urban retail market price will fall. From (4.13) and (4.21), we see that

$$\bar{p_v} - \hat{p_v} = -(m-1)\frac{n}{4(n+1)}(c - c^*)$$

The village market price will go down when $c > c^*$ with more FDI coming in. If the retailing cost of the domestic retailers is higher than that of the MNCs, then as FDI comes in, the domestic retailers get crowded out. So the village market experiences an excess supply, which will lead to the price fall.

We see that the results do not vary qualitatively if one or more MNC is allowed. However, if the domestic retailing cost is higher than the MNCs' retailing cost, then more MNCs would find it profitable to enter the domestic retail market, which would reduce the domestic retailing activities further. If the domestic retailing cost is higher, then the urban consumers will face an even higher price as more MNCs enter, and will lose. If the domestic retailing cost is lower, then as more MNCs come in, the village consumers will have to pay a higher price, as now there will be more demand in the village market. Allowing competition among the MNCs need not be

good for the domestic retailing sector and the urban and rural consumers.

4.3 Introducing Preferences

Gabszewicz-Thisse Preference

As the MNC enters the domestic retail market, it comes in with its suave infrastructure, in the form of supermarkets and hypermarkets. Urban retail market consumers are now faced with two different products, one that is sold by the MNC in the supermarkets and hypermarkets giving the consumers a feel of the global consuming experience and the one sold by the retailers in the traditional local wet markets. In this section we would like to see if the urban consumers are benefited due to this product differentiation and we would also like to find out the the effect of such product differentiation on the urban and rural poor. A consumer believes to receive a higher utility if she buys the product from the MNC. This preference can be captured through Gabszewicz-Thisse type of utility function. In this section, we assume a monopolist domestic wholesaler for the sake of algebraic simplicity. We also assume only one MNC is allowed to buy from and sell in the domestic market. The two players then involve in a price competition, and this sort of utility function will rule out Bertrand competition. The utility function for the urban consumers is given by:

$$U_u = \begin{cases} (I_u - p_R)\,\beta_R & \text{if purchased from MNC} \\ (I_u - p_u)\,\beta_u & \text{if purchased from retailers} \end{cases}$$

where β_R and β_u are the utilities from the consumption of one unit of each of the two goods with $\beta_R > \beta_u$ Each individual consumes exactly one unit of either of the goods or does not buy the good at all. I_u follows a uniform distribution between $\underline{I}_u$ and $\bar{I}_u$. I_u^* is the income for which an individual is indifferent between the two goods.

$$I_u^* = \frac{p_R - p_u\beta}{1-\beta}$$

For $I_u > I_u^*$ a consumer will choose MNC product, else will choose retailers' product provided $p_u < I_u$. If $p_u > I_u$, then the consumer gets a fixed utility R which is normalized to 0, and she is called poor.

The rural utility function is given by:

$$U_v = (I_v - p_v)\,\beta_v$$

where β_v is the utility from the consumption of one unit of the good. Each individual consumes exactly one unit of the good provided $p_v < I_v$. I_v follows a uniform distribution between $\underline{I}_v$ and $\bar{I}_v$. Village consumers have no choice. If $p_v > I_v$, then the consumer gets a fixed utility V which is normalized to 0, and she is called poor. Farmers produce a fixed output $\bar{y}$. As before, we consider the two scenarios, with and without MNC. I_v follows a uniform distribution between $\underline{I}_v$ and $\bar{I}_v$. Village consumers have

no choice. If , then the consumer gets a fixed utility which is normalized to , and she is called poor. Farmers produce a fixed output . As before, we consider the two scenarios, with and without MNC.

4.3.1 Equilibrium without MNC

The total supply will go to the village market and the domestic retail market. Therefore,

$$\bar{y} = Q_u + Q_v$$

The village consumers' demand is given by

$$Q_v = \bar{I_V} - p_v$$

The domestic retail market demand is given by

$$Q_u = \bar{I_u} - p_u$$

The monopolist wholesaler will buy from the village market at a price p_v and sell it to the wholesale market to the price taking retailers at a price p_w, who will finally sell it in the urban market at a price p_u, where $p_u = p_w + c$ as before, c being the retailing cost. The monopolist wholesaler will maximize the profit by choosing the optimal price

$$\pi = (p_w - p_v)Q_u \tag{4.24}$$

Rewriting (4.24),

$$\pi = (2p_u - c - \bar{I_u} - \bar{I_v} + \bar{y})(\bar{I_u} - p_u)$$

From the first order condition, we solve for p_u.

$$p_u = \frac{1}{4}(c + \bar{I_v} + 3\bar{I_u} - \bar{y}) \tag{4.25}$$

4.3.2 Equilibrium with MNC

The total supply will now be the sum of the MNC's demand, the domestic retailers' demand and the village consumers' demand.

$$\bar{y} = Q_M + Q_u + Q_v$$

Retail market demand for the product sold by the MNC and by the domestic retailers are as follows:

$$\begin{aligned} Q_R = &\quad (I_u - p_R)\beta_R \qquad \text{MNC product} \\ Q_u = &\quad (I_u - p_u)\beta_u \quad \text{Retailers' product} \end{aligned}$$

Village demand:

$$Q_v = \bar{I_v} - p_v$$

As before, the total cost incurred by the MNC when he buys from the domestic farmers is given by $p_v Q_M$. The MNC will consider equating the marginal cost with p_w^*. From that we get the optimal Q_M given Q_u.

$$Q_M = \frac{1}{2}(p_w^* - \bar{I_v} + \bar{y} - Q_u) \tag{4.26}$$

As we have seen earlier, the total revenue earned by the MNC when he sells to the domestic retail market is given by $p_u Q_R$. The MNC will equate the marginal revenue with p_u^*. From that we get the optimal Q_R given Q_u.

$$Q_R = \frac{1}{2}(\bar{I_u} + \frac{p_u \beta}{1-\beta} - p_u^*) \tag{4.27}$$

Given Q_R and Q_M, the monopolist maximizes profit Π w.r.t p_u

$$\Pi = (p_u - c - p_v)Q_u \tag{4.28}$$

Using (4.26) and (4.27) and maximizing (4.28) w.r.t. p_u, we get

$$\begin{aligned} p_u = & \frac{1-\beta}{6-5\beta}(2c + p_w^* + \bar{I_v} - \bar{y}) \\ & + \frac{4-3\beta}{(6-5\beta)(2-\beta)}\left(\bar{I_u}(1-\beta) + p_u^*\right) \end{aligned} \tag{4.29}$$

From (4.29), we see that as β increases p_u falls. That is,

$$\frac{\partial p_u}{\partial \beta} < 0$$

We also see that if the consumers perceive the two products to be very similar and the difference of utility is very small, then the price of the domestic retailers would converge to the international price.

$$\lim_{\beta \to 1} p_u = p_u^*$$

If the perceived difference is very high, then we see that

$$\lim_{\beta \to 0} p_u = \frac{1}{6}(+p_w^* + \bar{I_v} - \bar{y}) + \frac{1}{3}\left(\bar{I_u} + p_u^* + c\right)$$

Figure 4.2: Diagrammatic Representation

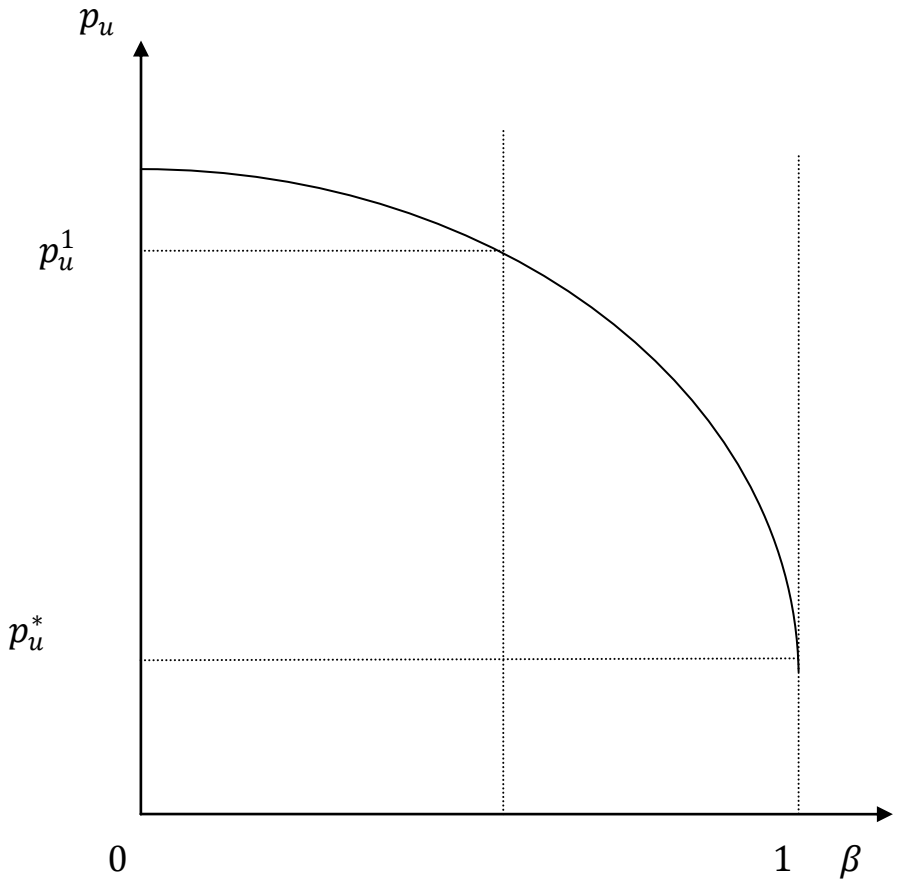


Figure 4.2 is a diagrammatic exposition of the above observations.

Let us denote the price before MNC came in as p_u^0 and the price after MNC came in as p_u^1. $p_u^0 = \frac{1}{4}(\bar{I}_v + 3\bar{I}_u + c - \bar{y})$. The highest possible domestic retail price after MNC comes in is p_u^{max}

$$p_u^0 - p_u^{max} = \frac{1}{3}p_u^0 + \frac{1}{6}(\bar{I}_u - c - p_w^* - 2p_u^*)$$

If $p_u^0 > p_u^{max}$ then the entry of the MNC would lead to a reduction of the price faced by the low-end urban retail consumers. However, if $p_u^0 < p_u^{max}$, and β is sufficiently low, then the low-end urban consumers might end up paying a higher price for the goods sold by the retailers, which will increase the number of urban poor. We further see that $\frac{\partial p_R}{\partial p_u} > 0$ and $\frac{\partial p_v}{\partial p_u} < 0$. So if the the price of the goods sold by the retailers go down the price of the high end good will also go down but the village price will go up.

Proposition 4.3.1. *If the retail market price before the MNC comes in is greater than the maximum price after allowing for MNC, then allowing MNC will reduce the price faced by the low-end urban consumers. However, the rural price will go up, raising the number of rural poor.*

When the domestic retail market price is sufficiently high, allowing MNCs would increase the competition in the retail market and hence reduce the price, as consumers can now choose between the two products. However, as MNCs come in, the demand in the village market goes up, increasing the village market price. Therefore, even though the urban lower-

end consumers benefit and the number of urban poor decreases, there will be an increase in the village poverty level as villagers now pay a higher price.

Proposition 4.3.2. *If the retail market price before the MNC comes in is less than the maximum price after allowing for MNC and β is sufficiently high (low), then the low-end urban consumers might pay a lower (higher) price and urban poor will decrease (increase) in number. However, the rural price will go up (down), increasing (decreasing) the number of rural poor.*

If the domestic retail market price is low enough, and there is a high perceived difference between the two vertically differentiated products, the urban low-end consumers will pay a lower price. This is because the demand for the "better" good will increase, reducing the demand for the good sold by the domestic retailers. However, if the perceived difference is low, then the low-end consumers might end up paying more than before.

A decrease in the urban price would lead to more demand for the product in the rural market. This would increase the village market price, hurting the village consumers and increasing the number of village poor. On the other hand, an increase in the urban price would reduce the demand of the product in the rural market, reducing its price. The village consumers will be better off and the village poverty will go down.

4.4 Contract Farming

It is often the case that a well functioning rural credit market is absent in the agricultural sector of a developing country. Farmers face an interest rate which is higher than the market. The formal credit market would require a collateral which, the small and the marginal farmers do not have. Also, getting credit from the formal sector is a long and laborious process, making the formal credit market virtually absent from the village market. The small and marginal farmers can effectively take loans from the rural informal money lenders, to run the production. A stylized fact is that with globalization, large corporate houses are offering contracts to the primary producers and farmers for the supply. With contract farming, the small and marginal farmers can avail any amount of loan necessary for running the production. However, the farmers are required to sell their output to the large corporate houses at a price given by them. Hence, we modify our basic model to see the effect of contract farming. We introduce production in to the model. In order to produce the agricultural good, each farmer needs to take a loan of amount L. Farmers are differentiated by the rate of interest they have to pay. A typical farmer is denoted by a parameter θ, where θ is distributed according to the distribution function $F(\theta)$ with support $[\underline{\theta}, \bar{\theta}]$. Farmer faces an interest rate $r(\theta)$. The rural credit market is highly fragmented and the interest rate is often determined by the

personal relation between the lender and the borrower. Basu (1983) and Bhaduri (1977) suggest that the rural markets are essentially isolated, and hence farmers may face different rates of interest. This also explains why there is no arbitrage between the farmers facing different interest rates. It might also be the case that a farmer gets a fraction of his loan requirement from a rural money lender which charges a higher interest and the remaining from a bank. The bank might require that a fraction of the loan requirement must be arranged by the farmer (from perhaps a rural money lender) and this fraction might depend on the collateral the farmer can provide. If collaterals vary across farmers, effective rates of interest would also vary. Following the standard literature on rural credit, we say that the production function is essentially a function of the loan amount. The cost the farmer incurs is the interest payment. A representative farmer of type θ will maximize his income Y_f. The farmer's production function in terms of the loan is given by $f(L)$, where L is the loan amount, $f(L)$ is a standard neo-classical production function which is twice differentiable, with $f_L > 0$ and $f_{LL} < 0$. The farmer is a price taker in the village market and receives the price p_v for each unit that he produces. His income is given by the following equation.

$$Y_f = p_v f(L) - (1 + r(\theta))L \tag{4.30}$$

The farmer chooses the optimal L^* by maximising (4.30). The first order condition is

$$f'(L) = \frac{1 + r(\theta)}{p_v} \tag{4.31}$$

The total output of the economy is then given by

$$S(p_v) = \int_{\underline{\theta}}^{\bar{\theta}} f(L^*(r(\theta)), p_v) d\theta$$

As p_v increases, the production level increases for each farmer, as they take more loan now and the total supply increases ($S' > 0$). The village consumers have a demand given by $D(p_v)$, which is strictly decreasing in p_v, i.e., $D' < 0$[‡]. The quantity demanded by the village consumers must equal the total supply net of what is demanded by the wholesaler. Let Q_u be the amount demanded by the wholesalers. Then,

$$D(p_v) = S(p_v) - Q_u \tag{4.32}$$

Differentiating (4.32) w.r.t. p_v, we get

$$D' = S' - \frac{\partial Q_u}{\partial p_v}$$

Rearranging, we get

$$\frac{\partial p_v}{\partial Q_u} = \frac{1}{S' - D'}$$

In this section, we assume that the wholesaler has some market power when she buys from the village market, but is a price taker in the retail market. The retail market price is given and is set to p_u. The wholesalers will then

[‡]In this section we are deviating from our earlier assumption of linear demand

maximize their profits by equating their marginal costs of buying from the farmers with the price in the urban market. The representative wholesaler's profit is given by

$$\pi_w = p_u Q_u - p_v Q_u \tag{4.33}$$

Differentiating (4.33) with respect to Q_u, we get

$$p_u - p_v + \frac{Q_u}{(S' - D')} = 0$$

Rearranging, we get:

$$Q_u = (S' - D')(p_u - p_v) \tag{4.34}$$

Clearly, the RHS of (4.34) is positive. The retail market price is greater than the village market price for an equilibrium to exist and $S' > 0$ while $D' < 0$.

4.4.1 MNC Enters but does not Offer Contract

In this framework we now allow the MNC to come in. In this model, we allow MNC only to buy from the domestic farmers and then sells the output to the international market at a given international price p^*. Suppose, the MNC buys an amount Q_M from the domestic farmers. This quantity will be determined at the point where the The MNC's marginal cost of buying is equal to the international retail price p^*. The demand function of the village consumers will now look like the following:

$$D(p_v) = S(p_v) - Q_u - Q_M \tag{4.35}$$

Differentiating (4.35) partially with respect to Q_u will give

$$D' = S' - \frac{\partial Q_u}{\partial p_v}$$

Rewriting, we get

$$\frac{\partial p_v}{\partial Q_u} = \frac{1}{S' - D'} \tag{4.36}$$

Again, differentiating (4.35) partially with respect to Q_M yields

$$D' = S' - \frac{\partial Q_M}{\partial p_v}$$

Rewriting, we get

$$\frac{\partial p_v}{\partial Q_M} = \frac{1}{S' - D'} \tag{4.37}$$

The total cost incurred by the MNC when he buys from the domestic farmers is given by $p_v Q_M$. The MNC will consider equating the marginal revenue with p^*.

$$p_v + Q_M \frac{\partial p_v}{\partial Q_M} = p^*$$

Substituting from (4.37) we get

$$Q_M = (S' - D')(p^* - p_v) \tag{4.38}$$

The wholesaler, as before, will maximize his profit.

$$\pi_w = (p_u - p_v)Q_u \tag{4.39}$$

The first order condition will be given by the following equation

$$\frac{\partial \pi_w}{\partial Q_u} = p_u - p_v - \frac{\partial p_v}{\partial Q_u} Q_u = 0 \tag{4.40}$$

Substituting from (4.36) and rewriting (4.40), we get the amount of the good purchased by the wholesalers.

$$Q_u = (p_u - p_v)(S' - D') \tag{4.41}$$

Putting (4.38) and (4.41) in (4.35) we get the village market demand.

$$D(p_v) = S(p_v) - (S' - D')(p_u + p^* - 2p_v) \tag{4.42}$$

4.4.2 MNC Offers Contract

Now, suppose the MNC can offer individual contracts to the farmers. The θ^{th} farmer faces interest rate $r(\theta)$ and the village market price p_v. The θ^{th} farmer's income before taking up the contract will be given by

$$Y_f = p_v f(L) - (1 + r(\theta))L$$

The farmer maximizes income with respect to the loan amount. A representative farmer's income maximising condition will be given by

$$f'(L) = \frac{1 + r(\theta)}{p_v}$$

Suppose, the MNC can get any amount of loan from the international market at an interest rate i. MNC can sell the output in the international market at price p^*. Now, had the MNC been producing on its own, the profit function would be

$$\pi_M = p^* f(L) - (1+i)L$$

The profit maximizing condition will be given by

$$f'(L) = \frac{1+i}{p^*}$$

The MNC has complete information about the farmers' productivity and can give them individual contracts. The farmers get a share of the MNC's profit. The MNC offers him an interest rate $\delta(\theta)i$ and a price $\eta(\theta)p^*$. After taking the contract, it will be given by

$$Y_c = \eta(\theta)p^* f(L) - \delta(\theta)(1+r(\theta))L$$

The new profit maximizing condition after taking the contract will be given by

$$f'(L) = \frac{\delta(1+i)}{\eta(p^*)}$$

A representative farmer's participation constraint is given by

$$Y_c(L^*(\delta, \eta, p^*, i)) \geq Y_f(L^*(p_v, r(\theta))) \tag{4.43}$$

where L^* denoted the optimal loan taken by the farmer. In order to maximize the production from contract, as we can see from MNC's profit maxi-

mizing condition, the MNC must set $\eta = \delta$. We assume that MNC can give each farmer a unique contract. Since the MNC will be paying a fraction of its profit to the farmers, $\delta \leq 1$. We assume, additionally, that

$$\frac{1 + r\bar{\theta}}{p_v} > \frac{1 + i}{p^*}$$

This assumption guarantees that the farmers with higher θ will opt for the contract. That farmer with the lowest θ accepting the contract will be given a contract where $\delta = 1$ and beyond that δ will be less that unity. The MNC will choose each δ such that the farmers' participation constraints are satisfied, i.e.,

$$\delta = \frac{Y_f(L^*(p_v, r(\theta)))}{Y_c(L^*(\delta, \eta, p^*, i))} \tag{4.44}$$

MNC will not offer contract to those farmers for whom $\delta > 1$. Total productivity of the farmers increase when the farmers take the contract. MNC does not buy from the open market anymore. In the open market the supply comes from the farmers who do not take the contract and the demand will be from the village consumers and the wholesalers. Let the supply from the farmers who do not take the contract be denoted by S_2. The villagers' demand $D(p_v)$ will then be given by

$$D(p_v) = S_2(p_v) - Q_u \tag{4.45}$$

Differentiating (4.45) w.r.t. p_v, we get

$$D' = S_2' - \frac{\partial Q_u}{\partial p_v}$$

Rearranging, we get

$$\frac{\partial p_v}{\partial Q_u} = \frac{1}{S_2' - D'}$$

In this model, we assume that the wholesaler has some market power when she buys from the village market, but is a price taker in the retail market. The retail market price is given and is set to p_u. The wholesalers will then maximize their profit by equating their marginal cost of buying from the farmers with the price in the urban market. The wholesaler's profit is given by

$$\pi_w = p_u Q_u - p_v Q_u \tag{4.46}$$

Differentiating (4.46) with respect to Q_u, we get

$$p_u - p_v + \frac{Q_u}{(S_2' - D')} = 0$$

Rearranging, we get:

$$Q_u = (S_2' - D')(p_u - p_v) \tag{4.47}$$

Clearly, the RHS of (4.47) is positive. The retail market price is greater than the village market price for an equilibrium to exist and $S_2' > 0$ while $D' < 0$.

Therefore, the village consumers' demand will be

$$D(p_v) = S_2(p_v) - (S_2' - D')(p_u - p_v) \tag{4.48}$$

4.4.3 Comparing the Equilibria

Here our entire focus is on how the farmers would be affected if the MNC offers contract exploiting the product market and credit market interlinkage as compared to the situation when the MNC cannot offer any contract. We compare the two equilibria to see how farmers who are entering into a contract with the MNC and farmers who are not entering into such a contract are affected by contract farming. We start from a situation where hypothetically the village market price, the only variable in our model, is the same in the two cases, that is, $\tilde{p_v} = \hat{p_v}$. Let $\tilde{p_v}$ be the equilibrium price in the market where there is no contract farming. We will denote this price as p_v henceforth. We would now like to look at the excess demand in the model with contract farming at this price. We are fixing the village price at its old equilibrium level where there was no contract farming. Then we see if there is an excess demand at this price in the new situation, that is, when there is contract farming. If there is an excess demand (supply), then the village price in the former situation will be higher (lower) than the latter. The farmers will be hurt (will gain) in that case. From (4.42), we get the demand for the village consumers in the absence of contract and from (4.48), we get the demand for the village consumers in presence of the contract. We would like to calculate ΔD, which is simply the difference

between (4.42) and (4.48).

$$\Delta D = S(p_v) - (S' - D')(p_u + p^* - 2p_v) - S_2(p_v) + (S_2' - D')(p_u - p_v) \quad (4.49)$$

We define S_1 as the supply in the no-contract regime by the farmers who would have taken the contract had the MNC been allowed to offer contract. We have seen that

$$S = \int_{\underline{\theta}}^{\bar{\theta}} f(L(r(\theta), p_v))d\theta$$

From here, using Leibniz rule,

$$S' = \int_{\underline{\theta}}^{\bar{\theta}} f_L \frac{\partial L}{\partial p_v} d\theta$$

We know that

$$S = S_1 + S_2$$

and $S' = S_1' + S_2'$. Therefore, rewriting (4.49), we see that

$$\Delta D = S_1 - S_1'(p_u - p_v) - (S' - D')(p^* - p_v)$$

Clearly, the third term is positive. Therefore, a sufficient condition for ΔD to be negative is given by

$$S_1 - S_1'(p_u - p_v) < 0$$

We define the elasticity of supply of S_1 as e_{S_1}. We know that $e_{S_1} = S_1' p_v / S_1$. Therefore, the sufficient condition can be rewritten as

$$S_1 - (S_1 e_{S_1}/p_v)(p_u - p_v) < 0$$

Simplifying, we get if

$$p_u > \left(1 + \frac{1}{e_{S_1}}\right) p_v \text{ then } \Delta D < 0 \tag{4.50}$$

Proposition 4.4.1. *If* $p_u > p_v(1 + \frac{1}{e_{S_1}})$,

(i) the contract equilibrium will hurt the farmers who do not take the contract, and,

(ii) village consumers will be hurt when there is no contract.

If (4.50) holds then clearly, the village price is higher in the former scenario than in the latter. This would imply that the farmers with a lower θ, i.e., the farmers who are more productive will receive a lower price and hence, will lose if the MNC is allowed to offer a contract. The villagers will have to pay a higher price in case of no contract.

Proposition 4.4.2. *If* $p_u > p_v(1 + \frac{1}{e_{S_1}})$, *the farmers who take up the contract be worse off.*

Since δ is chosen so that just the participation constraint is just satisfied, the incomes of the farmers taking the contract are equal to their incomes if they do not take up the contract. When the farmers are offered contract the village price falls given the condition described in (4.50), their opportunity cost declines (interest rate remains unchanged). Farmers' income will fall even when they take the contract. So clearly, the farmers who take up the contract are also worse off.

4.5 Conclusion

In this chapter, we have built theoretical models in an attempt to see the consequences of allowing FDI in the retail sector. In the first model, we have a simple oligopolistic wholesale market and competitive village market and retail market. If now MNCs are allowed buy goods from the domestic farmers and sell it in the retail market, we find the conditions when the domestic retail sector shrinks. We also find the condition when the farmers and urban consumers can gain, and the rural consumers lose. In the second model, we have a monopolistic wholesale market, instead of an oligopolistic one. Here, the urban consumers vertically differentiate between the good sold by the domestic retailers and the good sold by the MNCs. The low end consumers buy the domestically retailed good, the high end consumers buy the good sold by the MNC, and the poor cannot buy either of the two goods, they depend on state for survival. In the village, consumers can buy only from the farmers. The village poor also depend on the state for food. We find the conditions when the urban low-end consumers and the rural consumers may lose. In the third model, MNCs are allowed to offer contract to the farmers. We compare the contract equilibrium with the equilibrium without contract. We find the condition when all the farmers will be hurt where the MNC can offer contract, as compared to the situation when the MNC cannot offer contract.

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