

**TRADE POLICY SIMULATION AND WELFARE
ANALYSIS USING A PARTIAL EQUILIBRIUM MODEL:
THE CASE OF BOVINE MEAT IN MOROCCO**

by

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ABSTRACT

The impact of agricultural trade liberalization on welfare is a major concern to the Government of Morocco. Several agricultural sectors and sub-sectors that are suffering from severe inefficiencies have been protected by the Government mainly through prohibitive import tariffs as a mean to support the income of domestic producers. Although the rhetoric in Morocco is of trade liberalization, the farm sector, with few exceptions, has largely escaped the general tendency.

The livestock sector in general and the bovine meat production in particular figure among the most protected goods in the country. Bovine meat imports are imposed a prohibitive tariff rate of 254 percent. In addition, several technical barriers to trade exist in the form of rigid sanitary regulations.

It is strategically important for Morocco's trade partners and those that are planning to negotiate different forms of trade agreements to understand the economic argument behind Moroccan protectionist policy in agriculture. The bovine meat market in Morocco is of high interest to major exporters given the growing size in domestic and tourist populations, the high domestic prices, as well as the increase in consumer awareness. Given its good sanitary status, Australia is a strong candidate for negotiating an agreement that will include bovine meat within a general agricultural package.

The objective of this study is to evaluate economic evidence and determine whether or not opening up trade of bovine meat will have a net positive impact on welfare.

Such evidence can become a strong argument in the hands of trade negotiators for major exporting nations such as Australia.

This study uses data from the United Nations Food and Agricultural Organization (FAO), the Ministry of Agriculture of Morocco and Meat and Livestock Australia (MLA) to construct a partial equilibrium model for the bovine meat market. The model simulates different trade policies: closed market, free trade, quota and TRQ. Using the theory of comparative advantage and the concepts of consumer and producer surpluses, gains and losses are assessed and the net impact on welfare is evaluated.

The empirical analysis suggests that total free trade in the bovine meat market results in the highest gain in social welfare when compared to protectionism (USD 246.62 million), followed by the TRQ (USD 206.11 million) and quota policy (USD 4.92 million). As hypothesized, the protectionist policy results in large losses in consumers' surplus. The results of the analysis converge with the economic theory and are compelling evidence for the benefits brought by openness in the bovine meat trade.

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DEDICATION

I dedicate this thesis to my baby daughter Lilia who was born in the midst of my research.

CHAPTER I: INTRODUCTION

Livestock production is the world's largest user of land, either directly through grazing or indirectly through consumption of feed grains (FAO, WAR, 2003). Globally, livestock production accounts for some 40 percent of the gross value of agricultural production (FAO, WAR, 2003). Livestock production (all categories) in Morocco accounts for 25 percent of the agricultural gross domestic product and supports the livelihood of about 1.1 million rural families or nearly 15 percent of the total population (Ministry of Agriculture, Morocco, Agricultural Census, 1996). The share of bovine within the livestock sector varies from year to year and has been ranging between 10 and 15 percent in terms of head stocks (Ministry of Agriculture, Department of animal production, Morocco, 2006).

Bovine meat production in particular remains as one of the most protected agricultural activities in some key areas in the world. Morocco is no stranger to the protection of the beef sector as it has promoted a self-sufficiency policy in livestock and meat products since the 1960's while imposing prohibitive ad-valorem tariff rates of 254 percent on bovine and 304 percent on ovine meat imports (Customs Administration of Morocco, 2006). These tariff rates have been constant since the 1960's and do not represent in any case the reality of the current market.

As the nation has been moving towards a more liberalized trade, there has been a need to assess the different economic impacts of the country's trade policies undertaken at bilateral and multilateral levels. Although the country has committed to several trade agreements, agricultural goods have always been given special provisions. Limited

exceptions in the form of quotas, TRQs and long term diminishing tariffs have emerged in the wake of the new century when Morocco signed an association agreement with the EU and an FTA with the US. Both these agreements provide for large quantities of wheat quotas and modest to decent quantities of bovine meat among other agricultural goods. However, sanitary bans on both origins have prevented the implementation of the quotas. Countries that have the required sanitary status can be well poised to access the market if they can negotiate a trade agreement. Australia can be a good example.

This study will provide nations with interest in the Moroccan bovine market an understanding of the current trade policy, and more importantly an evaluation of the gains in social welfare resulting from the gradual application of an open market policy (quota, TRQ, free trade). Such an evaluation will serve as a strong evidence and argument to future negotiators who would seek to convince the Moroccan Government of the worthiness of bovine meat liberalization.

Chapter Two will explore the relevant literature that relates either directly or indirectly to the issue of our research. It will also cover part of the literature that we used in support of the hypotheses we developed.

Chapter Three will give a general overview of the sector by looking into the current trade policy, the different weaknesses in the production chain, the general competitiveness, in addition to the changing nature of demand.

Many agricultural reforms have been launched (1960s through 1980s), with many policies targeted at the bovine sector. However, they all failed at two main levels:

- Production efficiency: gains in productivity have been very low from year to year, leaving domestic producer price levels very high. Sixty five percent of the farmers reach less than one kilogram per day gain in bovine production (Araba, 2005).
- Sanitary standards and food safety: no major improvements were registered in securing safe production of red meats, animal disease control or domestic sanitary regulation enforcement.

The food safety and eating quality aspects of demand have strongly increased in importance worldwide and Morocco is no exception. Consumer awareness of bio-security, animal disease and food safety has been stimulated by the well publicized outbreaks of Bovine Spongiform Encephalopathy (BSE), Foot and Mouth Disease (FMD) as well as Avian Flu. The poor sanitary and production standards in Morocco for red meat in general and bovine meat in particular combined with the inconsistent and non-standardized quality grading, all play a downgrading role in the sector considering the rising consumer awareness and the increasing growth in tourist population.

Although per capita consumption of bovine meat remains low in Morocco compared to developed countries or the rest of the world, total consumption in metric tons and growth in the size and income of the population send strong signals to exporting nations. In Morocco, consumption is close to 5 kg/capita, compared with 20 kg/capita in the EU, 42 kg/capita in the US, 46 kg/capita in Australia, 54 kg/capita in Argentina and 9.5 kg/capita in the world (FAOSTAT, Food Balance Sheets, 2003). It is important to note that

the limitation to Morocco's per capita consumption is due to the high prices, highly imposed tariffs on imports and a total supply that is limited only to domestic production.

Chapter Four will discuss the economic theory and concepts behind the gains in social welfare caused by trade liberalization and will attempt to demonstrate those gains using a partial equilibrium conceptual model and simulate the application of different policies.

Chapter Five will use data from the FAO, the Ministry of Agriculture of Morocco and MLA, to estimate an empirical model and test the hypotheses reached in Chapter Four. Chapter Five will also make a monetary comparison between the different trade policies in terms of net impact on social welfare.

Chapter Six will then address the different implications this study will have on:

- Possible trade negotiations.
- The best direction and approach to undertake for an exporting nation wishing to negotiate bovine meat market access.
- Future useful research, additions and considerations.

CHAPTER II: LITERATURE REVIEW

Reviewing the existing literature indicated a lack of research in the core subject of this thesis. In fact, none of the recent literature addressed the issue of welfare gains from freeing trade using a partial equilibrium model for the bovine meat market. Some of the papers and studies examined the general competitiveness aspect of the red meat industry, while others used welfare analysis for other agricultural goods where Morocco does not seem to have a comparative advantage such as wheat. Other research evaluated the liberalization impact on domestic production, imports and terms of trade and looked at the red meat category among other agricultural goods and within a general equilibrium framework.

A. Ait El Mekki, S. Jaafari and W. Tyner (2006) published a paper on the economic competitiveness of the meat sub-sector in Morocco. They concluded that the estimated production cost of the standard quality bovine meat in Morocco is higher than in France and the USA. The competitiveness-cost index (CCI) is around 135% compared to France and 156% compared to the USA. The high CCI is mainly due to high expenses on bull calves fattening. Also, the authors estimated the nominal and effective protection coefficients (NPC of 1.4 and EPC of 1.5), showing that the producers benefit from the high import tariffs protection and take advantage from an implicit subsidy of USD 0.8/kg.

Although Morocco has moved a long way into domestic market liberalization as well as international trade liberalization; and even though several economic reforms as well as structural and sectoral adjustment programs were undertaken since the 1980's;

agricultural goods including livestock products have largely escaped the reforms and the free trade trend. Arndt and Tyner (2003) argued in a study about policy and progress in Moroccan agriculture, that even when considering the reforms and progress made in domestic market liberalization as substantial steps forward, import competing agricultural products are still highly protected and no progress was made in linking them with world markets compared to fifteen years ago when the agricultural sector reform started. This has led the country to have a substantial portion of its agricultural sector not only isolated from world markets, but has also led to the existence of several inefficiencies in both production and distribution. The livestock commodities can be perfect examples of those strategic products that fall into this categorization.

Chafai (2004) from the National Association of Red Meat Producers (ANPVR), looked at the different constraints existing at the domestic production level. These include:

- Strong correlation between livestock production and climate conditions, knowing that Morocco constantly goes through recurrent cycles of drought, affecting pastures and feed availability.
- Dominance of small farm sizes and inadequate size and condition of feedlot units.
- Very high land cost.
- Poor productivity gains: between 0.6 and 1.3 kg/day.
- Inefficient financing system.

- Very little availability of specialized bovine breeds.

A. Ait El Mekki and W. Tyner (2004) in their study of The Moroccan-American FTA Effects on the Agricultural and Food Sectors in Morocco, used a computable general equilibrium model (CGE) to evaluate the changes in variables such as domestic supply, imports, terms of trade and welfare. They made a comparison between a free trade scenario with the US and with the rest of the world. They concluded that Morocco would gain more from multilateral liberalization than from a unilateral FTA. Their results showed an increase of 4% in GDP and of USD 2.7 billion in welfare. Interestingly, their model included the red meat sector (bovine, ovine and goat). In fact, the policy scenarios they used indicated that red meat domestic production would fall by 22% in the case of an FTA with the United States and by 44% in multilateral liberalization. Also, the percentage change in imports of red meat can be very large (noting however that these large changes come from a very low base figure). Under a bilateral FTA, red meat import from the US would increase by 4,400%. Imports would rise by 4,529% from the rest of the world under a multilateral agreement.

M. Ravallion and M. Lokshin (2004) conducted a study at the World Bank's Development Research Group titled, "Gainers and Losers from Trade Reform in Morocco." The authors used Moroccan national survey of living standard in order to calculate the short term impacts on welfare brought by diminishing prices of grains (one of the country's main food staples), while simulating different agricultural trade scenarios (tariff cuts on imported grains of 10%, 30%, 50% and 100%). The results indicated a net gain for rural population who are the main consumers of the traded commodity.

Doukkali (2003) also examined potential gains and losses linked to grains policy reform using a GE model. The results suggest that Morocco gains on average in terms of national income even though there are large disruptions in the grain sector.

Karaky (2002) has used a CGE model while taking into account climate variability scenarios. His findings were in line with other studies. He concluded that irrespectively of the state of climate and rainfall, the results of a combined wheat and livestock liberalization policy leads to a decline in agricultural terms of trade and to a strong growth in imports of both wheat and livestock commodities. He added that inter-sectoral linkages under this policy will expand to the urban sector by increasing employment.

Rutherford, Rutstrom and Tarr (1994) constructed a CGE model for 39 sectors including red meat. The comparative static model simulated different policies including liberalization with both the European Union (EU) and the rest of the world. The model resulted in an increase of 1.5 percent of GDP in case of a free trade agreement with the EU and 2.5 percent increase if Morocco has free trade with the rest of the world. On the other hand, employment in sectors such as grains and meat will diminish due to lower import prices from the EU.

Stoeckel, Saunders and Monck (2007) co-authored a publication for the Center for International Economics, Canberra, Australia, about the gains from freeing trade in developing countries. The study gives empirical evidence that openness leads to more trade, investment and growth. Modeling provides an estimation of potential benefits of an agreement in the Doha Round. Developing countries gain disproportionately from that

liberalization. They receive 45 percent of global gains which is above their 20 percent share of global trade. Also, 50 percent of these gains come from developing countries removing their own trade barriers.

Hertel (2006) produced a survey of findings on the poverty impacts of agricultural trade liberalization. He concluded that preliminary findings that are based on the currently available empirical evidence on the trade-growth linkage suggest that trade liberalization can be a very important vehicle for reducing poverty. He also mentioned that households' ability to adjust to the price changes flowing from trade reform would vary considerably across countries and that the more responsive a given household is to price changes, the greater they will gain from trade openness.

The later statement brings us to the question of price elasticity of demand which becomes important in determining the degree of responsiveness of consumers to changes in price. Moroccan consumers of bovine meat could represent the right category of households that would gain from trade openness as they would respond to changes in price of bovine meats with higher changes in quantity demanded. Mdafri and Brorsen (1993) used an Almost Ideal Demand System model to estimate demand elasticity for beef, mutton, poultry and fish in Morocco. Their model resulted in a Hicksian price elasticity of demand for beef of -1.633. This elasticity is an evidence for the high degree of responsiveness of Moroccan households to changes in the price of beef. We will use this finding in developing our empirical model for welfare analysis.

As indicated in Chapter One, sanitary and food safety issues play an important role in driving demand for domestic bovine meat and will certainly be a major pillar for driving demand for imported bovine meat in a more trade-liberal scenario. That is particularly important given the nature of demand in Morocco that encompass more and more tourism related consumption which in turn requires higher sanitary standards. A safer and better quality meat can increase consumer utility and value perception, in addition to the gains in consumer surplus derived from opening up trade. Several studies and publications have pointed out the weaknesses of the domestic sanitary and food safety system especially in the red meat production sector.

Araba (2005) addressed the challenges to the whole red meat production chain from a quality and safety perspective. His paper examined the production system in terms of its sanitary weaknesses starting from the marketing level to the slaughter and handling level. The most compelling evidence of unsafe production comes from the slaughter houses that are poorly equipped and maintained and which are run by communal councils with no possibility to establish privately run units under existing laws. The paper also noted the absence of ante mortem examination in rural slaughter facilities and the non-conformity of means of transport and refrigeration systems.

Ettabti (2005) conducted a survey of 221 Moroccan households in which they had to rate different red meat attributes. The sample rated color first, followed by price, origin (within the domestic boundaries and in the absence of imports of red meat cuts), butcher's experience, cut, fat content, marbling and certification. According to Ettabti, the fact that very little information is available to customers regarding quality and also that no product

differentiation exist in the market (no brands, grading or certification), makes it very difficult to rate the importance of some attributes. Color remains the basic mean for determining quality and safety in the eyes of the consumer, which is why it is rated first, while price remains a highly important driver.

The Magellan project on global beef liberalization was commissioned in 2003 by the Five Nations Beef Group (Australia, Canada, Mexico, New Zealand and the United States). These are major players in world beef trade and have a large stake in efforts to reduce support and trade barriers affecting the international beef market. The project was coordinated by Meat and Livestock Australia while the reports were prepared by the Centre for International Economics. The three phase reports produced through the project quantified the benefits of liberalizing world beef trade. The reports have also made an important note regarding the two-sided effect of consumer awareness and food safety. According to the reports, the risk from the new awareness of agricultural trade policy is that it comes from the perspective of food safety and not from the unnecessary high costs of the protection policies. The reports label this strategy as the “negative way” since it uses the fear of food safety and suspicion of imports to continue to justify import protection. This can be applicable to Morocco as the country imposes high tariffs on imports in addition to high technical barriers to trade. Sanitary rules on imported red meat in Morocco are surprisingly very rigid and strict. More surprising is the contradiction with the poor domestic sanitary standards. This is important in considering which export origins are to be accounted for in terms of import supply in Morocco under different trade openness scenarios.

CHAPTER III: OVERVIEW OF TRADE POLICY, COMPETITIVENESS AND SUPPLY AND DEMAND

3.1 Key Facts on Moroccan Agricultural Economy

Moroccan agriculture accounts for about 15 percent (average 2000-2006) of the total value added to the Gross Domestic Product (World Bank, World Development Indicators Database, 2007). This percentage varies from year to year and depends on the severity of recurrent droughts.

According to the World Bank Development Indicators Database, in 2006, Moroccan GDP was at USD 65.4 billion in which agriculture accounted for USD 10.26 billion. The same database shows that in 2004, agriculture accounted for USD 6.2 billion and for only USD 5.5 billion in 2000. GDP's growth in Morocco is highly affected by agricultural output which in turn depends on weather. For example, GDP growth rate was at 1.8 percent in year 2000 following a drought season, and was at 8.0 percent in year 2006 following a bumper crop (World Bank, World Development Indicators Database, 2007).

Livestock production (all categories) constitutes 30 percent of the agricultural value added (Ministry of Agriculture, Department of Animal Production, 2007). It is worth noting that the above mentioned value added includes all products and by-products of livestock raising (skin, leather, wool, etc. in addition to meat and offal products). Cattle (bovine) production represents only 11 percent of the total livestock production (FAO, ProdSTAT, 2006). On the other hand, bovine meat accounts for 45 percent of total red meat output and has been stagnant for more than 20 years (Chafai, ANPVR, 2004). In 2006, the producer revenue generated by the bovine meat sector was around USD 800

million (FAO, ProdSTAT and PriceSTAT, 2006). If we put this in terms of agricultural value added share of GDP in 2006, which stood at USD 10.26 billion, bovine meat producer revenue would represent nearly 8 percent of that value.

3.2 Current Trade Policy in the Bovine Meat Sector

Since the 1960's, Morocco has been following a protectionist policy in the red meat sector. The policy consisted of encouraging the growth in animal head stocks and maintaining prohibitive import tariff rates. Many farm reforms and programs have been planned, targeting the livestock industry, but have led to very poor results. These failing reform plans have negatively impacted the efficiency of the entire sector as we will address in Section 3.3 on supply and competitiveness. This inefficiency within the whole bovine meat production chain has made it difficult for the Government to liberalize the sector's trade since it finds in it the same recurrent excuse of having to upgrade and reform the sector as a mean to make it ready for international competition.

While current rhetoric in Morocco supports the liberalization approach, protectionists still have the upper hand in strategic agricultural commodities. When agricultural market liberalization is discussed, different voices get intertwined. On one hand, reform supporters are mainly Moroccan economists, agricultural economists and the World Bank. On the other hand, those against liberalization are mostly within the private farming sector and the Government. Those in the Government who would lose power from greater liberalization also argue against such a reform. A good example is the Direction of Animal Production and the various departments relating to it within the Ministry of Agriculture.

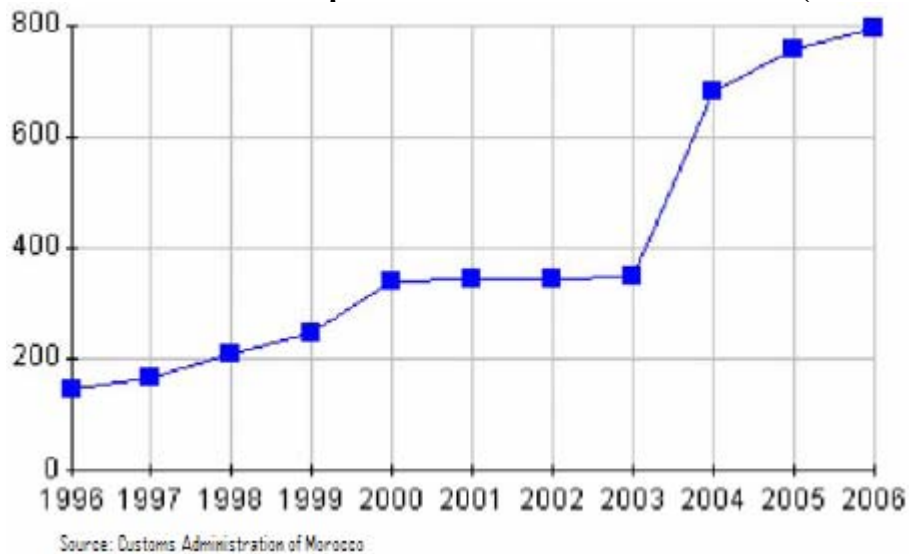
Appendix A lists the tariff schedule on chilled and frozen bovine meat, in carcasses, semi-carcasses, cuts, etc. (Customs Administration of Morocco, 2006). All bovine meat types are imposed a tariff rate of 254 percent making it impossible to import any of those meat products competitively.

There are few exceptions that escape the prohibitive rate, but quantities imported under these exceptions are minimal and sometimes irrelevant compared to the total consumption of the aggregated bovine meat types. Our study will not account for these exceptions simply because the quantities imported are either small, are not officially registered with the customs or they do not represent the bovine meat categories of interest in our study. These exceptions are:

- Beef burger patties weighing between 45 and 150 grams with 17.5% to 21% fat content and polyethylene packed (Customs Administration of Morocco, 2006). The reason why this very specific category of processed bovine meat is imposed a low tariff of 17.5 percent (compared to 254) is due to the convincing power of multinational fast food chains in general and that of US based McDonalds in particular. When the fast food giant was preparing to launch its franchise spree in Morocco, it had to convince the Government of lowering the duties for the beef patties types used in its restaurants. Cost management and food safety were the main concern for the multinational. Investment and employment gains seemed like a convincing argument in the eyes of the Government. The change in tariffs has also stimulated food importers to bring in frozen beef patties (with the exact same specifications as McDonalds) for supermarket and restaurant chains distribution.

Low cost producing countries such as Argentina have been able to dominate this particular market. Figure 3.1 shows the growth in imports of McDonalds style beef patties. Our study will not account for this category of processed bovine meat since the size of imports (800 metric tons, Customs Administration of Morocco, 2006) is minimal compared to the total consumption of 150,000 metric tons (FAOStat, ConsStat). Also, we will focus mainly on carcasses and meat cuts.

Figure 3.1 Growth in the Import of Beef Patties in Metric Tons (1996-2006)



- The Moroccan Royal Armed Forces through the Supply Commission of the Southern Provinces makes direct import purchases for the military stationed in the southern Sahara provinces. These imports of frozen full carcass bovine and ovine takes place through yearly tenders. The tenders are managed by the Office of Exportation and Commercialization (OCE). On average, imports of red meat for the military can reach 6,000 metric tons per year, shared equally between ovine and bovine meat. Usual import origins are Argentina and Australia (OCE, 2007). Given

that the military institution is exonerated from all taxes and duties and is not representative of civilian/market consumption, their purchases are neither accounted for in the customs database nor in balance of trade. For this reason, we will exclude these imports from our study.

- The last exception concerns the temporary admission imports. Temporary admission status grants the importer a certain period of time during which the product needs to be processed before being exported. Once exported, the original buyer will cease to be responsible for any tariff payments. Market intelligence provided for MLA in Morocco suggests that air catering uses the temporary admission procedure to import red meat from Australia, prepare it for consumption and deliver it to airlines in duty-free zone where they fly out from Moroccan territory. No tariff duties are paid under this transaction since the meat is processed and exit the Moroccan border (Coprallim, 2007). However, air catering is a new business for Moroccan companies servicing the international airports and such imports of red meat are sporadic and it is very difficult at this stage to estimate their growth in the future.

If we exclude the above elements from our study, we will be left with a virtually closed market in the face of imports.

Even if the resistance to liberalization is dominant, the different FTAs and preferential trade agreements that Morocco negotiated in the past ten years with different nations and economic blocs, resulted in some sort of agricultural provisions, allowing for

certain trade flexibility in agricultural and food products such as long term tariff elimination, TRQs and quotas.

In the case of bovine meat, Morocco granted modest import quotas and TRQs to the EU and the US respectively:

- European Union: An annual import quota of 4,000 tons is envisaged in the provisions of the association agreement between Morocco and the EU with a reduction of 82.3% on the basic tariffs. This import quota has been practically ineffective due the sanitary ban imposed on most EU origin bovine during the BSE outbreak and also to the non-competitive nature of EU producers (Ministry of Agriculture of Morocco, 2007).
- United States: The Agreement includes two preferential TRQs, one for high quality beef and a second for standard quality beef. Before giving more details about each, it is essential to note that since the signature of the FTA in 2004, none of the TRQs have been implemented because the sanitary side of the agreement has not been finalized on the Moroccan side. Morocco sanitary barriers on US beef are supposedly due to the non compliance with standards on hormones, antibiotics and other residues (Ministry of Agriculture of Morocco, 2007). In addition, Morocco did not accept the rule-of-origin conditions as set by the US and providing for the inclusion of US produced red meat but from cattle origination from other countries (such as Mexico).

- High Quality Beef: High quality beef is defined by tariff line and other common US industry standards such as grading (prime or choice). It is also referred to as the Hilton beef. The initial in-quota quantity for the TRQ on high quality beef was set at 4,000 metric tons, and will expand by four percent annually. According to the terms of the agreement, the quantity should be standing now at above 4,500 metric tons. The in-quota tariff of 34 percent will be subsequently phased out in equal annual increments by year five. The over-quota tariffs will be eliminated in 18 years in equal annual installments. Imports of this US beef will primarily target hotels and restaurants (USTR, 2004).
- Standard Quality Beef: The initial in-quota quantity for the TRQ on standard quality beef will be 2,000 metric tons, and will expand by two percent annually after five years. The in-quota tariffs will be eliminated in equal annual installments over ten years. Over-quota tariffs will remain in place unless Morocco negotiates a reduction with another trading partner, which the United States would receive under the preference clause (USTR, 2004).
- If there was no sanitary restriction on US origin, the main dynamics will come from the high quality beef TRQs. These will result on the long term in a gradual increase of annual import, 0 percent in-quota tariff and very low above-quota tariff (USTR, 2004).

Currently, and given the elements discussed in this section, we can conclude that Morocco is in a state of autarky as far as the bovine meat sector is concerned. This situation is mainly due to the extremely high import tariffs, in addition to sanitary regulations on hormones, antibiotics and residuals. The sanitary regulations can be considered in some instances as technical barriers to trade because some are non-scientifically based.

3.3 Overview of Supply, Competitiveness and Comparative Advantage Indicators

3.3.1 Failing Agricultural Reform Programs

As indicated previously, the Government of Morocco has been developing several reform plans with the objective to increase the efficiency and productivity of the livestock sector. Unfortunately, all the reform policies have failed in reaching the main objectives: higher productivity and safer production. A higher productivity would have resulted in more quantities available for consumption and lower prices. Safer production is becoming essential as consumer awareness is rising and a larger part of the consumption is represented by the tourism sector (hotel chains, restaurants, etc.). Recurrent food related illness and intoxication incidents in Moroccan restaurants and group catering have been blamed on the very poor control and inspection system along the food production chain.

The reasons behind the failure of the Government reform programs lie within poor planning, mismanagement, and limited resources available for implementing the plans. Whether it is a breed amelioration plan, farmers' education or financial support in modernizing feedlots, the different Governments have failed in assigning both capital resources and competent human resources to seriously implement the different programs. The general aspects of the domestic production are not making it easy for a reform plan to

be generalized and effective, leading to a causality circle. Complex aspects of inefficiency in the sector complicate the implementation of the reforms, while ineffective reforms sustain the inefficiency. The following section will address those aspects.

3.3.2 Domestic Production, Weaknesses and Challenges

Morocco produces three main categories of livestock: ovine (sheep: mutton and lamb), bovine (cattle: bull and cow) and caprine (goat). Figure 3.2 shows the percentage share of each category, and Table 3.1 shows the share in terms of head stocks.

Figure 3.2 Percentage Share of Production between the Main Livestock Categories (in Number of Heads) in 2006

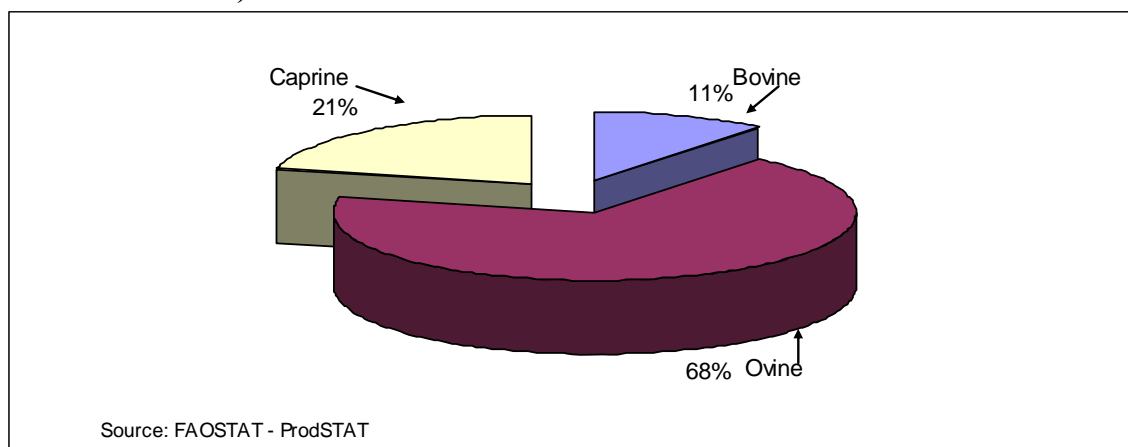


Table 3.1 Heads of Livestock in Morocco by Type (1996-2006)

Year	Stocks of Bovine	Stocks of Ovine	Stocks of Caprine
1996	2 408 400	14 536 100	4 594 700
1997	2 547 200	15 286 700	4 789 900
1998	2 568 600	14 783 900	4 959 200
1999	2 565 500	16 576 400	4 704 400
2000	2 674 600	17 299 700	4 930 700
2001	2 647 100	17 172 300	5 133 300
2002	2 669 600	16 335 500	5 090 400
2003	2 688 600	16 743 000	5 208 300
2004	2 728 800	17 026 300	5 358 600
2005	2 721 700	16 872 000	5 331 600
2006	2 721 700	16 872 000	5 331 600

Source: FAOSTAT – ProdSTAT

Appendix B gives a longer historical data on stock production (FAOSTAT, ProdSTAT). It is easy to notice that as far as stocks are concerned, ovine exceeds bovine by far. On the hand, bovine meat production in metric tons is larger than ovine meat production due to the difference in animal weight. Table 3.2 shows the red meat production in Morocco by major type.

Table 3.2 Production of Red Meat in Morocco by Major Type in MT (1996-2006)

Year	Bovine Meat	Ovine Meat	Caprine Meat	Total Red Meat
1996	103 000	90 000	22 000	216 996
1997	125 000	120 000	22 000	268 997
1998	120 000	115 000	22 000	258 998
1999	135 000	126 000	20 000	282 999
2000	140 000	125 000	22 000	289 000
2001	145 000	125 000	20 500	292 501
2002	170 000	110 000	15 000	297 002
2003	150 000	105 000	13 000	270 003
2004	140 000	105 000	18 000	265 004
2005	150 400	108 000	16 000	276 405
2006	150 000	112 000	17 000	281 006

Source: FAOSTAT - ProdSTAT

Figures based on Dressed Carcass Weight: Excluding Offal and Slaughter Fats.

Bovine includes Veal and Ovine includes Lamb.

Appendix C contains a longer term history of red meat production across more animal categories (FAOSTAT, ProdSTAT).

The Ministry of Agriculture through the General Agricultural Census, estimates that there are 1.1 million families (about 15 percent of the total population) relying on livestock as their source of income. The same census estimates that 74 percent of all farmers practise some form of livestock raising (all types). In fact, domestic producers use livestock as a security and risk diversion activity in case of crop failure. This means that specialization in livestock production is uncommon if not rare.

Domestic production of bovine suffers from both structural and cyclical weaknesses and inefficiencies. These have been reported by the ANPVR, which is the National Association of Red Meat Producers as well as several agricultural economists like Abdelilah Araba from the Hassan II Institute of Agronomy and Veterinary Medicine. Both sources have published studies about the challenges facing national bovine production.

- The bovine sector did not receive the necessary support from the Government to enable it to become efficient. The lack of high added value and specialized breeds (similar to Santa Gertrudis or Angus) and the high costs of feed inputs have contributed to the low carcass weight (194 kg per head). This poor yield has led to the low levels of consumption which are below the nutritional standards. For instance, the yield in the US is of 351 kg per head and 247 kg per head in Australia. Table 3.3 shows the poor improvement in productivity in terms of carcass weight (FAOSTAT, ProdSTAT). Appendix D includes a longer history of cattle meat yield in Morocco, Australia, France and the US (FAOSTAT, ProdSTAT).

Table 3.3 Bovine Yield in Morocco in Kg/Head (1996-2006)

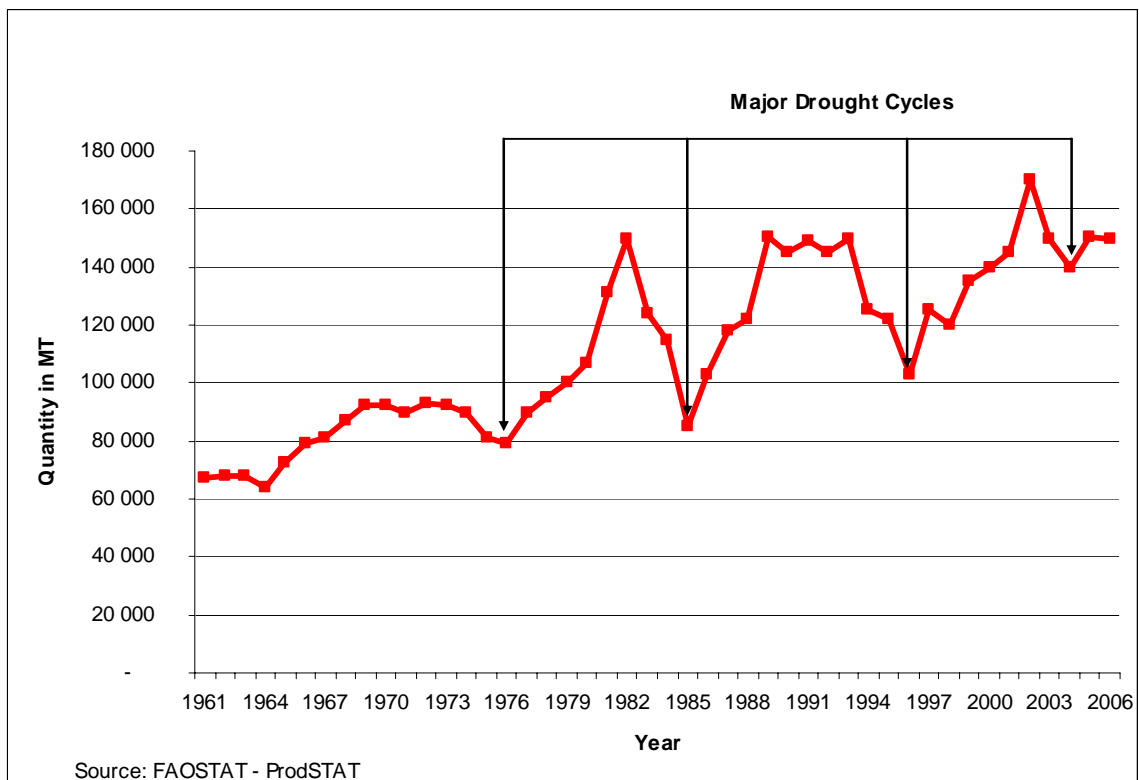
Year	Yield in Kg/head *
1996	160
1997	176
1998	178
1999	192
2000	175
2001	180
2002	178
2003	185
2004	194
2005	194
2006	194

Source: FAOSTAT, ProdSTAT

* Based on Full Carcass Weight.

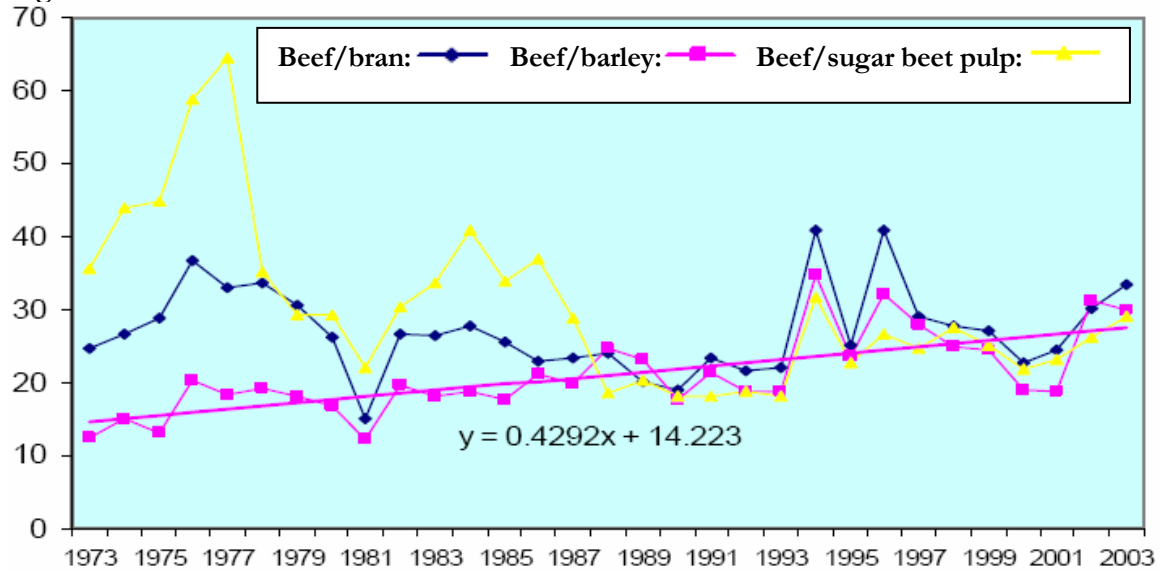
- Moroccan agriculture is subject to recurrent cycles of drought. These have also had a major impact on bovine production and yield fluctuations, and have affected prices significantly. A dry year also implies lower feed grains production and low pasture yield which increase total costs. Figure 3.3 illustrates the change in bovine meat production due to the climatic conditions. In 1975, the total bovine stock was at 3.6 million heads and dropped by 30% during the 1980s drought, then due to tough climatic conditions in 1992, 1993 and 1995, bovine stocks went down to 2.4 million (Chafai, ANPVR, 2004).

Figure 3.3 Bovine Meat Production and Cyclical Drought in Morocco (1961-2006)



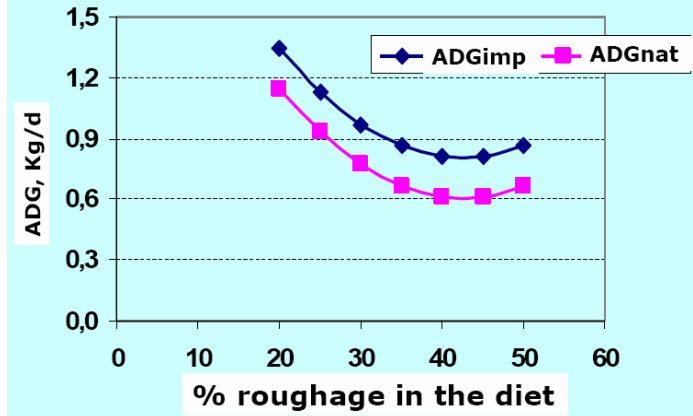
- The big impact the drought cycles have on pastures has pushed some farmers to abandon extensive ranching and seek fattening and feedlot activities, while ignoring the large constraints and challenges faced by this activity given the absence of high quality breeds, high feed-grains cost and lack of technical knowledge pertaining to fattening and commercialization. Figure 3.4 shows a Beef/Feed price ratio, while Figure 3.5 shows roughage concentrate ratio and animal daily gains.

Figure 3.4 Beef/Feed Price Ratio in Morocco



Source: Araba (2005)

Figure 3.5 Roughage / Concentrate Ratio and Bovine Daily Gains in Morocco



Source: Araba (2005)
 - ADG: Average Daily Gain in Kg per day
 - ADGimp: Average Daily Gain using imported breeds
 - ADGnat: Average Daily Gain using national breeds

- Increasing the total population in the bovine sector remains very difficult due to the currently high animal density. In addition, price of land is very high. An increase in total meat production could only come from an increase in productivity.
- In Morocco, the bovine sector is known for the very small size of its operations, which add to the general inefficiency. In 1996, the year during which the last Agricultural Census was conducted, out of the 1.1 million farm units that practice livestock production, 768,000 units owned a total of 2.4 million heads of bovine. The very large number of units led to a very low average ownership per farm of less than 2 animals (Chafai, ANPVR, 2004). This factor has also resulted in small and non-dynamic professional organizations.
- In the commercialization side, there is existence of great speculation animated by multiple intermediaries. Sale of cattle is often quoted in piece-rate instead of weight. 95% of the transactions are done within the “souks” which are poorly organized rural markets.
- Finally, the sanitary side suffers from extreme weaknesses:
 - No traceability systems are in place to contain animal disease. Actually, no effective systems have been put in place to permanently control for animal disease outbreaks or control for meat contamination.

- Poor control at the animal marketing and commercialization levels and absence of cleaning between the market point of sale and the slaughter houses. In addition, there is absence of grading based on animal breed or meat quality.
- There are 182 city-owned slaughter houses in Morocco and 724 in rural areas. According to the Ministry of Agriculture figures, only 45 percent of the total red meat produced in the country is controlled by the veterinary and sanitary service. In major cities like Casablanca, 70 percent of red meat is supplied through clandestine slaughtering and escape all forms of veterinary or sanitary regulations. On the other hand, the existing official slaughter houses are in very poor condition affecting tremendously meat quality and safety: absence or bad state of plumbing, lack of cold rooms, absence of post-mortem examination in rural slaughters, no separation between clean and soiled areas. By law, only municipalities have the right to own slaughter houses which means that private initiative is discarded. The food safety issue goes all the way down distribution chain: Non conformity of means of transport and storage (carcasses are seldom kept refrigerated in butcher shops).

3.3.3 Competitiveness and Comparative Advantage Indicators

It is important to measure the degree of inefficiency in the bovine sector within the context of international competitiveness. Ait El Mekki, Jaafari and Tyner (2006) have conducted an interesting study on economic competitiveness of the meat sub-sector in

Morocco. The results of interest to us include the competitiveness cost index (CCI) and the protection and comparative advantage indicators (nominal protection and effective protection).

Table 3.4 shows production costs of standard bovine meat in Morocco compared to France and the USA and shows the corresponding CCIs.

Table 3.4 Production Costs of Standard Bovine Meat in Morocco, France, USA and the Competitiveness Cost Index

	Morocco	France	USA
Average carcass weight (Kg)/animal	195	325	381
Total cost \$/Kg carcass	4.94	3.64	3.17
Cost structure %			
Calves	58.4	60.2	59.2
Feed	22.5	15.2	19.8
Veterinary care	1.1	1.3	1.8
Labor	5.6	4.6	nd
Amortization	2.7	8.7	6.9
Slaughtering cost	3.5	3.1	1.7
Financial fees	5.5	1.5	5.5
Miscellaneous	0.7	4.6	4.6
Competitiveness Cost Index	-	135%	156%

Source: Ait El Mekki et al. (2006)

The above table shows that standard quality bovine meat (bone-in) in Morocco costs about USD 5/kg in which operational costs occupy over 88%. The expenses related to fattening and feed constitute the most important components since they represent respectively over 58% and 22.5% respectively. Also, the performance of the bovine fattening shows significant differences with France and the US (only 60% and 50%

respectively of the registered weight in those two countries). More important to know is the CCI comparison with the US and France. CCI measures the domestic producers' costs in terms of a percentage of other nations' producers' costs. The CCI amounts to 135% in terms of France's producer's costs and 156% in terms of US producers' costs. The purchase price of the animals and the feed prices are the main reasons behind the higher costs in Morocco. In addition, the low weight of the bovines at slaughter reduces the possibilities of reaching economies of scale.

Table 3.5 displays nominal and effective protection (NPC and EPC) figures that were calculated by Ait El Mekki et al. (2006) using a Policy Analysis Matrix (PAM). NPC in beef was found to be 1.4 and EPC was 1.5. These results show clearly that there is a protection policy in place which imposes high tariffs on imports. This policy was found to benefit producers of an implicit subsidy of USD 0.8/kg. The PAM also showed no real comparative advantage in Morocco in the beef industry.

Table 3.5 Nominal and Effective Protection in Bovine Meat in Morocco

Indicators	Bovine Meat
Nominal Protection	1.4
Effective Protection	1.5

Source: Ait El Mekki et al. (2006)

3.4 Overview of Demand

Due to the limited domestic production, absence of imports and high prices, Moroccan consumption of bovine meat remains quite low in terms of kilograms per capita:

5 kg/capita, compared with 20 kg/capita in the EU and 9.5 kg/capita worldwide (FAOSTAT, Data Archives, 2003). As a matter of fact, consumption of bovine meat in Morocco (excluding burger patties and military consumption) is only covered by domestic production. The domestic production figures shown in the previous section will match the consumption figures.

The limited per capita consumption is in no means a detractor for potential exporters who see in the Moroccan market a big potential for growth. In fact, total bovine consumption in aggregate terms is quite high (150,000 metric tons in 2006). Moreover, the attractiveness of the market resides within the following important factors:

- Price elasticity of demand: Mdafri and Brorsen (1993) are among the very few who made an accurate estimation for the price elasticity of demand (ϵ_d) for bovine meat. The study resulted in a Hicksian elasticity of -1.633 ($\epsilon_d = -1.633$). This indicator of consumer's sensitivity to price is relatively high and means that a 100 percent decrease in the price will lead to a 163 percent increase in quantity demanded.
- Large population: the Moroccan population is over 30 million and is growing constantly (World Bank, World Development Indicators Database, 2007). If the market becomes open to international trade of bovine meat, opportunities will be very big for major exporting nations.
- Changing composition of demand: The tourism industry has become a major source of economic growth, employment and hard currencies for the country. The Government has started a very ambitious and effective plan to boost tourist visitors

up to 10 million visitors by 2010. The plan has been working efficiently and in fact, the tourism population went from 3 million visitors in 2000 to over 7 million by the end of 2007 (Ministry of Tourism of Morocco, 2007). The growth plan is accompanied by gigantic foreign investments in tourism facilities (resorts, hotels, restaurants, leisure and attraction, etc.). Foreign investments in tourism related activities have exceeded USD 20 billion during 2006 alone. All this has led to changes in the nature of demand for bovine meat in Morocco. The MLA's market intelligence in Morocco has suggested that hotels and restaurants are suffering because of poor and inconsistent quality of domestically supplied bovine meat. In addition, international hotel chains have strict food safety and traceability rules and they find it very disturbing to know that only 45% of the officially slaughtered red meat is controlled by sanitary authorities. Owners of these tourist facilities believe that the sanitary and food safety issues that the local red meat represents is a big disadvantage which should be taken care of rapidly. They argue that an incident (or recurring incidents) due to the poor food safety can have grave to disastrous impacts on tourism which is mainly controlled by tour operators.

- Changing habits and consumer awareness: the Moroccan consumer is also becoming very concerned about the food safety issues that relate to red meat. Several cases of animal tuberculosis have led people to avoid beef consumption in some areas of Morocco. In addition, international media has played a determinant role in spreading the fear of animal disease outbreaks (BSE, FLD, avian flu, e-coli, etc.). These outbreaks have proven to be highly impacting the level of demand in

different parts of the world. Also, Moroccan consumption habits are changing as more and more of the household food purchases are made in hyper and super markets where more frozen and processed food is available. The tendency to eat away from home has also become very important and sizeable.

CHAPTER IV: THEORY, METHODOLOGY AND CONCEPTUAL MODEL

This chapter will define the different economic theories and concepts behind this study: comparative advantage and gains from trade, welfare analysis and the notions of consumer and producer surplus. These theories were used within a partial equilibrium model in order to simulate different trade policies and evaluate their net impact on welfare. The derived conceptual model will be the basis for our empirical analysis.

4.1 Comparative Advantage and Gains from Trade

Reed (2001) stated that even though gains from trade are not well known in the popular press, it is crucial for practicing economists to understand the resulting gains behind trade activity. Reed mentioned that the “gains from trade” concept does not involved “gains from exports” or “losses from imports,” but it rather illustrates the gains from importing and exporting.

Stoekel, Saunders and Monck (2007) from the Center of International Economics (CIE) mentioned that trade is a vital source of economic growth and that all parties get to gain from the consumption of more products, greater diversity and higher production efficiency. They added that openness to trade and its link to increased economic growth is one of the few things economists agree upon.

The economic case for free trade was brought forward by British economists Adam Smith and David Ricardo over two centuries ago and has been constantly reiterated ever since. The theory of comparative advantage stresses the proposition that relative productivity between nations is more important than absolute productivity.

In fact, gains from trade are driven by both “absolute” and “comparative” advantage. The least-cost producer is the one who is said to have an absolute advantage. This producer will be able to sell his products worldwide. Although it might seem counterintuitive, but even if a country is not the least cost producer of anything they could make, they would still gain from trade. That is due to the more subtle and yet important concept of comparative advantage.

A producing country with comparative advantage is not necessarily the one with the lowest absolute cost of production but rather the one who is “relatively” more efficient at producing a certain good or in other terms, the one with the lower opportunity cost of production. In terms of trade, opportunity cost is the cost of foregoing production of an alternative good. What matters in comparative advantage is the relative efficiency of production. This concept is more complex than absolute advantage since it lies with the producing country that is relatively more efficient than another. Comparative advantage always exists because it is a relative concept.

Reed (2001) stresses an important point which is that countries with closed economies are bound to consume only along their Production Possibility Frontiers (PPF). Their endowments cannot allow them to produce more than a certain combination of goods and in certain cases they cannot have access to several goods altogether. When assuming a fixed supply of inputs: land, labor, capital, etc. the production function of a country is such that if all those inputs are used for the production of a certain good, other products will have to be forgone.

There are several methods to measure gains from trade. One of them is to use a simplified two goods model in order to draw a PPF (with diminishing marginal rates of technical substitution) and account for the change in the social indifference curve. The indifference curve can be defined as the willingness of consumers to substitute one good for another. The economic objective in a society is to be on the indifference curve with the highest level of utility.

Figure 4.1 and Figure 4.2 depict the difference in welfare between two consumption points, one with trade and one without trade. For the sake of illustration, we assumed no tariffs or taxes, no transportation cost and the following:

- Two countries: Morocco (small country) and the Rest of the World (ROW).
- Two goods: Olives and Bovine Meat. Where Morocco has a comparative advantage in producing olives while the ROW's comparative advantage lies in meat.

Morocco can use all its resources to either produce 100 units of olives or 20 units of cattle meat, or a combination of both along the *PPF* curve. Note that with the introduction of trade, the indifference curve is lifted upward from *UU* to *U'U'* as the *PP* line which depicts the consumption possibilities is no longer relevant since Morocco can use the ROW supply and trade at the world relative price. This results in higher utility. Also, the world terms of trade are shown as *P'P'* line which becomes the new budget constraint for the country instead of the *PPF*. If Morocco is a small country and can buy or sell any amount of goods without affecting the world price, and if the world relative price (or terms of trade) of olives are higher than the Moroccan relative price without trade, then

Morocco will export olives and import meat. Producers in Morocco will react to the new higher relative price of olives and increase their production (from Q_o to Q_{ot}). The only way they can do that is by decreasing the production of meat (from Q_m to Q_{mt}). The gains from trade can be assessed by measuring the difference in welfare between the two consumption points ($C_{ot} - C_o$ and $C_{mt} - C_m$).

Figure 4.1 Morocco PPF and Indifference Curve with No Trade

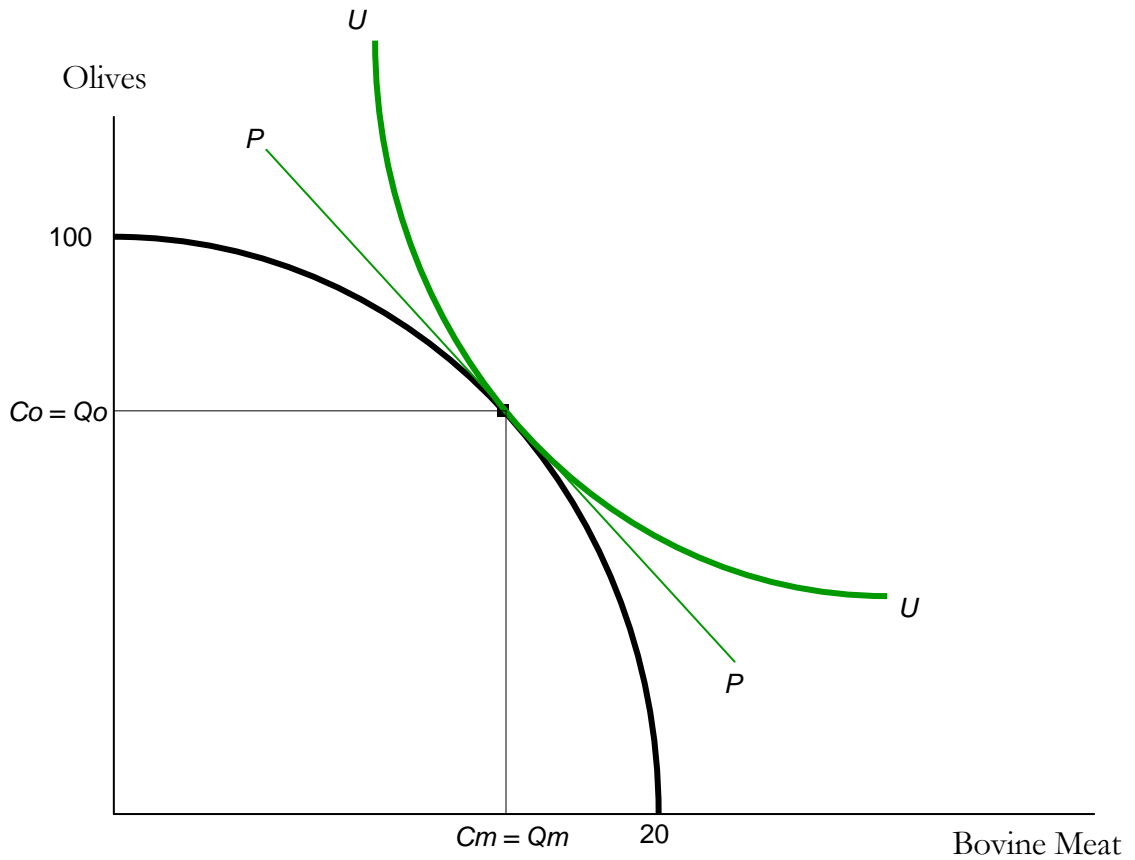
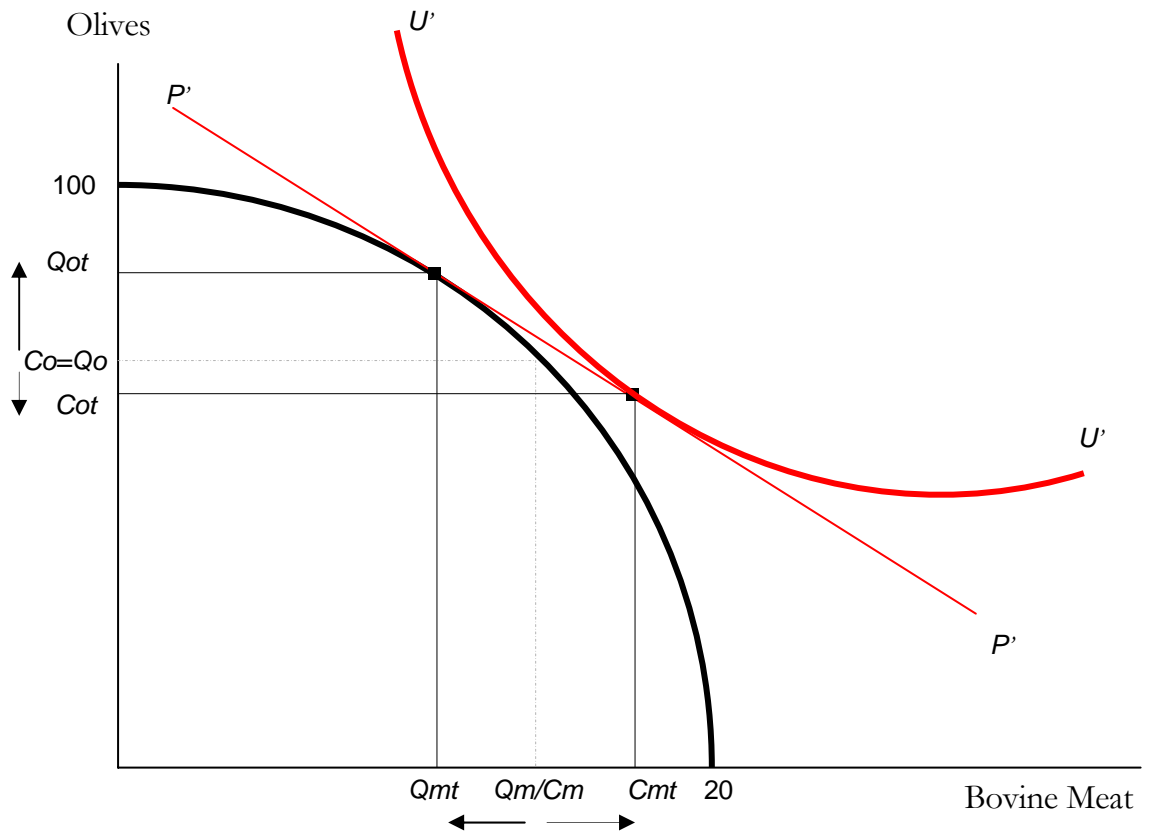


Figure 4.2 Morocco PPF and Indifference Curve with Trade Introduction



4.2 Welfare Analysis

The concept of PPF and the movement of the utility curve are good indicators of gains attained through free trade. However, they would not be a precise monetary measure of change in social welfare (how much producers lose and how much consumers gain).

Just et al. (1982) stated: “The definition of economic welfare for the consumer has been one of the most controversial subjects in economics. Unlike the producer’s case, where the observable measures of well-being such as profit can be clearly determined, no equally appealing observable measure exists for a utility-maximizing consumer. That is the

criterion of the consumer utility is not observable.” The author also mentioned that monetary measures of change in consumer welfare can be reflected in his “willingness to pay” which is related to his utility function. He added that “consumer surplus” that we will address in the following section, is the concept that is most often used in empirical studies in order to measure consumer welfare.

4.3 Methodology: The Partial Equilibrium Model and the Notions of Consumer and Producer Surplus

4.3.1 Partial Equilibrium

The use of a partial equilibrium model to simulate trade policies and analyze changes in welfare is a preferred method in agricultural economics. Reed (2001) argued that most international economists use the two-good model and emphasize the factor markets like labor and capital because their objective is to study the impact of trade on returns on those factors. However, agricultural economists usually focus on the output market and they look to analyze international trade matters and their effects on the pattern of trade. This type of analysis becomes easier when using a partial equilibrium model involving one good and several countries. The partial model involves supply and demand analysis that includes only the price of the good to be studied while holding all other prices constant.

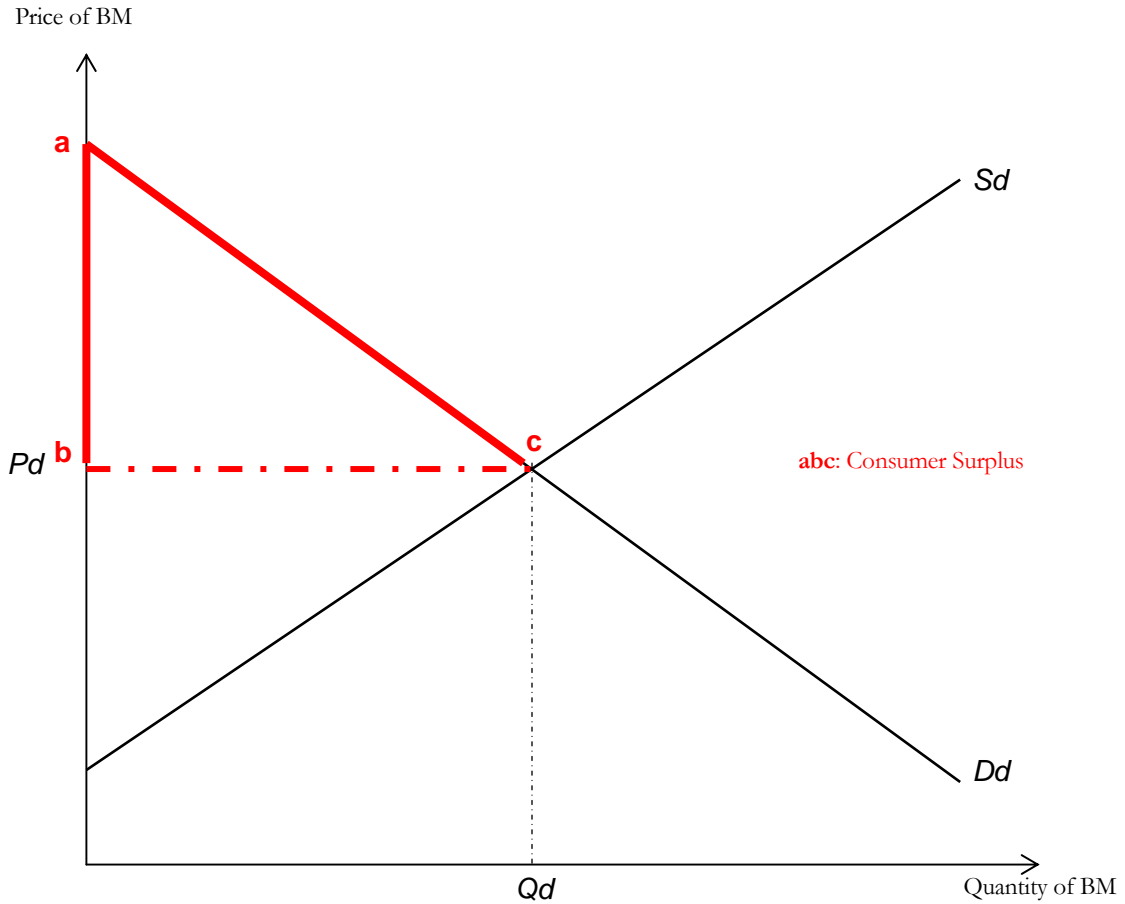
This model can be the best choice in our case because it can show how changes in different variables (trade policies) affect the equilibrium for the one good in question (bovine meat). More importantly, it is the effect on equilibrium brought by those changes in trade policy variables that will let us measure the differences in net welfare in Morocco when trading with the rest of the world (ROW).

4.3.2 *The Notions of Consumer and Producer Surplus*

Reed (2001) gives a good description of consumer and producer surplus and stresses their importance in measuring welfare within comparative static situations such as the partial equilibrium model. He makes the following definitions:

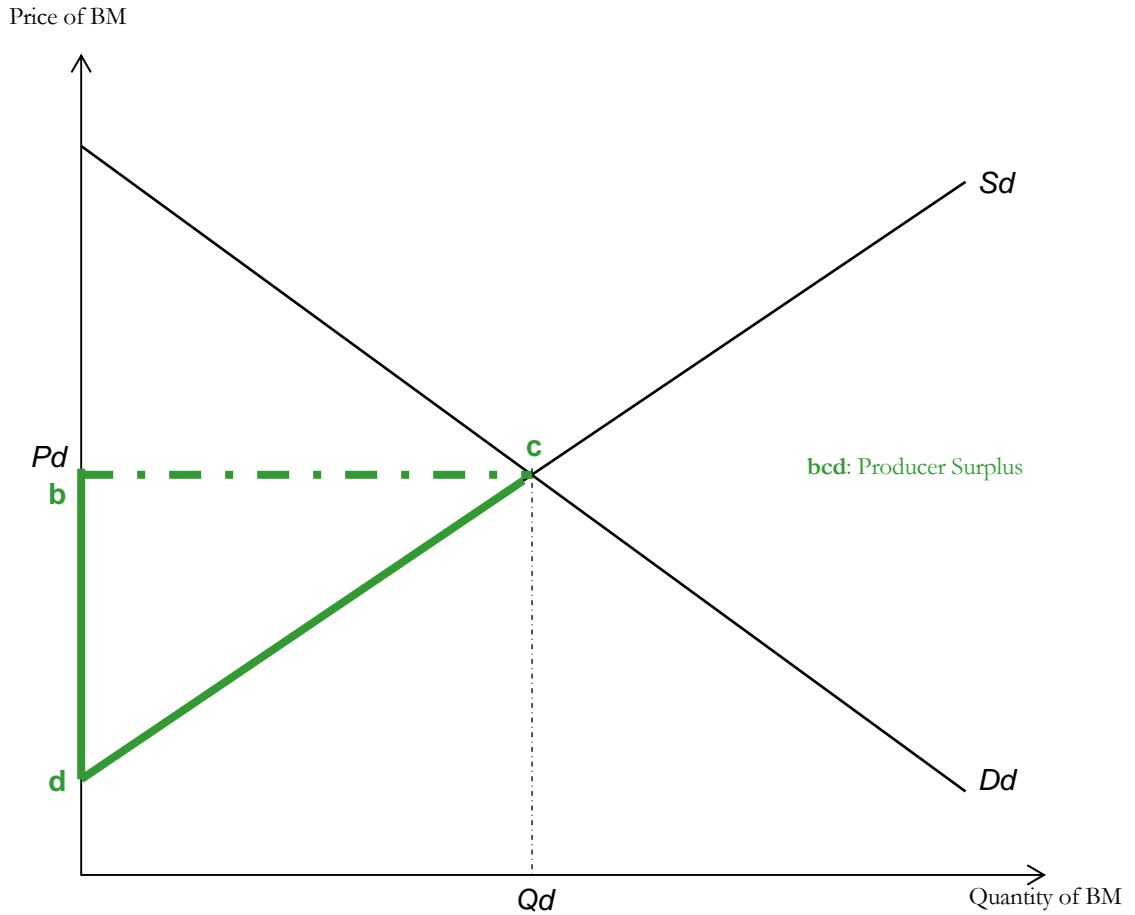
- Consumer surplus: A mean to measure the gains in welfare that consumers realize from buying goods at prices that are below what they are worth. Considering that a typical demand curve is downward sloping, it means that consumers are often willing to pay more for a product than the market price. This net gain that consumer accumulate is defined as a consumer surplus. Figure 4.3 uses a conceptual supply and demand domestic market for bovine meat (BM). The figure shows area *abc* which is below the demand curve and above the market price as the consumer surplus. That area is the sum of gains that consumers obtain but do not actually pay when considering the market price.

Figure 4.3 Notion of Consumer Surplus



- Producer surplus: Similarly, a producer's surplus will measure the gain in welfare that producers obtain from selling goods at a price level which is above their production cost. Since the typical supply curve (marginal cost curve) goes upward, the producer is often able to produce some units of his goods at levels below the market price. The net gain accumulated is the producer surplus. Figure 4.4 uses the previous example and depicts the surplus area bcd which is above the marginal cost curve and below the market price.

Figure 4.4 Notion of Producer Surplus



4.4 Conceptual Model and Policy Simulation

This section will build a conceptual model and simulate trade policies given the theories and concepts discussed previously.

The model will use the Morocco bovine meat market (conceptually) to simulate four different trade policies and assign the corresponding consumer surplus, producer surplus, Government revenue when applicable and the net impact on social welfare. It is essential to make the following assumptions that would fit the case of our study before illustrating the model:

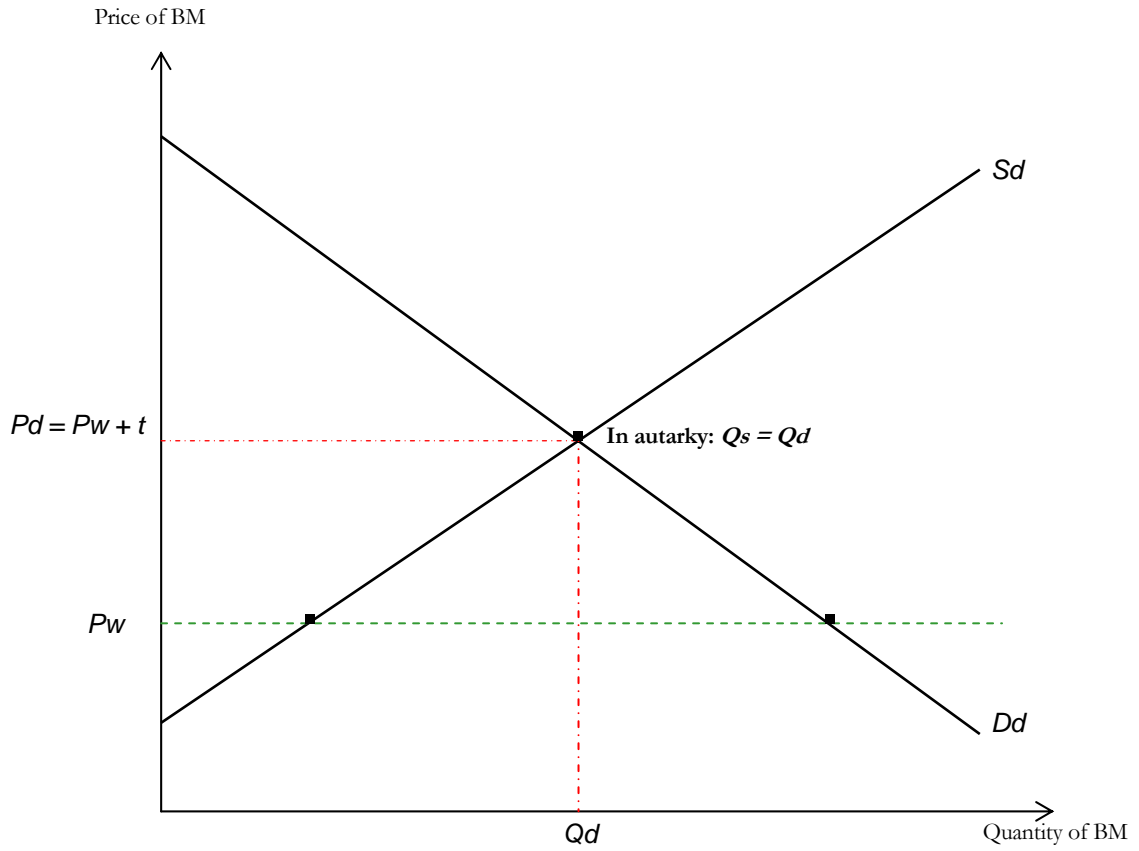
- There are two countries: Morocco and the Rest of the World (ROW).
- Morocco is a small country compared to the ROW and does not affect international trade (either price or quantity).
- There is perfect competition.
- Prices of substitutes and complimentary goods are held constant.
- Morocco does not have either an absolute or comparative advantage in the production of bovine meat.
- Moroccan consumers are price sensitive and price elasticity of demand is greater than -1 (more negative than -1).
- World prices of bovine meat are under the domestic price level.
- There are no transport costs.
- Morocco imposes a prohibitive tariff rate on bovine meat.

4.4.1 Protectionist Policy

A protectionist policy simply means that the Government imposes trade barriers (most of the time in the form of tariffs) in order to protect the domestic production from import competition. A protectionist policy makes total supply and consumption limited to domestic production ($Q_s = Q_d$). Figure 4.5 illustrates partial equilibrium in an autarky

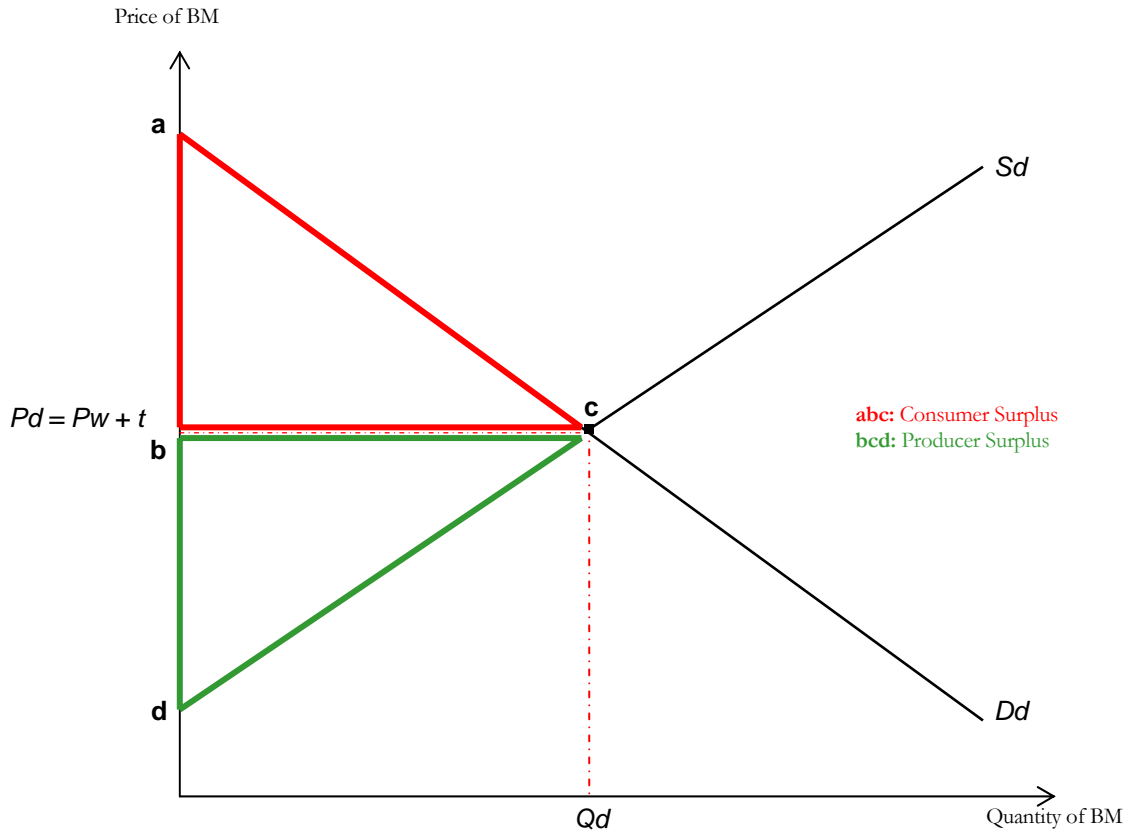
scenario. The domestic price P_d would equal to the world price $P_w + t$, where t is the tariff imposed on that particular good.

Figure 4.5 Conceptual Equilibrium under a Protectionist Policy (Autarky)



The following figure 4.6 shows consumer and producer surplus in the domestic closed market.

Figure 4.6 Conceptual Consumer and Producer Surplus under a Protectionist Policy



4.4.2 Free Trade Policy

An open trade policy would imply that the country’s borders are open to the ROW at the commercial level (as other restrictions may still prevail including sanitary regulations). With free trade, Morocco will be able to import and export freely all sorts of goods and services. Production will become specialized in those goods in which the country has a comparative advantage, while production of inefficient goods will be forgone.

At this point, it is important to introduce the concept of the “Effective Supply” curve. Effective supply, which is shown in the upcoming analysis as S_e , in a small country,

is the sum of the upward-sloping domestic supply curve and the international supply curve. The international supply curve part is perfectly flat and elastic at the world price P_w since a small country cannot affect the world price. In this scenario, the new domestic price P_d' becomes equal to P_w .

Figure 4.7 Conceptual Equilibrium under a Free Trade Policy

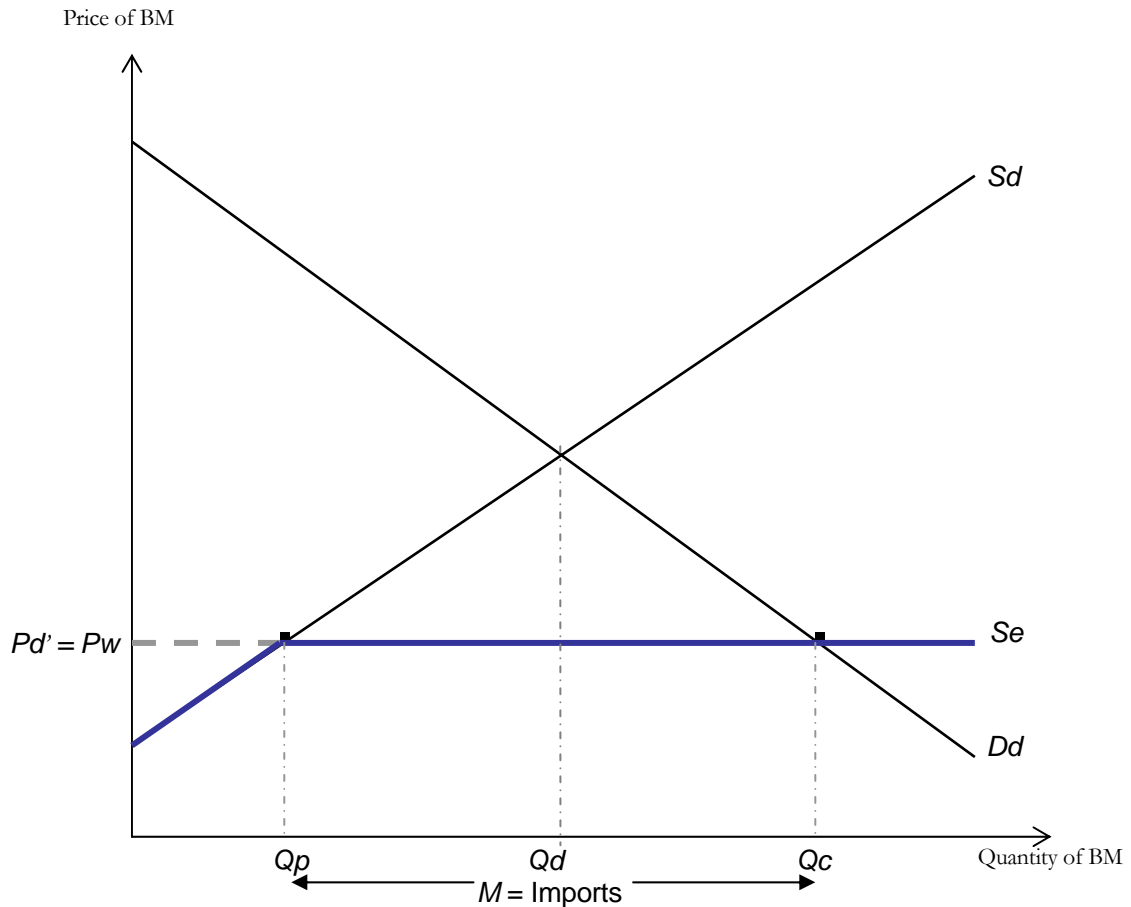


Figure 4.7 shows the supply and demand picture under free trade. Free trade policy results in lower domestic production Q_p (compared to Q_d) and an increase in consumption Q_c relative to the closed economy equilibrium. The difference in quantity between Q_p and

Q_c are covered by imports M . More importantly, free trade leads to lower prices for small importing nations. The domestic price becomes equal to the world price.

Figure 4.8 Conceptual Equilibrium under a Free Trade Policy - Producer Surplus

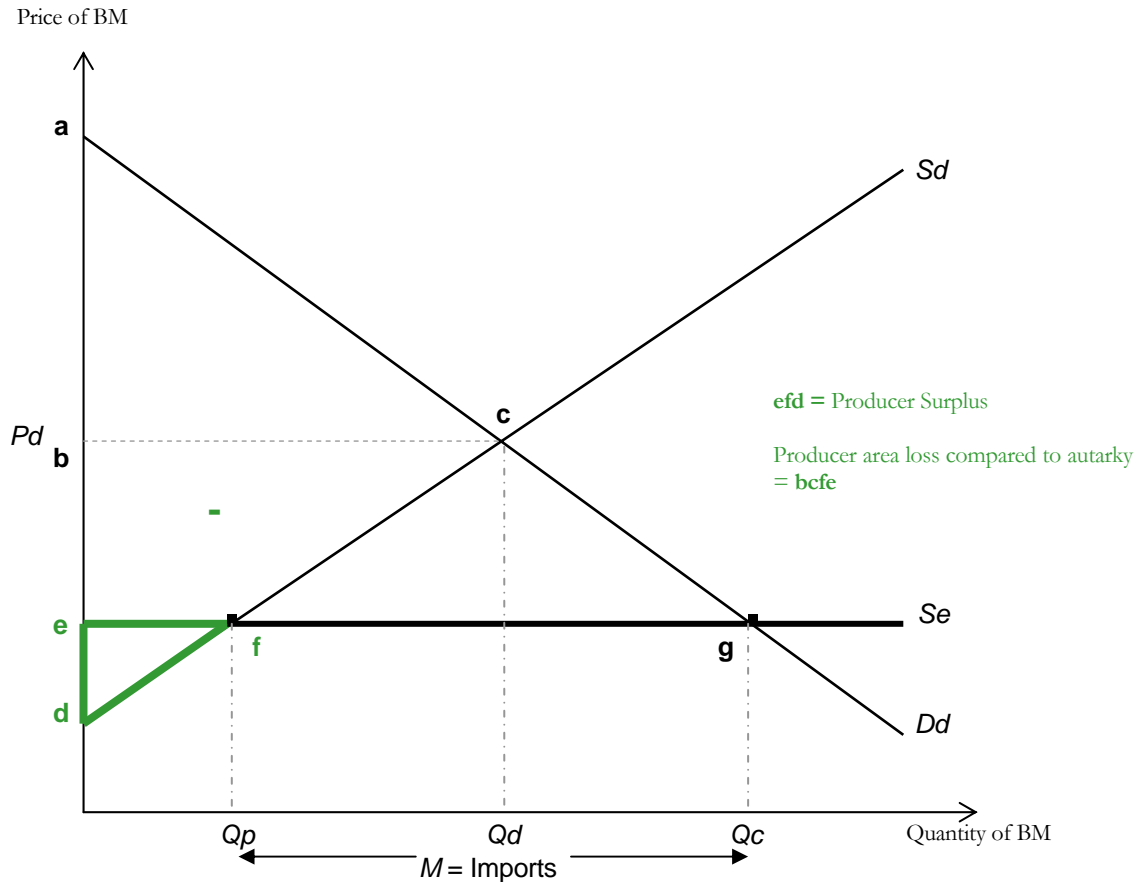
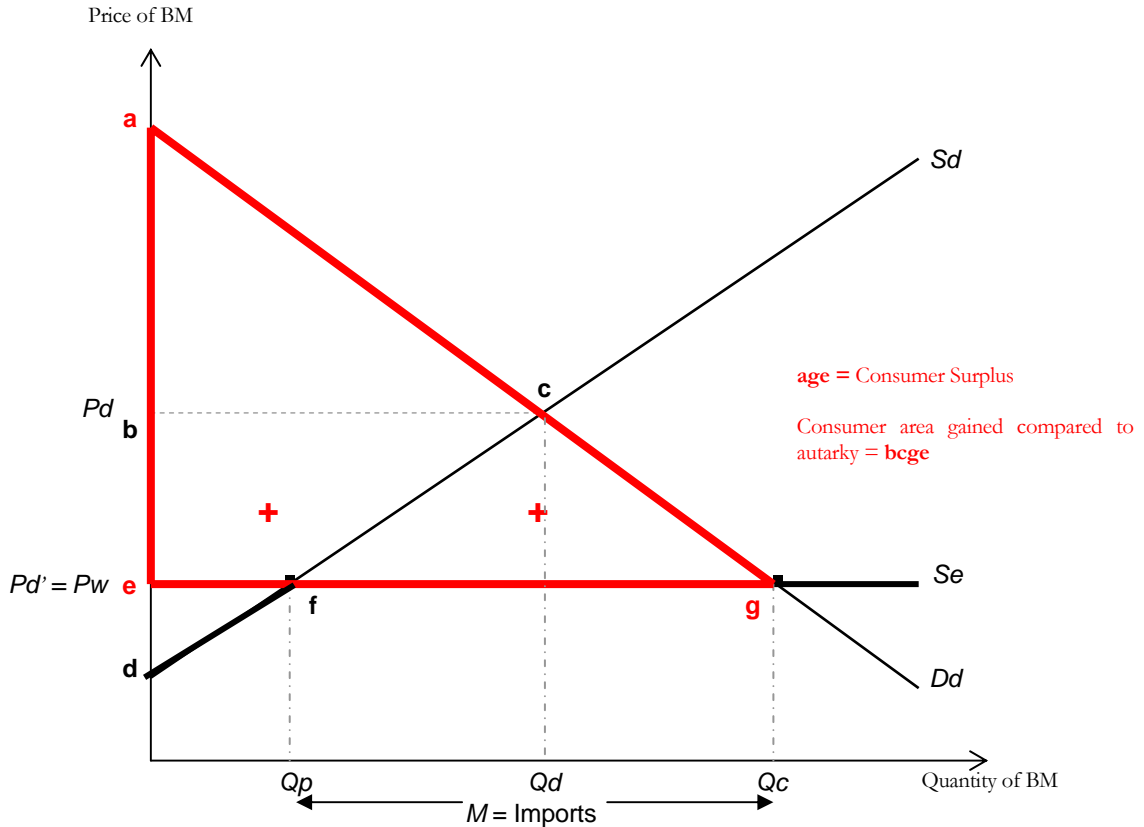


Figure 4.8 demonstrates the loss incurred by producers due to free trade and the new prevailing price P_w . The producer surplus decreased from area bcd to efd which means a net loss of area $bcfe$. Only producers who can compete with world price P_w will receive the surplus. Producers who cannot compete will exit the market and imports will replace the difference in production. Domestic production has decreased by $Q_d - Q_p$, while

consumption has increased by $Q_c - Q_d$. Since S_e is horizontal, the ROW will be able to supply any quantity that buyers are willing to pay for at P_w .

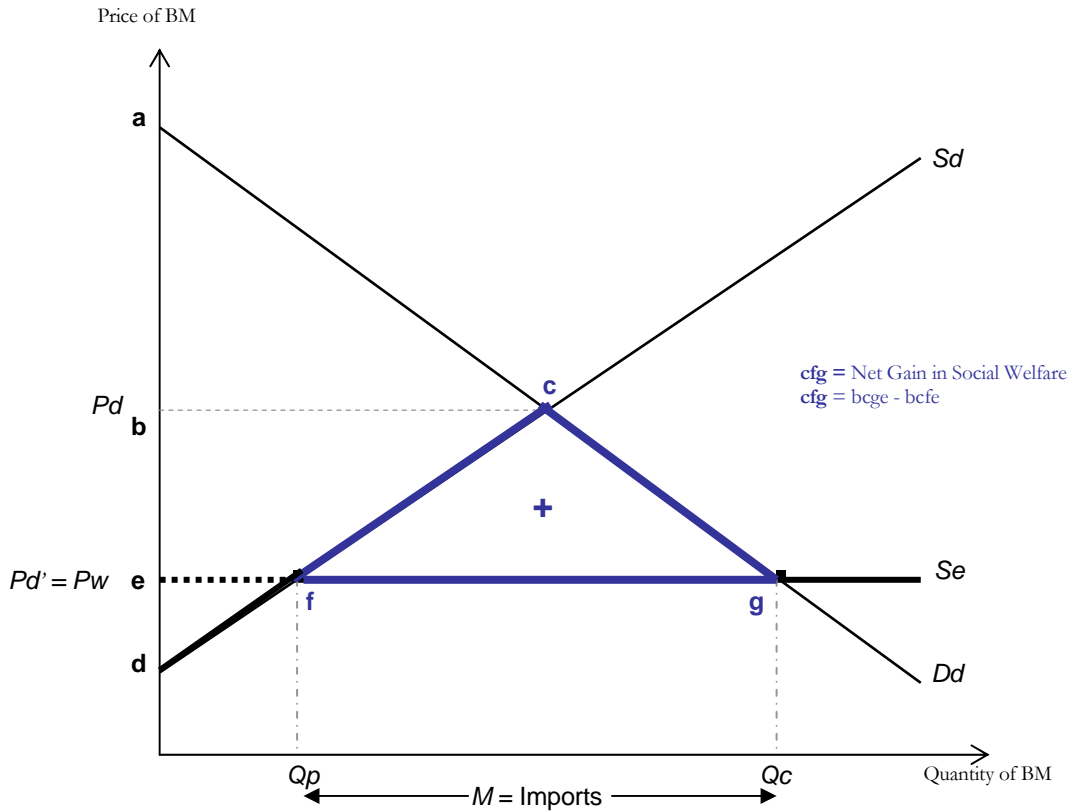
Figure 4.9 Conceptual Equilibrium under a Free Trade Policy - Consumer Surplus



On the other hand, Figure 4.9 shows the gain in consumer surplus due to free trade and which exceeds by far the loss to the producers. Consumer surplus increased from area abc to area aeg . This means that they gained the whole area $bcge$. Even if domestic production went down significantly (from Q_d to Q_p), buyers get to consume more (from Q_d to Q_c) as they are no longer bound to the PPF of their country. Their only boundary is the world supply and their willingness to pay at the P_w level. Since they save in monetary

terms, by paying Pw instead of Pd , and since they also increase their consumption, the combination results in a gain to consumer surplus exceeding the loss in producer surplus.

Figure 4.10 Conceptual Equilibrium under a Free Trade Policy - Net impact on Social Welfare



The gain in consumer surplus and the loss in producer surplus resulted in a net positive impact on social welfare. This net social welfare gain is shown in Figure 4.10 as area cfg which is the subtraction of producer surplus loss $bcfe$ from the consumer surplus gain $bcge$.

4.4.3 Import Quota Policy

The quota policy involves the introduction of limited free trade for a product (quantitative limit). Once the quantity under the quota is exhausted, over the quota imports

are taxed at the prevailing tariff rate. Usually, quotas are granted to other nations with whom a country has preferential trade status. Quotas in the red meat sector are very popular. One of the most famous issues related to quota granting is Australian sheep meat versus New Zealand sheep meat in the EU community. New Zealand has a preferential quota agreement with the EU compared to Australia due to its pre-existing strong agricultural ties with the United Kingdom and the existence of a quota with the UK prior even to the creation of the European common market.

Figure 4.11 Conceptual Equilibrium under an Import Quota Policy

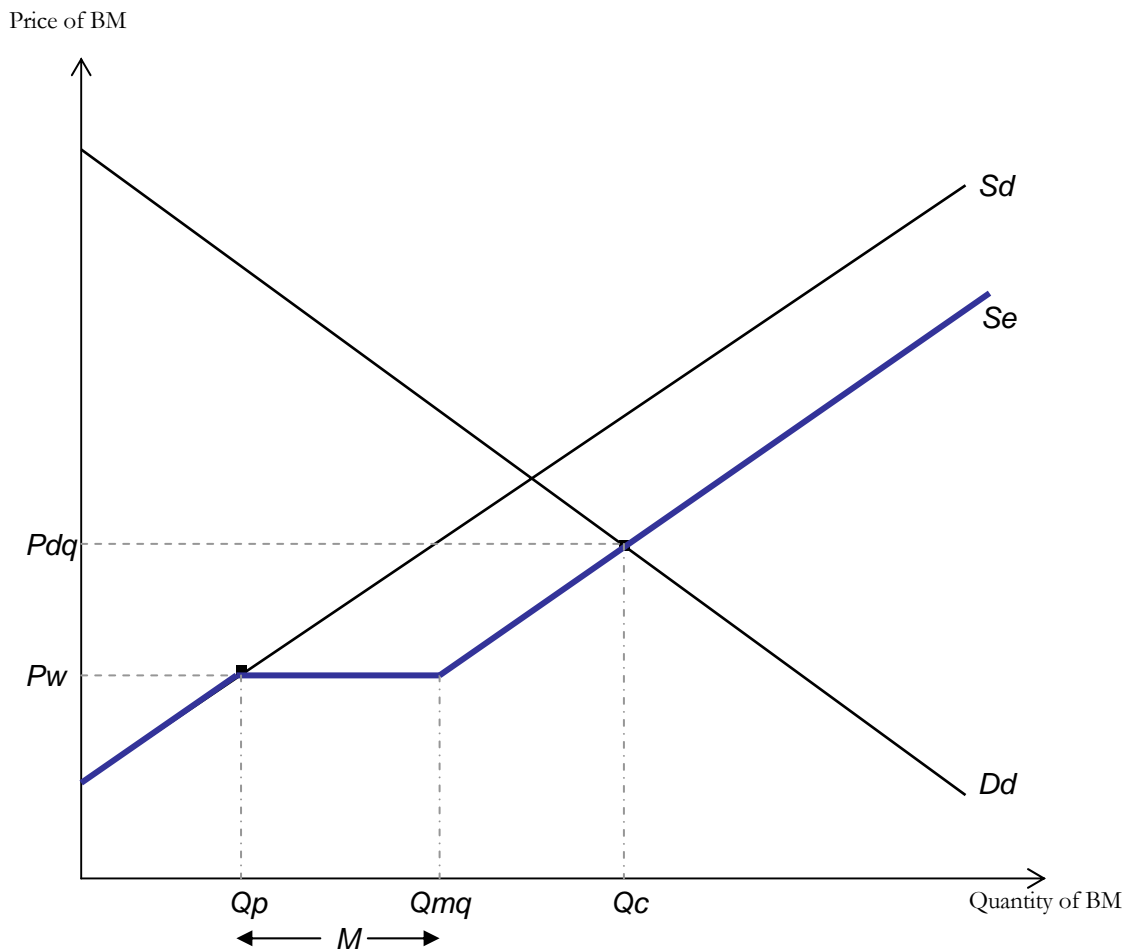
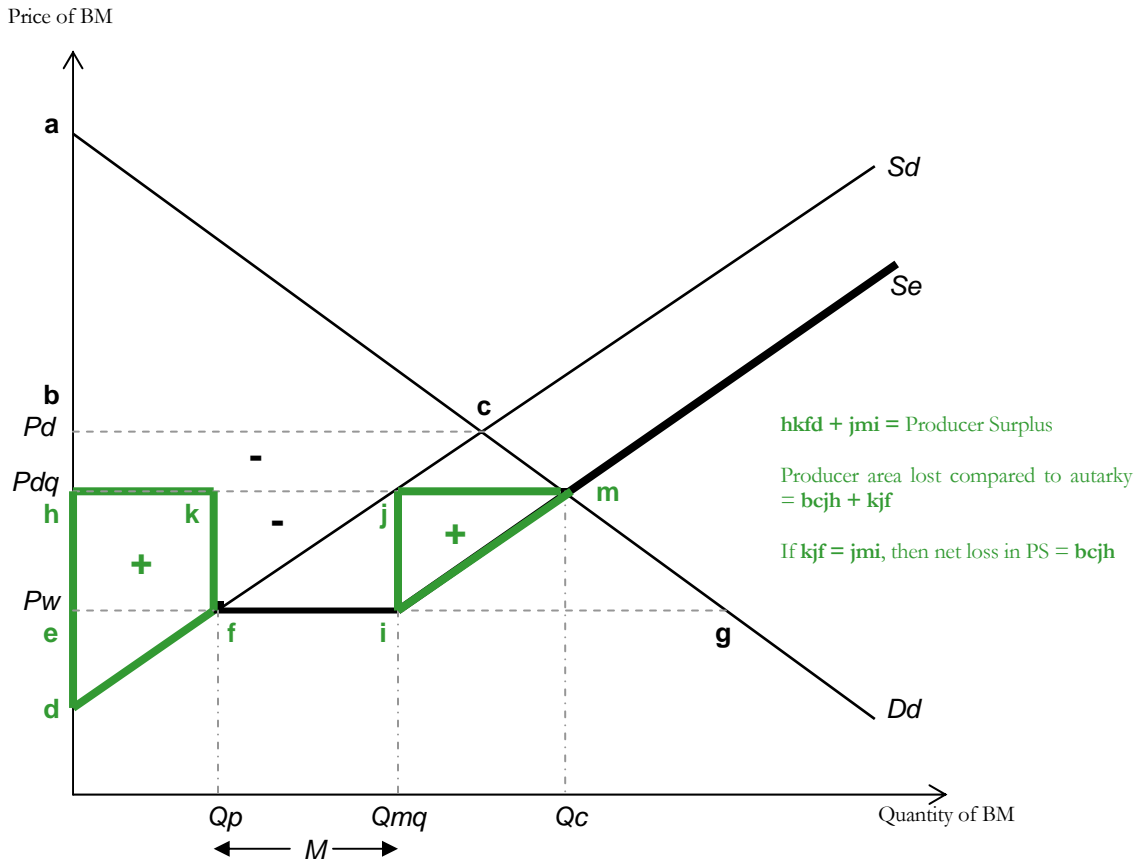


Figure 4.11 introduces the quota policy in the conceptual bovine meat market in Morocco. It is important to notice that at a price level under the world market price, the effective supply will correspond to the domestic supply curve which means that supply will come from domestic producers only. At price level P_w , the ROW is willing to supply any amount Morocco will allow. Since the country will only allow quantity $M = Q_{mq} - Q_p$ under the import quota agreement with the ROW, the only way for the domestic market to be supplied with the product after the import has been exhausted is for domestic producers to increase production, which requires a higher price P_{dq} . This is the reason why S_e comes back to an upward sloping shape for quantities above Q_{mq} . P_{dq} is the new equilibrium domestic price that producers adjust to when the quota import is over, however, it is still lower than the original price of P_d under autarky.

Figure 4.12 Conceptual Equilibrium under an Import Quota Policy - Producer Surplus

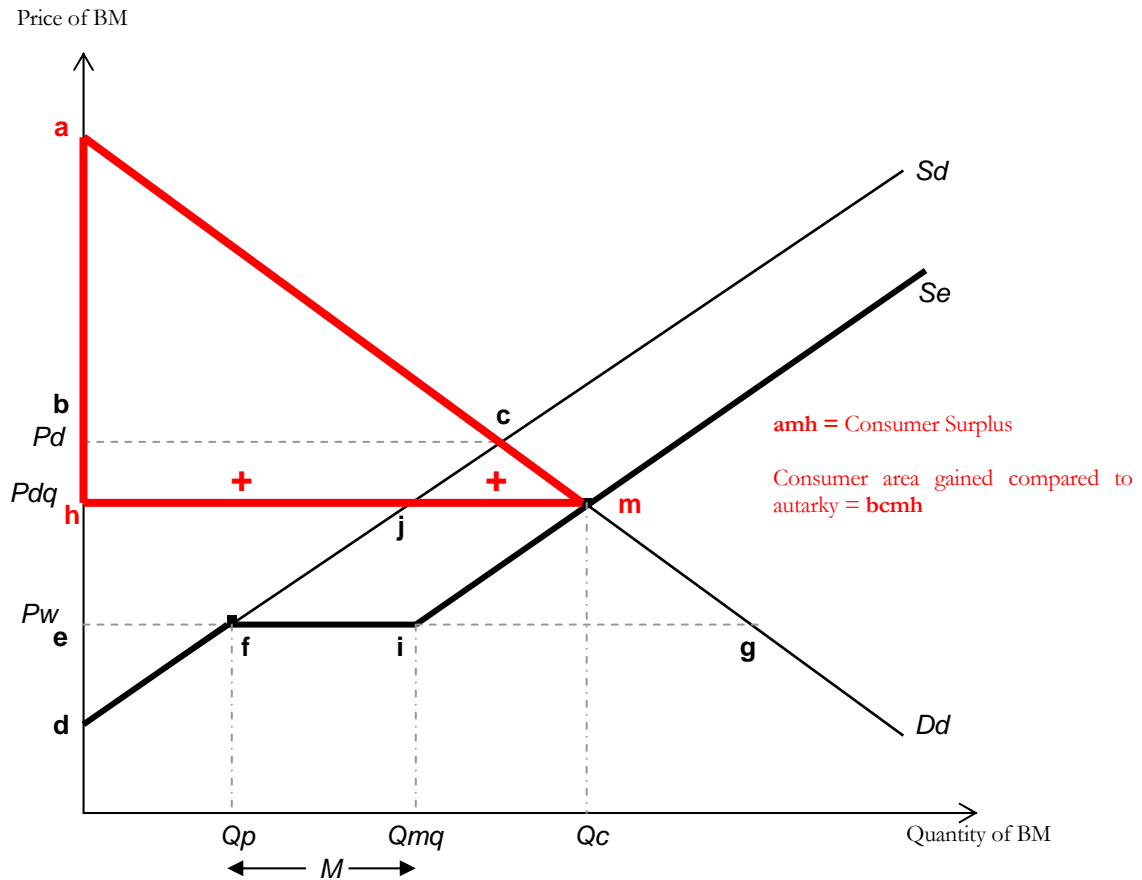


Gains from trade will differ from the free trade scenario as they will be limited to the quota part. In this study, all trade policy outcomes on social welfare will be compared with the initial autarky scenario. This means that our analysis of change in consumer and producer surplus in free trade, import quota and TRQ situation will be based on a comparison with the initial autarky situation (not with free trade scenario) and so on.

Figure 4.12 demonstrates the change in producer surplus when an import quota policy is introduced. The figure shows that compared to autarky, producers will lose in net terms area $bcjh$. This area is smaller than what they have lost under free trade because

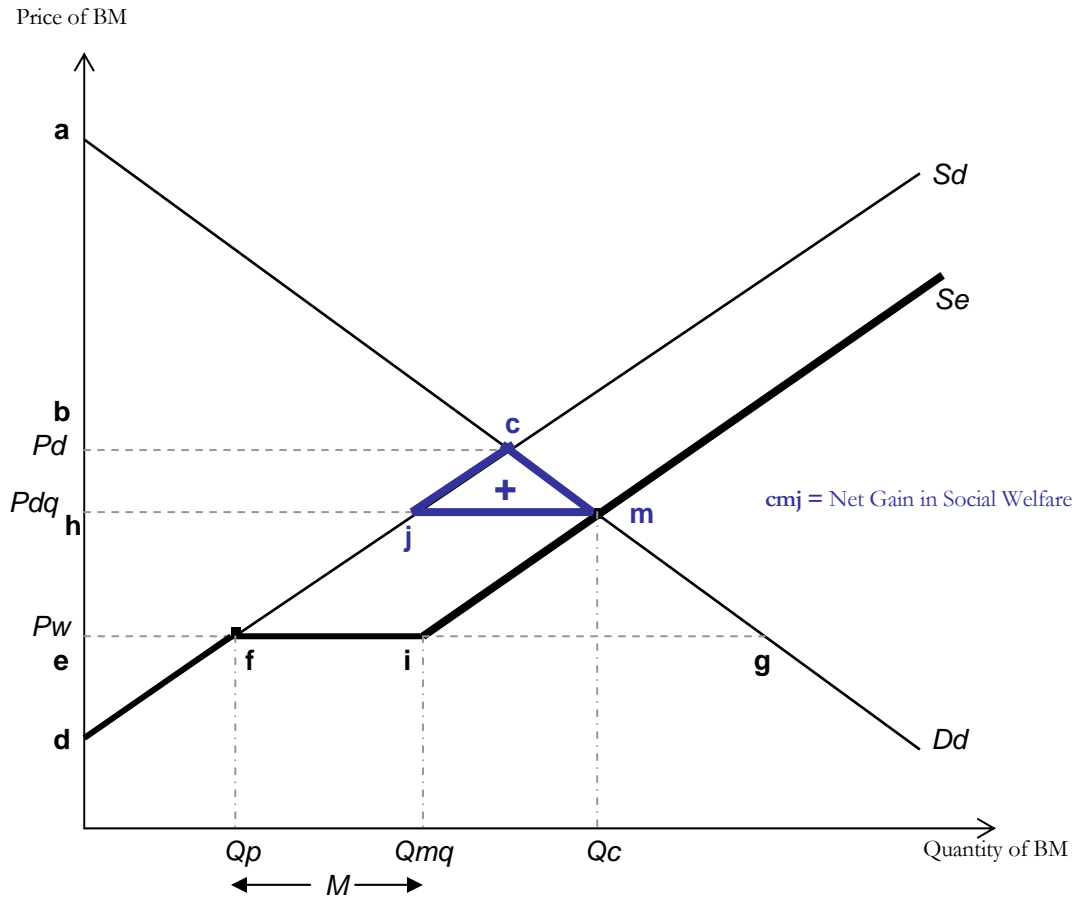
producers will still be able to supply their product after the quota expires and charge a price of Pdq which is higher than Pw . Producers will supply Qp in addition to $Qc - Qmq$.

Figure 4.13 Conceptual Equilibrium under an Import Quota Policy - Consumer Surplus



On the other hand, consumer surplus will increase under an import quota policy compared to a protectionist policy but not as much as under free trade. Figure 4.13 illustrates this increase in consumer surplus which is shown as area $bcmh$. The distance $Qmq - Qp$ is the quantity imported under the quota agreement will allow buyers to consume more and pay less (Pdq instead of Pd).

Figure 4.14 Conceptual Equilibrium under an Import Quota Policy - Net impact on Social Welfare



The gain brought to consumers through the import quota compared to a closed economy does exceed the loss that is incurred by producers. This means that social welfare will witness a net gain. The above figure shows the net welfare gain as cmj . Again, the net gain compared to autarky exists but it is much smaller compared to a free trade scenario (triangle cmj versus cgf).

4.4.4 Tariff-Rate Quota Policy (TRQ)

A TRQ is a quantity limit on imports below which a reduced in-quota tariff is charged on imports. Most of the time the agreement will allow the quota quantity itself to

become duty free over time while the above-quota quantity will be taxed at a preferential or diminishing rate. Also, in order to account for seasonality of local production, the TRQ agreement could set a certain time period in the year during which imports will cease after the in-quota quantity is exhausted (example: 3 months after). Once imports resume under the TRQ terms, the above-quota imports will be taxed at the preferential rate.

The above example is the one that we use in this study since it is close to reality. Such a policy is also popular within protectionist countries and will allow the Government to maintain long term tariff revenues on imports and still insure commercialization of domestic production during high season periods. At the same time, the policy will give preferential access to countries to which the TRQ has been granted.

Figure 4.15 Conceptual Equilibrium under a Tariff-Rate Quota (TRQ) Policy

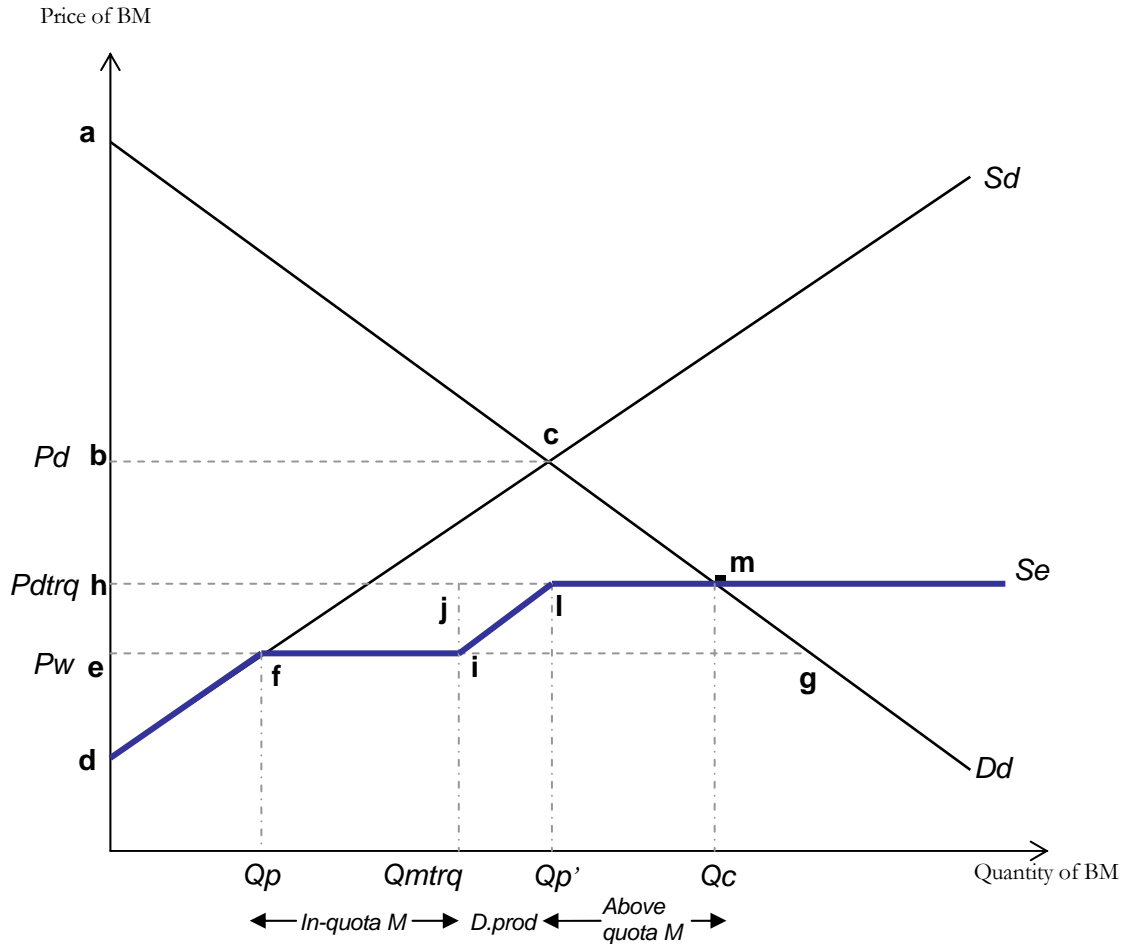


Figure 4.15 demonstrates an equilibrium situation in the case of a TRQ in which the in-quota tariff is null, while the above-quota tariff is a reduced preferential tariff granted to the ROW. In the above example we will make the following assumptions:

- Under the TRQ terms, the Government of Morocco will ban imports during 3 months each year in order to allow local producers to sell during a sensitive period of the year.

- The above-quota preferential tariff (under the TRQ terms) is considerably lower than the prohibitive tariff under autarky. This makes the ROW still very competitive compared to Morocco producers when the above-quota is implemented. A preferential tariff will also generate revenue to the Government considering that a 254 percent prohibitive tariff rate under autarky does not generate any revenue.

These assumptions imply that the effective supply Se adjusts to the situation. Se slopes upward as long as domestic producers can supply under the Pw level. Then, the curve becomes flat when the in-quota rate (0 percent) is introduced. Effective supply will slope upward again between Pw and $Pdtrq$ during the import ban period. As the competing production becomes exhausted and as imports are allowed back under the TRQ terms; exporters from the ROW will supply the difference at the price level of $Pdtrq$. Since there is no limit on the above-quota quantity, and since the ROW can sell without competition at $Pdtrq$ level; Se which becomes world supply, will flatten again because Moroccan consumers cannot affect the world price.

Figure 4.16 Conceptual Equilibrium under a Tariff-Rate Quota (TRQ) Policy - Producer Surplus

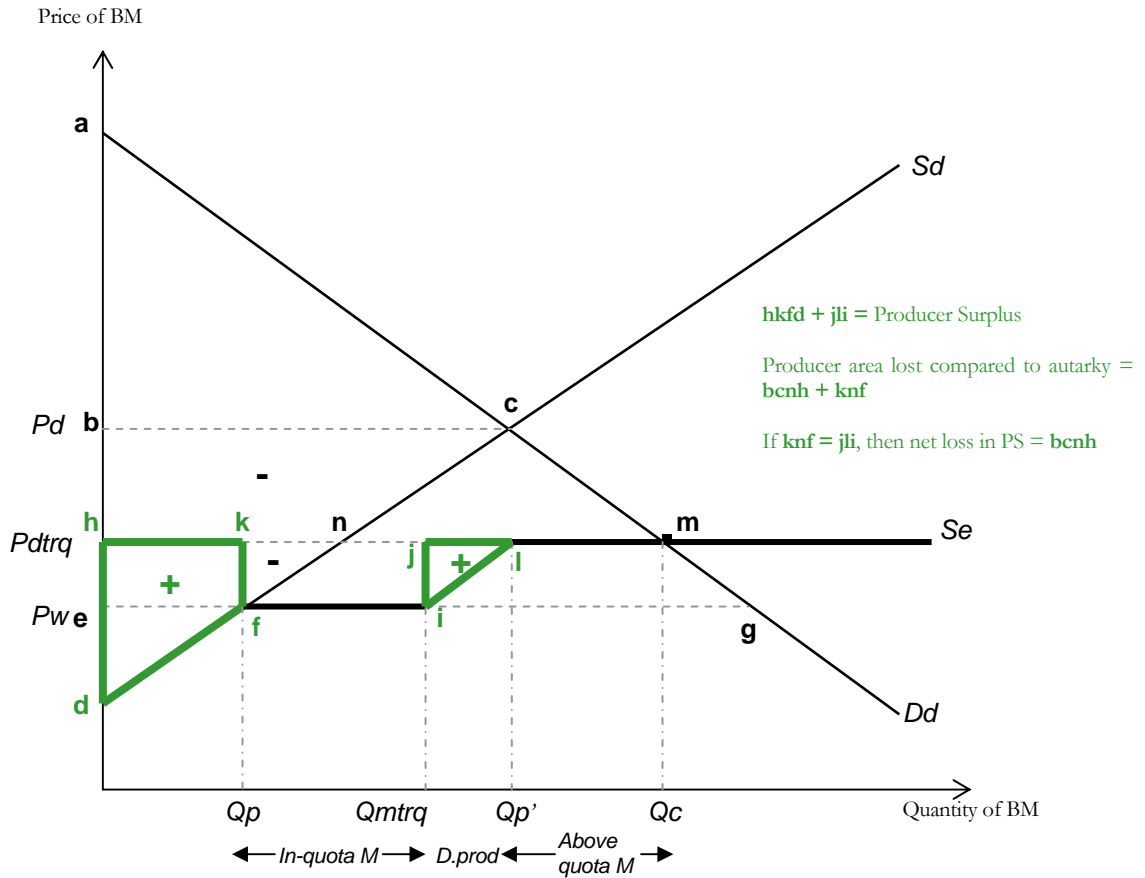
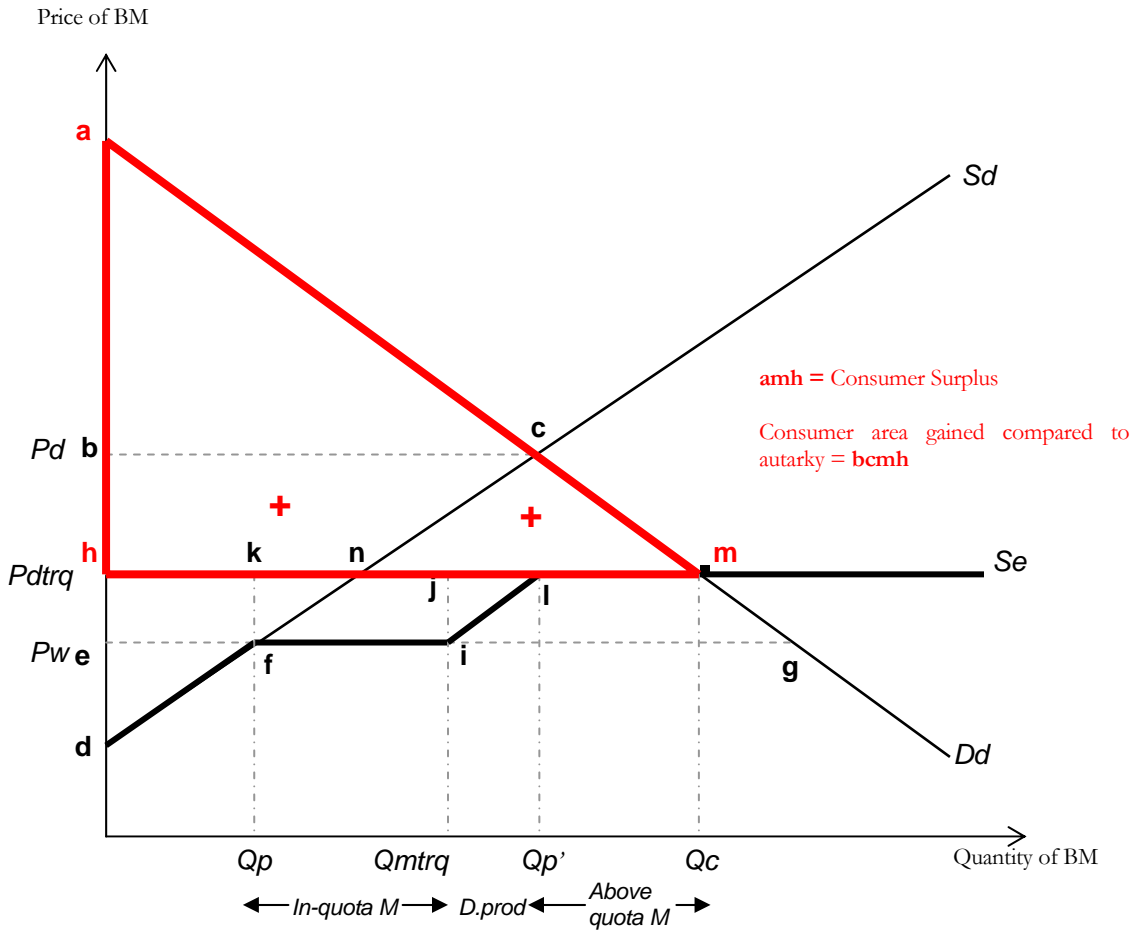


Figure 4.16 determines the change in producer surplus due the TRQ agreement.

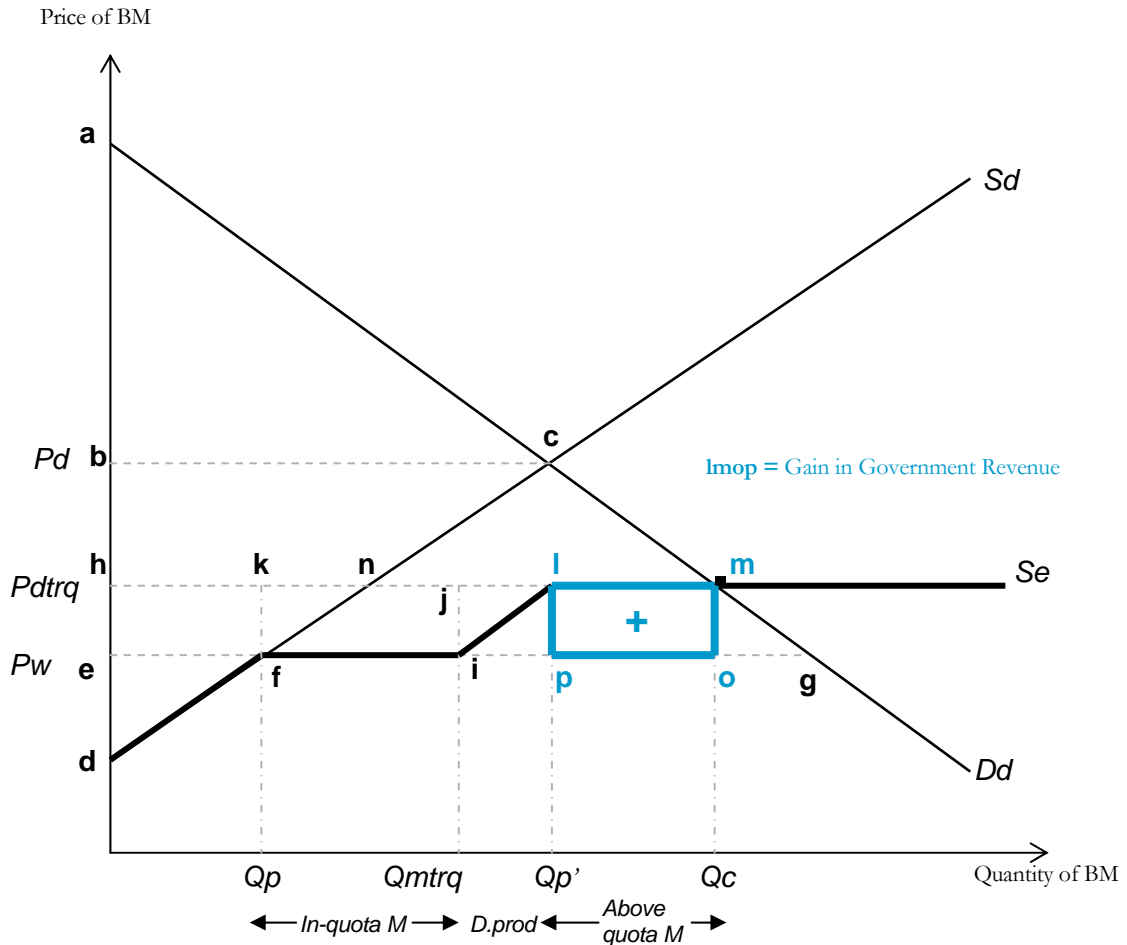
Here, we do make another assumption which is that the gained area jli which is gained by producers due to the import ban period will be offset by the loss of area knf which belonged to producers under autarky. Therefore, the net loss in producer surplus compared to autarky is area $bcnh$.

Figure 4.17 Conceptual Equilibrium under a Tariff-Rate Quota (TRQ) Policy - Consumer Surplus



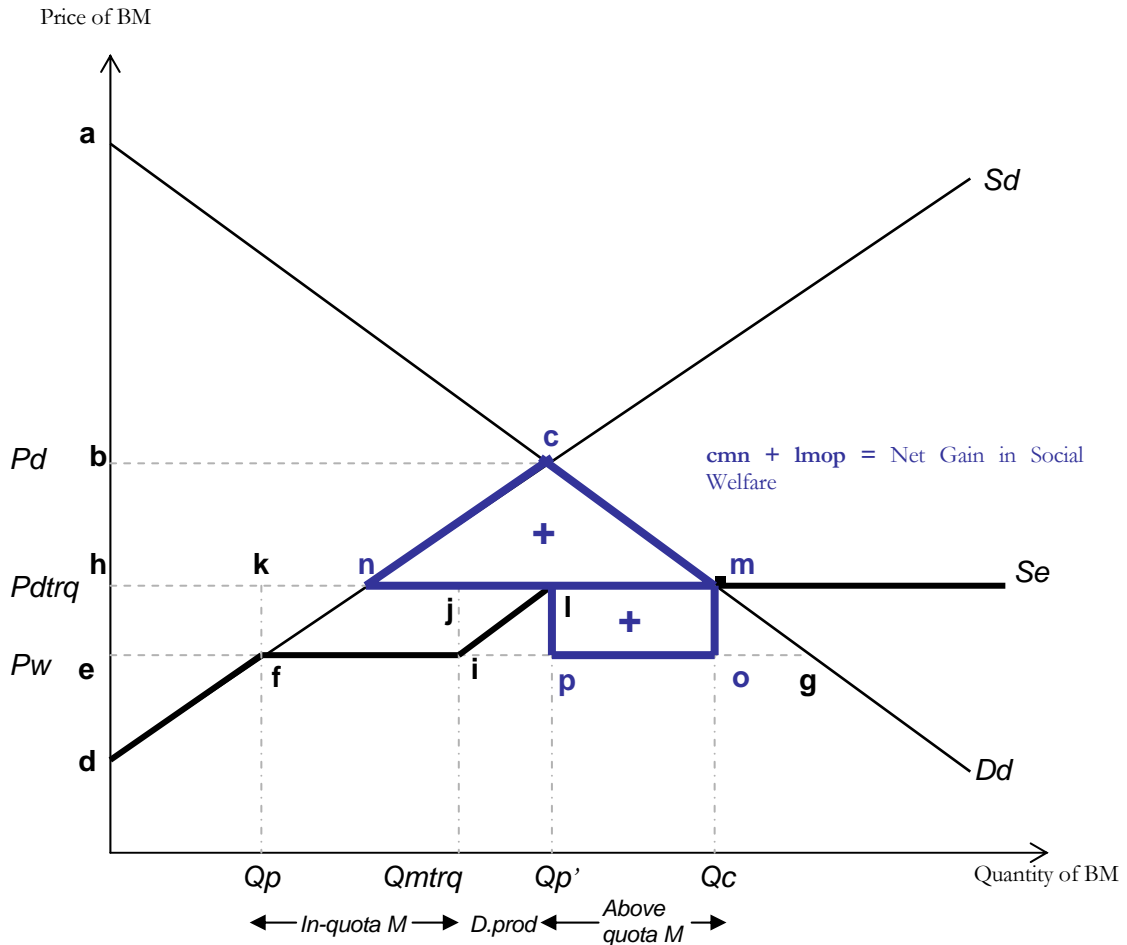
Consumer surplus clearly benefits from the TRQ agreement and gains area ***bcmh*** compared to autarky and as shown in Figure 4.17. In our case and given that the TRQ terms provide for preferential above-quota tariffs, making prices from the ROW still competitive; the gain made in consumer surplus should exceed the one made in the simple import quota policy (Figure 4.13).

Figure 4.18 Conceptual Equilibrium under a Tariff-Rate Quota (TRQ) Policy – Government Revenue



The TRQ policy will also generate revenue to the Government during the above-quota period. This gain in Government revenue is depicted in area **lmop** in Figure 4.18. The above-quota preferential tariff ($P_{dtrq} - P_w$) is behind this gain. This is an important gain simply because the Government does not currently have any revenue given the absence of imports caused by prohibitive tariff rates. Also, a simple import quota with 0 percent tariff would not generate any Government revenue.

Figure 4.19 Conceptual Equilibrium under a Tariff-Rate Quota (TRQ) Policy - Net impact on Social Welfare



The above figure shows the result of the net gain to social welfare from a TRQ policy. The net benefit in comparison with autarky is represented by area $cmn + lmop$. The area is the difference between the net gain in consumer surplus and the net loss in producer surplus in addition to the gain in Government revenue.

It is worth noting that a TRQ scenario (using the TRQ terms we assumed) leads to a much higher gain in social welfare compared to a simple quota policy. Comparing area $cmn + lmop$ in Figure 4.19 and area cmj in Figure 4.14 illustrates this big difference in welfare gain.

4.5 Conclusion

Through the application of economic theory covered in this chapter, we modeled the different trade policies of interest (protectionism, free trade, import quota and tariff-rate quota) to demonstrate the impact each has on producers, consumers and social welfare.

Even though the conceptual model does not use numerical data to estimate gains and losses in monetary terms, the results of the model clearly shows the different effects each trade policy has and the positive impact of bovine meat trade openness.

Considering the conceptual model and the different assumptions we have made so far, we are able to derive the following hypotheses:

- Free trade, import quota and TRQ policies, all have an advantage over protectionism (autarky) in terms of net gains in social welfare.
- When we use protectionism as a basis for comparison, the other three policies all bring a net gain to consumers and a net loss to producers but at different degrees.
- Free trade would bring the largest net benefit to social welfare followed by TRQ, then the import quota.
- A TRQ is the only policy that could generate Government revenue.

Chapter Five will test the above hypotheses by building an empirical model and assigning monetary figures to each variable.

CHAPTER V: EMPIRICAL MODEL, POLICY SIMULATION AND WELFARE ANALYSIS

This chapter puts life into the conceptual model and attempts to test the hypotheses and to find the necessary evidence for gains from trade and its net positive impact on social welfare. As in the conceptual model, we will simulate the four main trade policies of interest: protectionism, free trade, import quota and TRQ. We will also analyze the impacts on consumer surplus, producer surplus and net welfare, all in comparison with the starting point: autarky. It is essential to note that the empirical model's importance lies within its monetary results.

Finally, we will summarize the simulation results into a Policy Analysis Matrix (PAM) and we will use a Sensitivity Analysis Matrix (SAM) to determine how sensitive these results are to variation in the price elasticity of demand and supply.

5.1 Data

This research relied on the following sources of data: FAO, Ministry of Agriculture of Morocco and MLA. On the other hand, and for the sake of consistency, the empirical model part relied solely on FAO data except for price elasticity.

The required data is to be used to estimate the demand and supply functions in terms of price as a function of quantity while holding other variables constant.

Demand price function:

$$P f(Q) = b + mQ$$

Supply price function:

$$P g(Q) = b' + m'Q$$

In order to estimate demand and supply price functions, where P is the price of bovine meat in USD per metric ton and Q is the quantity of bovine meat in metric tons, we needed to have necessary data for Price (P), Quantity (Q) and elasticity (ϵ).

Elasticity ϵ will be used to estimate the demand and supply functions' slopes (m and m') since $m = P / (Q\epsilon)$. This is found through the following derivation:

$$\epsilon = (\Delta Q / \Delta P) \times (P / Q)$$

$$\Delta Q / \Delta P = (Q\epsilon) / P$$

$$\Delta P / \Delta Q = m = P / (Q\epsilon)$$

- Price: We used a 10-year average producer price for both Morocco and the ROW. In the case of ROW, we used a weighed average based on quantities produced in each country. Table 5.1 displays the producer price of bovine meat in USD per MT in Morocco while Table 5.2 shows the producer prices of bovine meat in USD per MT for ROW. The ROW includes the following countries: Australia, US, France and Argentina. The prices used are nominal prices since inflation rate between 1997 and 2006 was minimal. For instance, average inflation (1997-2006) was less than 2% (World Bank, World Development Indicators Database, 2007).

Table 5.1 Morocco Producer Nominal Price for Bovine Meat in USD per MT (1997-2006)

Year	USD per MT
1997	5 353
1998	5 602
1999	5 487
2000	4 442
2001	4 273
2002	4 891
2003	5 995
2004	6 770
2005	6 069
2006	5 364
10 yr av	5 425

Source: FAOSTAT – PriceSTAT

Table 5.2 ROW Producer Nominal Price for Bovine Meat in USD per MT (1997-2006)

Year	USD per MT
1997	2 504
1998	2 446
1999	2 451
2000	2 582
2001	2 606
2002	2 461
2003	2 928
2004	3 182
2005	3 411
2006	2 651
10 year avg	2 722

Source: FAOSTAT – PriceSTAT

Appendix F and E include data on ROW producer nominal price and production respectively. These were used to calculate a weighted average producer price for the ROW.

- Domestic price P_d = USD **5425** per MT and
- ROW price P_w = USD **2722** per MT.

- Quantity: Since domestic production in Morocco covers nearly 100% of domestic demand, we have used a 10-year average of the production quantity of bovine meat.

Table 5.3 Production of Bovine Meat in Morocco (1997-2006)

Year	Quantity in MT
1997	125 000
1998	120 000
1999	135 000
2000	140 000
2001	145 000
2002	170 000
2003	150 000
2004	140 000
2005	150 400
2006	150 000
10 year avg	142 540

Source: FAOSTAT – ProdSTAT

In the current circumstances, quantity produced domestically equals quantity consumed. $Q_d = Q_c = 142,540$ MT.

- Elasticity:
 - Price elasticity of demand $\epsilon_d = -1.633$

The elasticity of demand was sourced from a study by Mdafri and Brorsen (1993) on demand for red meat, poultry and fish in Morocco.

- Price elasticity of supply $\epsilon_s = 0.80$

The elasticity of supply was sourced from ANPVR (National Association of Red Meat Producers) in a study by Chafai (2004).

Using the above data, we can estimate both the demand function and supply function within a partial equilibrium model while other variables are held constant:

- Demand function: $P f(Q)$

$$P = b + mQ, \text{ where } P = 5425, Q = 142,540 \text{ and } \epsilon d = -1.633$$

$$\text{The slope } m = P / Q\epsilon d = -0.023$$

$$\text{By replacing } m, P \text{ and } Q, \text{ we find: } b = 8747.10$$

The bovine meat demand function (Price as a function of Quantity) is:

$$P = 8747.10 - 0.023 Q$$

- Supply function: $P g(Q)$

$$P = b' + m'Q, \text{ where } P = 5425, Q = 142,540 \text{ and } \epsilon s = 0.8$$

$$\text{The slope } m' = P / Q\epsilon s = 0.047$$

$$\text{By replacing } m', P \text{ and } Q, \text{ we find } b' = -1356.25$$

The bovine meat supply function (Price as a function of Quantity) is:

$$P = -1356.25 + 0.047 Q$$

5.2 Empirical Model Assumptions

We will keep similar, but more refined assumptions compared to the conceptual model:

- The two countries consist of: Morocco (small nation with no effect on international price) and the ROW. The ROW will include for the sake of our research: Australia, United States, Argentina and France. The choice of these countries to be included in the ROW is based on either existing trade agreements (US and France) or fully approved sanitary status by Moroccan authorities (Australia and Argentina).
- There is perfect competition.
- Prices of substitutes and complimentary goods are held constant.
- Morocco does not have either an absolute or comparative advantage in the production of bovine meat.
- Moroccan consumers of bovine meat are price sensitive. Price elasticity of demand (ϵ_d) is -1.633 (Mdafri and Brorsen 1993).
- Price elasticity of supply (ϵ_s) is 0.8. This figure is commonly used for bovine meat supply (Chafai, ANPVR, 2004).
- There are no transport costs.
- In order to be consistent with our statistical database, bovine meat excludes edible offal and fats.

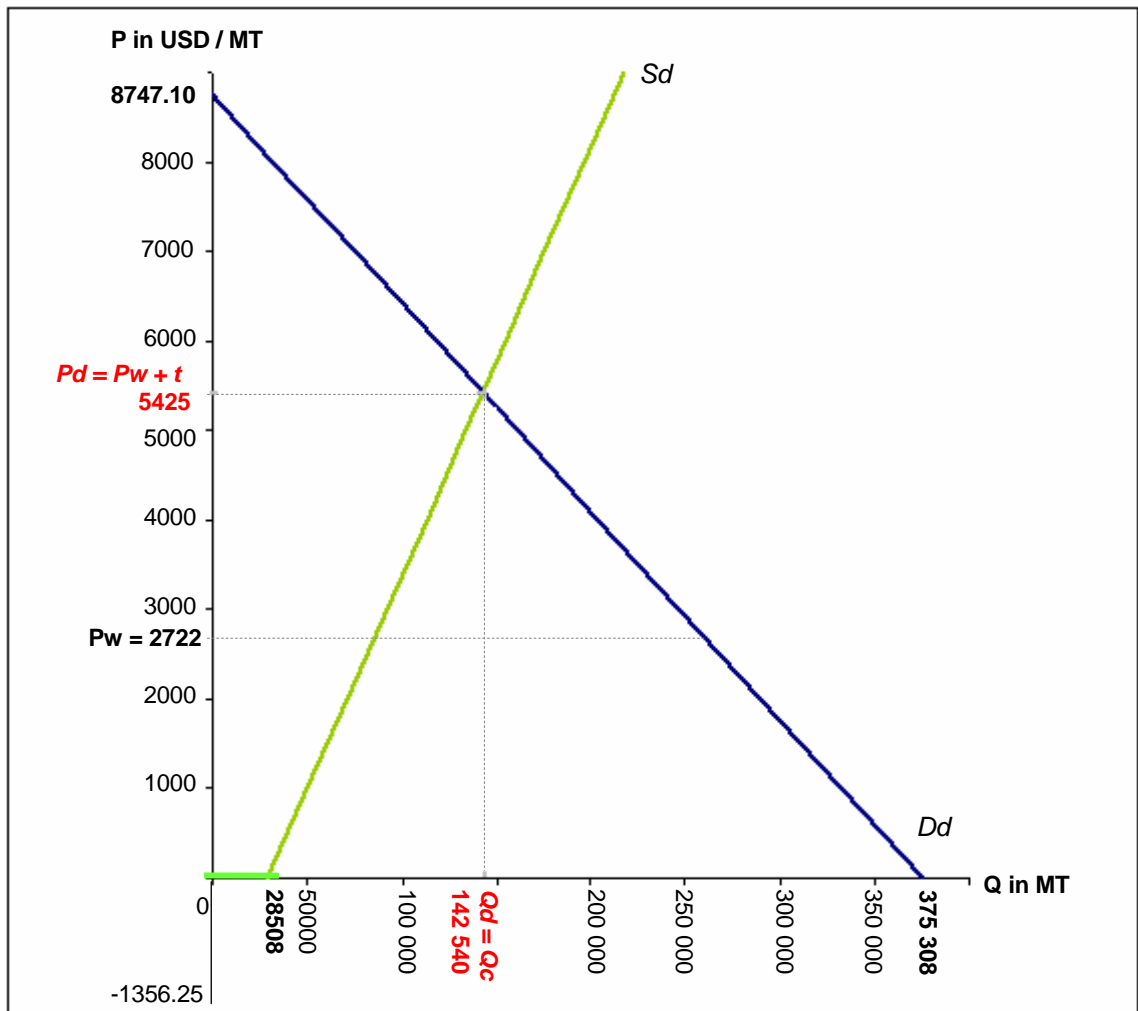
5.3 Trade Policy Simulation and Welfare Analysis

We have used the researched data and the derived supply and demand functions to produce computer generated supply and demand curves and simulate a partial equilibrium model across the four trade policies.

5.3.1 Protectionist Policy

Figure 5.1 in the next page shows the actual market demand and supply curves and equilibrium given the current state of autarky and a prohibitive tariff rate.

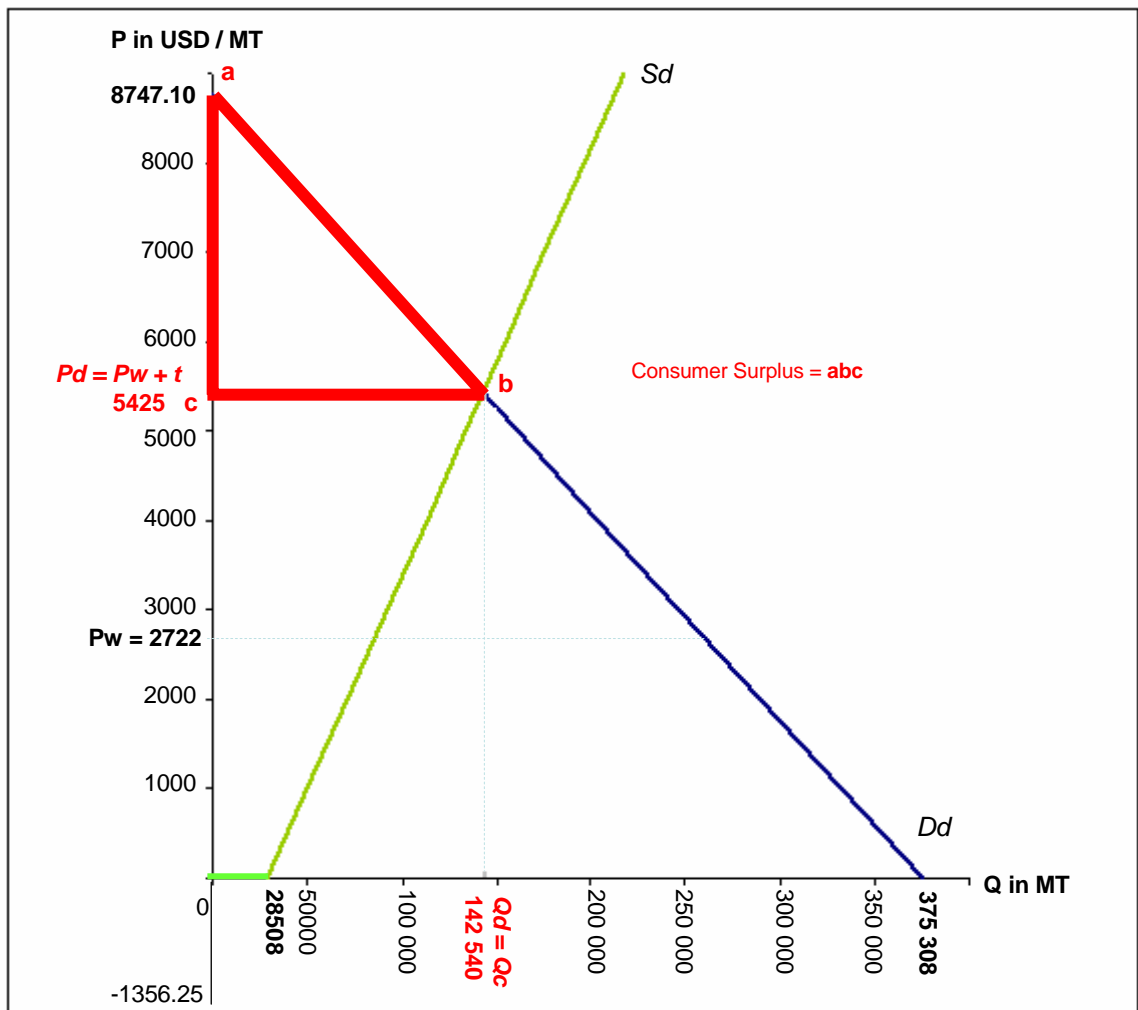
Figure 5.1 Empirical Equilibrium under a Protectionist Policy



The equilibrium model in a protectionist scenario gives us price $Pd = Pw + t$ and $Qc = Qp$ at the levels we have found in the previous section. At equilibrium, $Pd =$ USD 5425 per MT, and $Qc = Qp = 142,540$ MT. Under autarky, all domestic consumption is covered by domestic production. We should note that the current tariff of 254 percent was set decades ago and does not reflect the actual difference between Pd and Pw .

Figure 5.2 shows the size of the consumer surplus (CS).

Figure 5.2 Empirical Equilibrium under a Protectionist Policy – Consumer Surplus



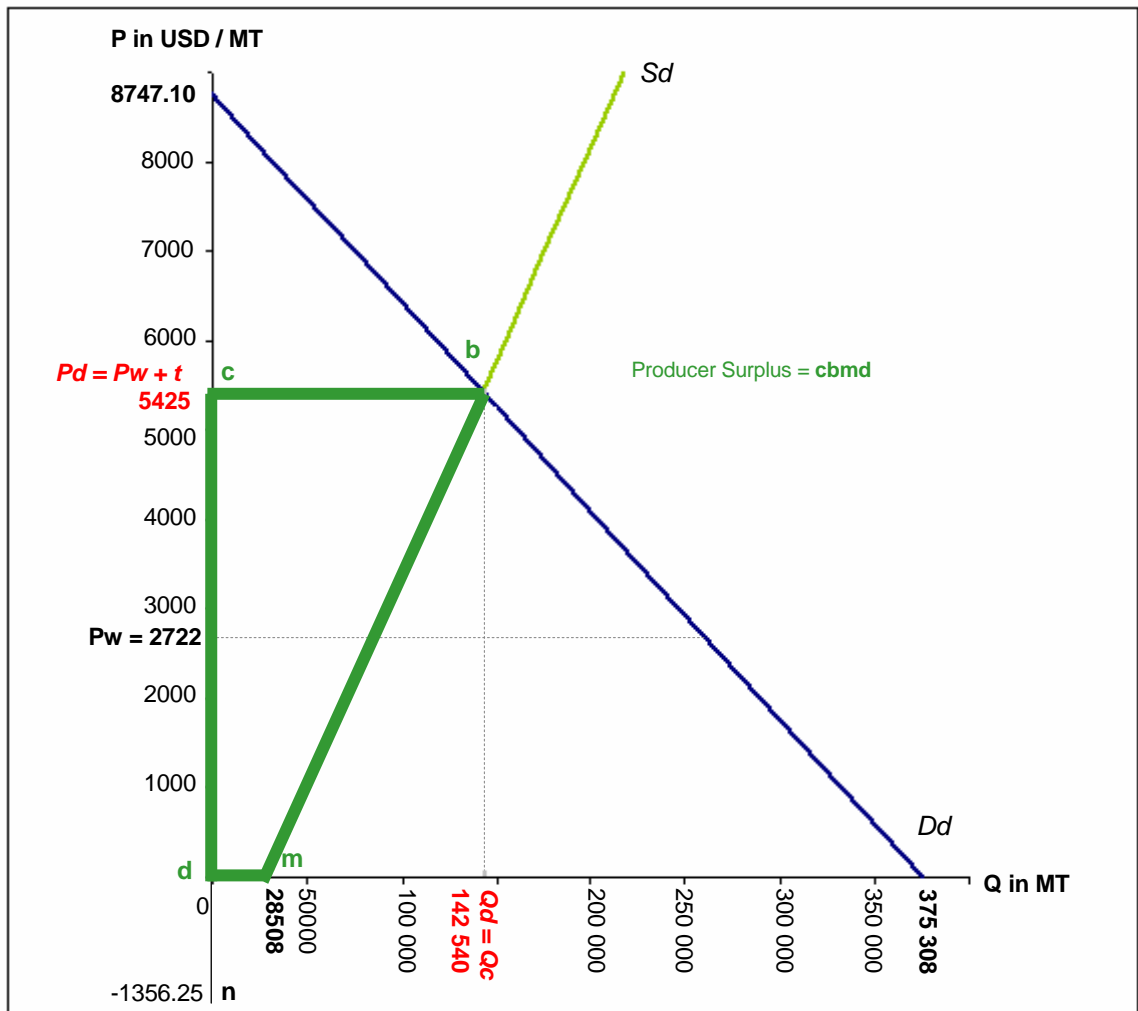
Consumer surplus (CS) would be equal to area *abc*. Triangle area *abc* would equal to line *ac* times line *bc*, divided by 2.

This gives us:

$$CS = \text{USD } 236,766,067.00$$

The next figure 5.3 shows the size of the producer surplus (PS).

Figure 5.3 Empirical Equilibrium under a Protectionist Policy – Producer Surplus



Producer surplus (PS) would be equal to area *cbmd*. We will calculate the area of triangle *cbn* and subtract triangle *dmn* from the total $(28,508 \text{ MT} \times 1356.25) / 2 = \text{USD } 19,331,987.50$.

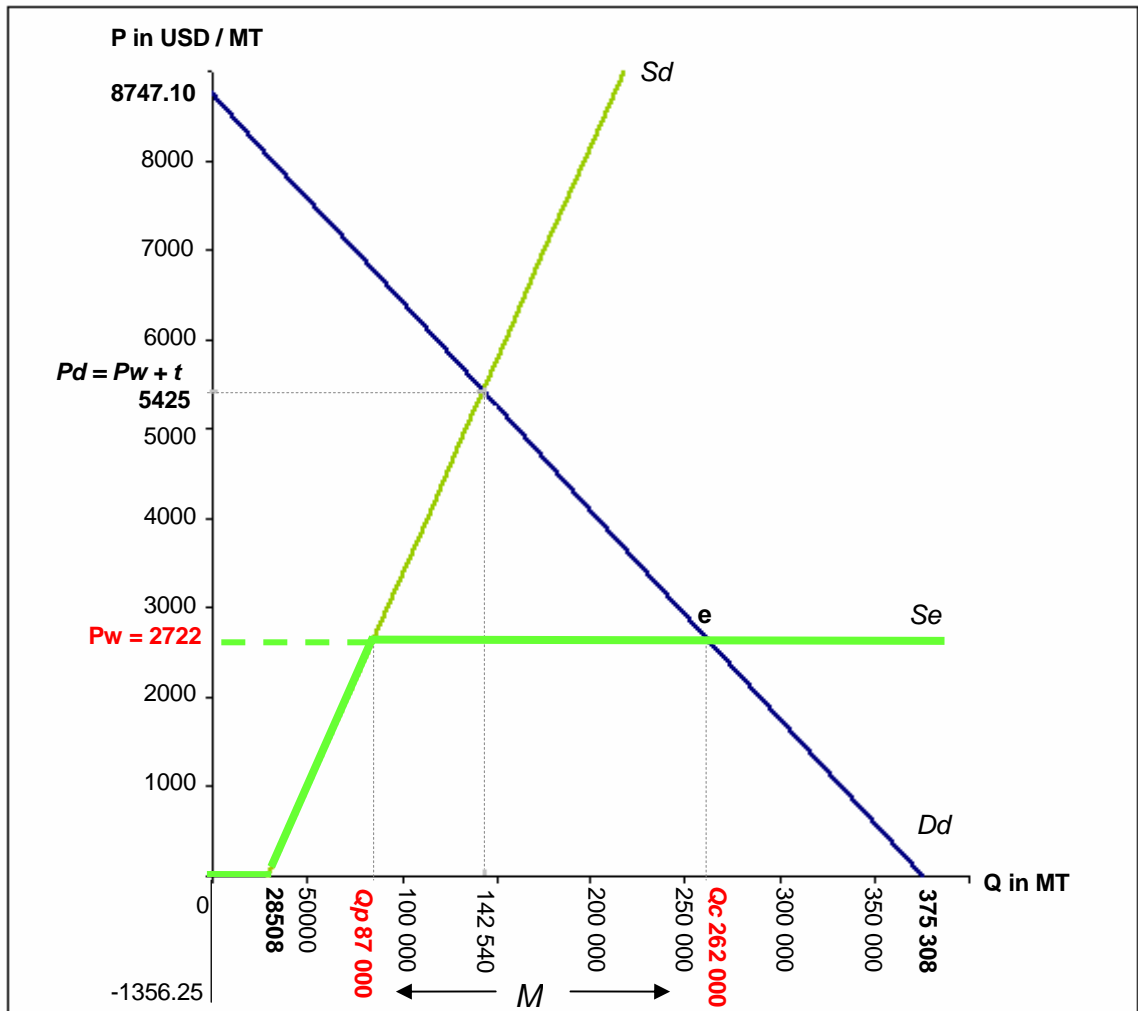
This gives us: $\text{PS} = ((5425 + 1356.25) \times 142,540) / 2 - \text{USD } 19,331,987.50$

$$\text{PS} = \text{USD } 463,967,700.00$$

In the protectionism scenario, producers have about two times more surplus than consumers.

5.3.2 Free Trade Policy

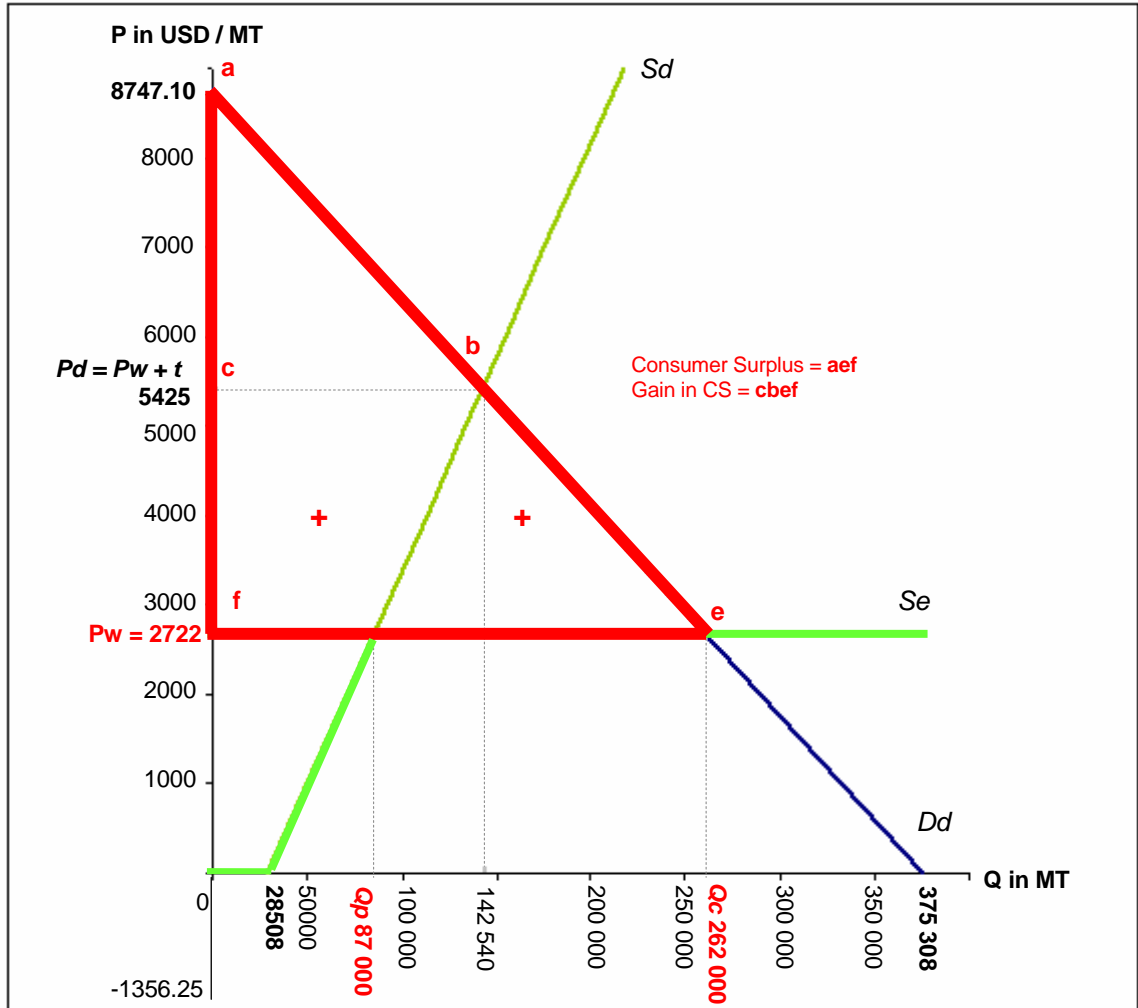
Figure 5.4 Empirical Equilibrium under a Free Trade Policy



The above figure shows the new equilibrium when free trade is introduced with the ROW. The price falls significantly (a drop of 50 percent). P_w becomes the prevailing price and consumption increases by 262,000 MT – 142,540 MT (119,460 metric tons) which is a phenomenal increase of 84 percent. This is also equivalent to 4 kg per capita increase in nutritional intake making total consumption close to 9 kg per capita which becomes in line

with the world average. Imports M are now covering the majority of the domestic needs (175,000 MT or 67% of total demand).

Figure 5.5 Empirical Equilibrium under a Free Trade Policy – Consumer Surplus



Consumer surplus (CS) in a free trade scenario as shown in Figure 5.5 is equal to area aef . Which can be quantified by multiplying fe by af and dividing by 2. This gives us:

$$CS = \text{USD } 789,288,100.00$$

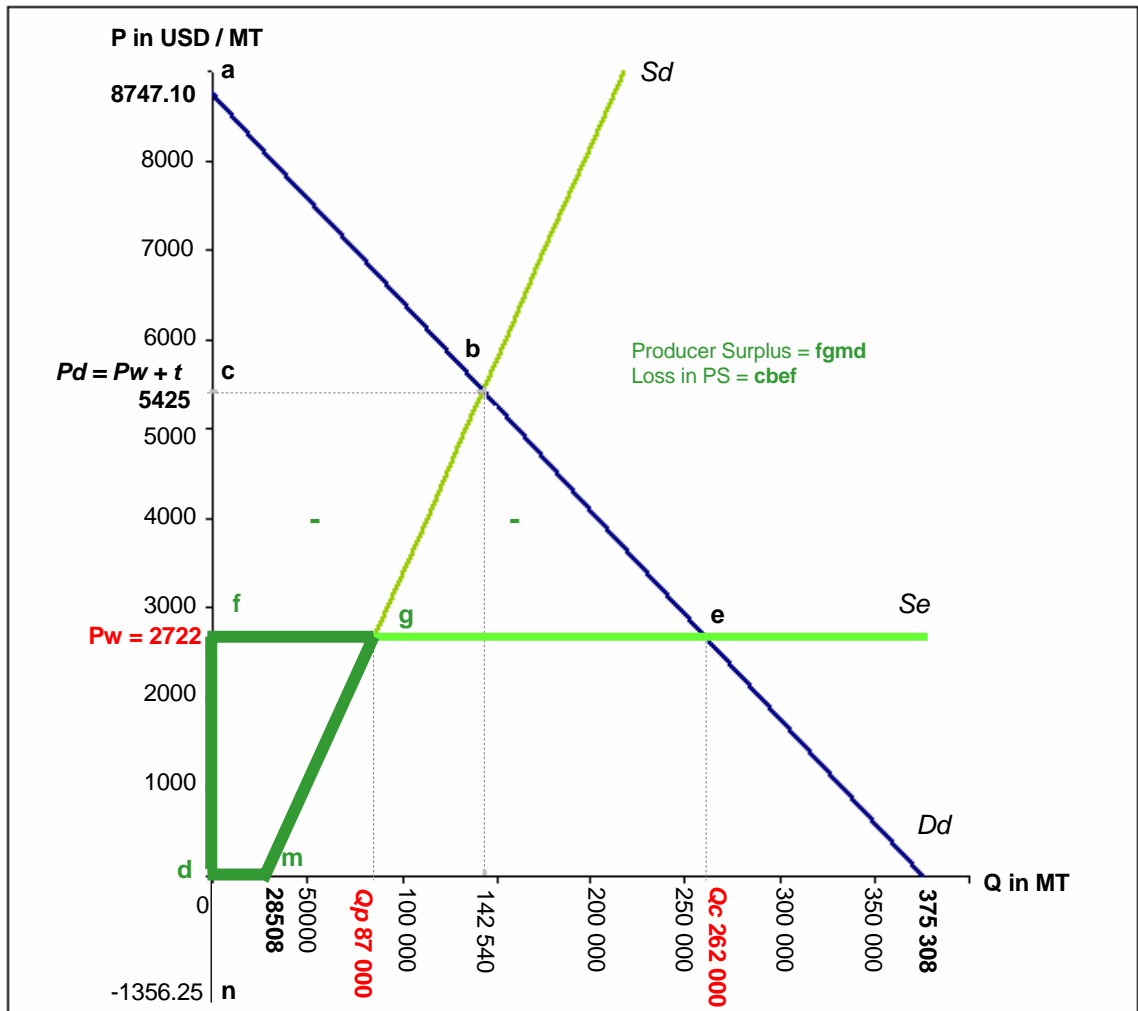
CS more than tripled compared to the autarky scenario (USD 236,766,067.00).

The net gain in CS is:

CS gain = USD 552,522,033.00

Figure 5.6 shows the change in producer surplus (PS).

Figure 5.6 Empirical Equilibrium under a Free Trade Policy – Producer Surplus



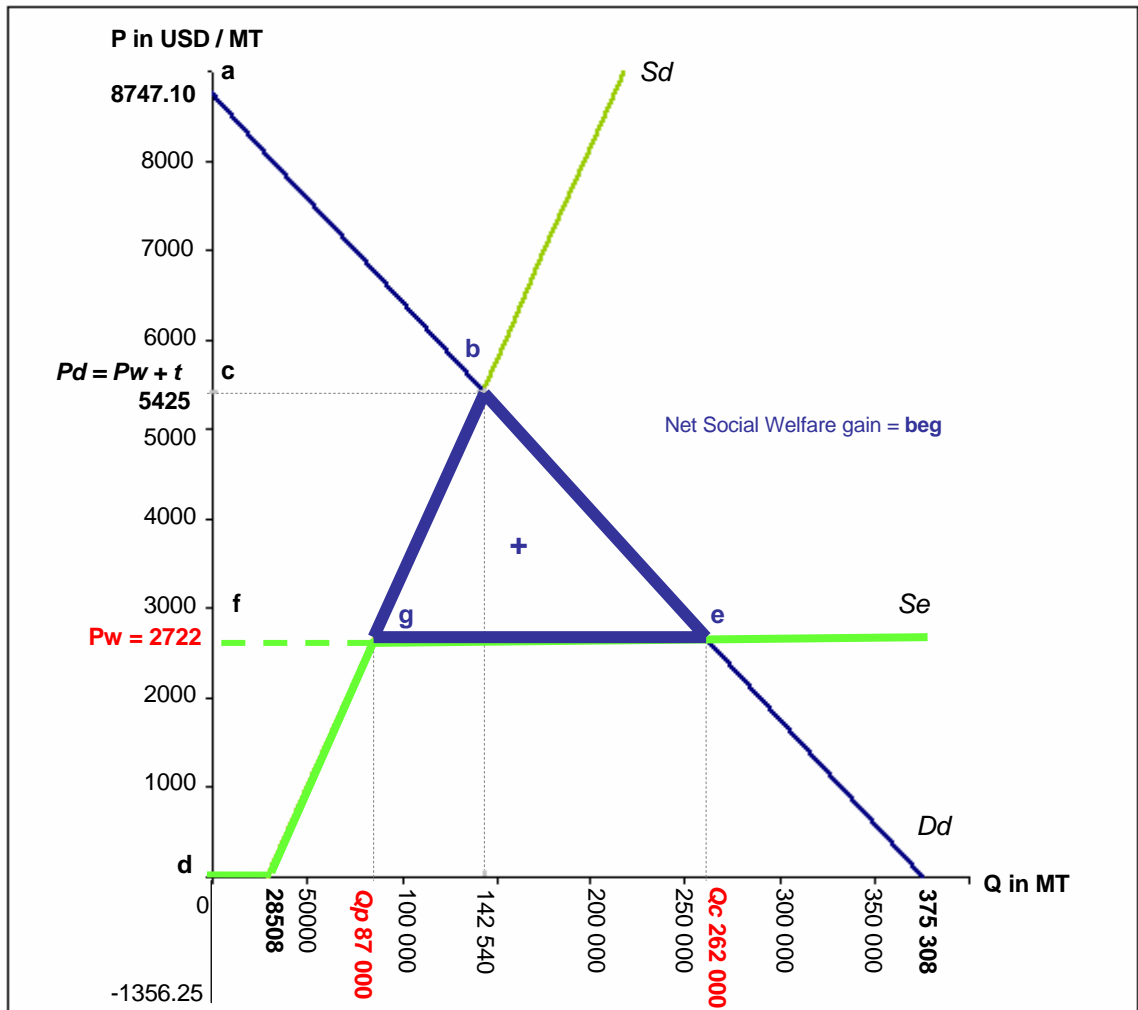
Producers in an open market will lose significantly. Their new surplus is equal to area *fgmd* which is triangle *fgn* minus triangle *dmn* (*dmn* being USD 19,331,987.50).

PS = USD 177,403,875 – USD 19,331,987.50

PS = USD 158,071,887.50

Their net loss is: PS loss = USD – 305,895,813.00

Figure 5.7 Empirical Equilibrium under a Free Trade Policy – Net Social Welfare



The net impact of the consumer surplus gain and producer surplus loss in a free trade policy is a net social welfare gain (area *beg*). This is shown in Figure 5.7.

SW gain = USD 552,522,033.00 - USD 305,895,813.00

SW gain = USD 246,626,220.00

5.3.3 Import Quota Policy

Figure 5.8 Empirical Equilibrium under an Import Quota Policy

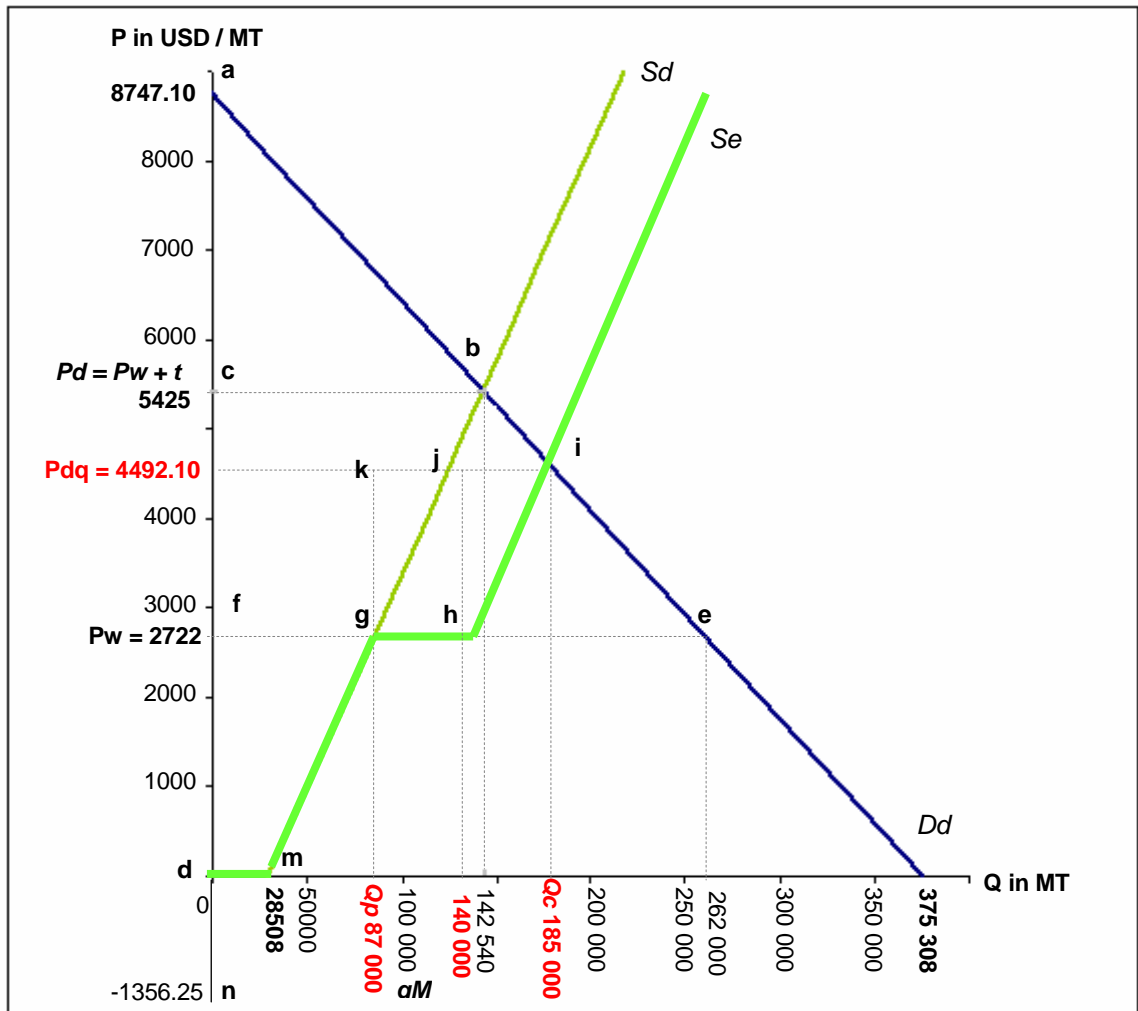


Figure 5.8 shows the equilibrium when we assume that a bovine meat quota of 53,000 metric tons is granted to the ROW. The quota will come in duty free, which means that when the quota is in effect, the domestic price will be equal to the world price.

Producers being able to compete below P_w will be able to sell 87,000 metric tons. After the quota is exhausted, another 45,000 metric tons will be supplied by those local producers.

The continuous price adjustment makes the equilibrium P_{dq} equal to USD 4492.10.

Figure 5.9 Empirical Equilibrium under an Import Quota Policy – Consumer Surplus

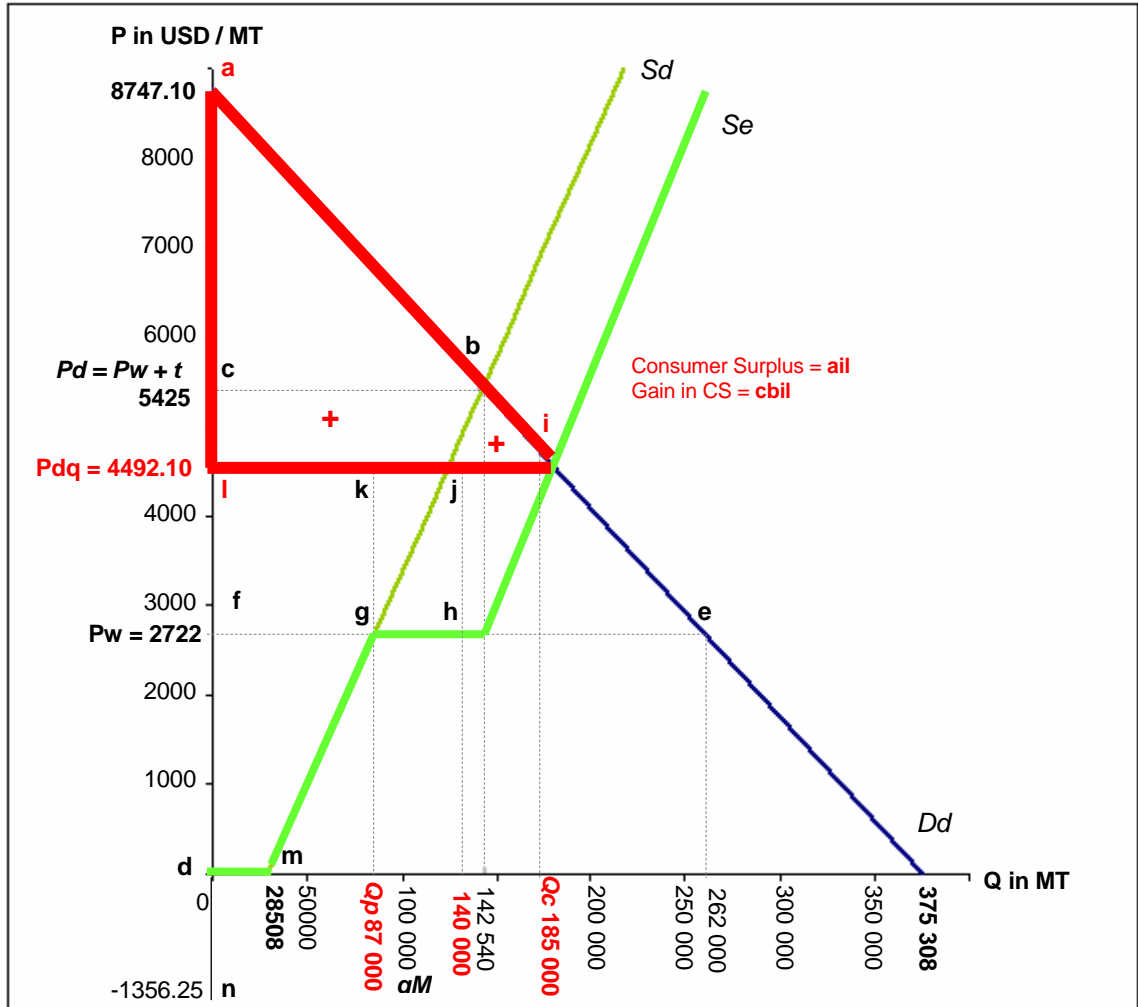


Figure 5.9 measures the consumer surplus in an import quota scenario. Consumer surplus would be equal to area ail (al times li , divided by 2) which is:

$CS = \text{USD } 393,587,500.00$

Compared to autarky, Consumers gain area *cbil*.

CS gain = USD 156,821,433.00

Figure 5.10 Empirical Equilibrium under an Import Quota Policy – Producer Surplus

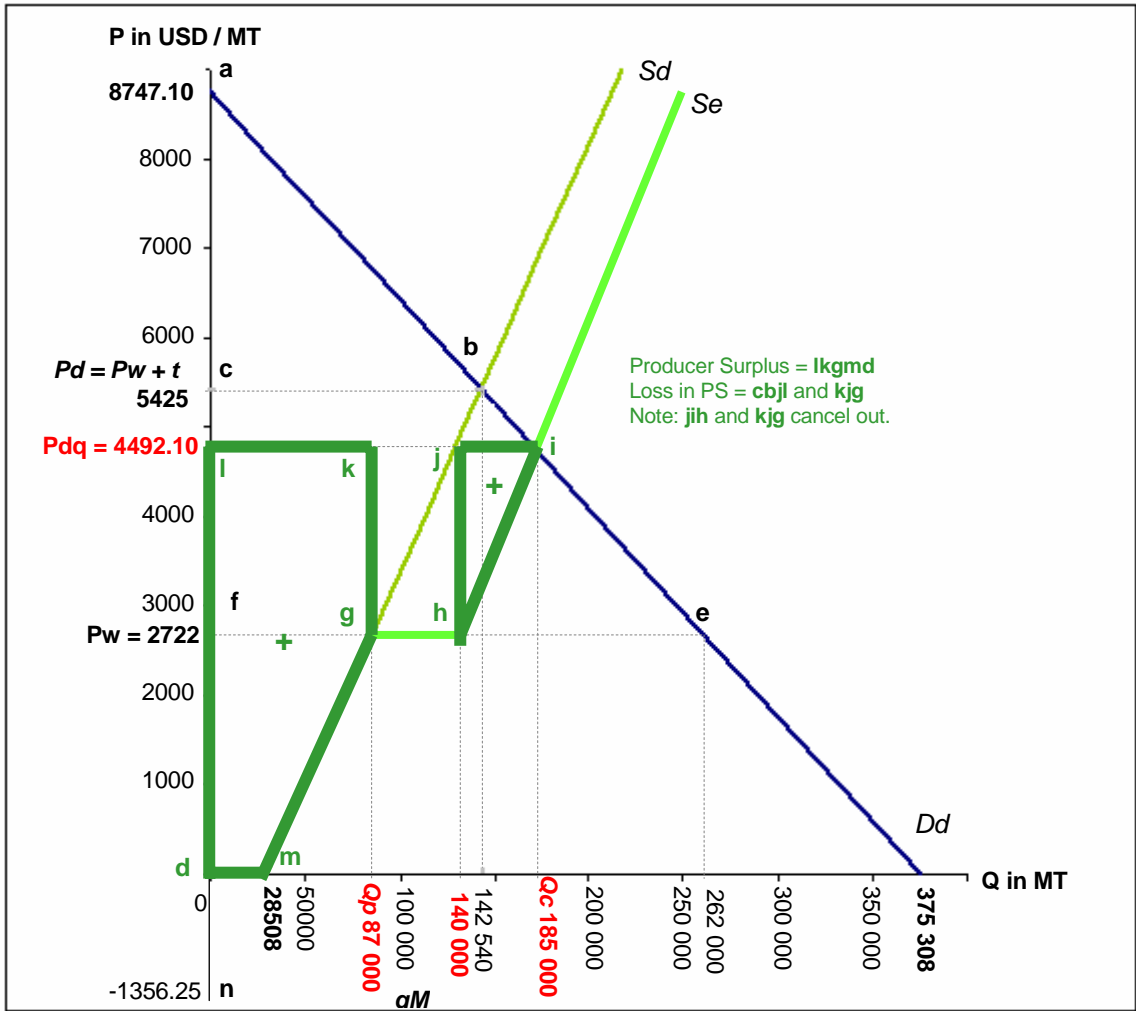


Figure 5.10 estimates the change in producer surplus when moving from autarky to import quotas of 53,000 metric tons granted to the ROW.

Producer surplus would be equal to area *lkgmd* + *jih*. Area *jih* represents the gain attained after the quota expires. However this later area will be canceled by the loss of area *kjg* when the quota is in place. Both areas *jih* and *kjg* have the same dimension (price time quantity). Overall, producers' net loss is area *cbjl*.

$$PS = \text{USD } 153,998,700.00 + \text{USD } 177,403,875.00 - \text{USD } 19,331,987.50$$

$$PS = 312,070,587.50$$

The net loss to PS compared to autarky is:

$$PS \text{ loss} = \text{USD } - 151,897,113.50$$

Generally, an import quota policy is implemented by the Government through the issuance of import licenses to private operators. These licenses may generate revenue to the Government that can be accounted for as an increase in social welfare. Since these revenues cannot be estimated accurately in our research and are usually not significant, we will assume that licenses are delivered at no cost.

Figure 5.11 Empirical Equilibrium under an Import Quota Policy – Net Social Welfare

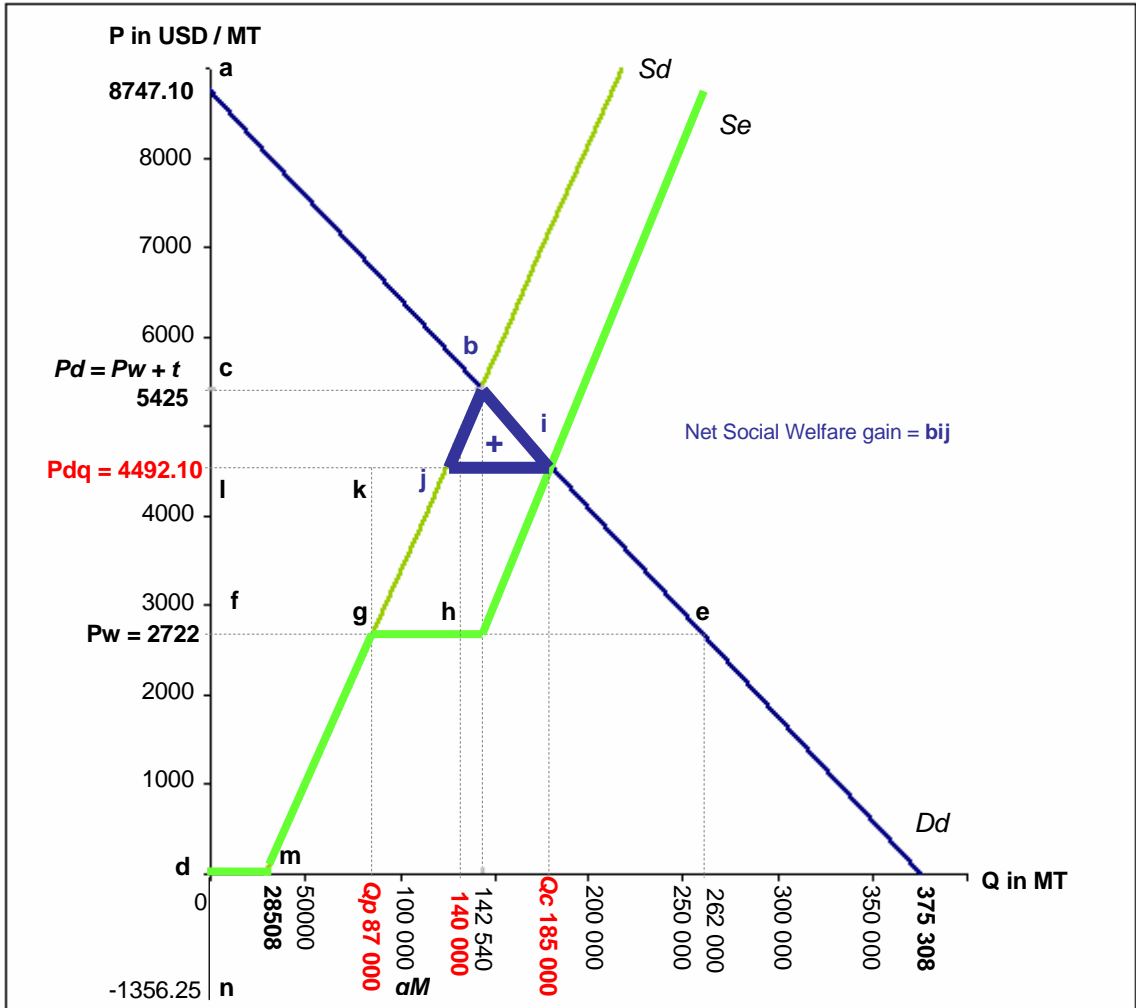


Figure 5.11 estimates the net gain in social welfare compared to autarky when import quotas are granted to the ROW. Area *bij* represents this net gain.

The net gain in social welfare compared to autarky is:

SW gain = USD 4,924,320.50

This is a very small gain compared to the free trade situation.

5.3.4 Tariff-Rate Quota Policy (TRQ)

Figure 5.12 Empirical Equilibrium under a TRQ Policy

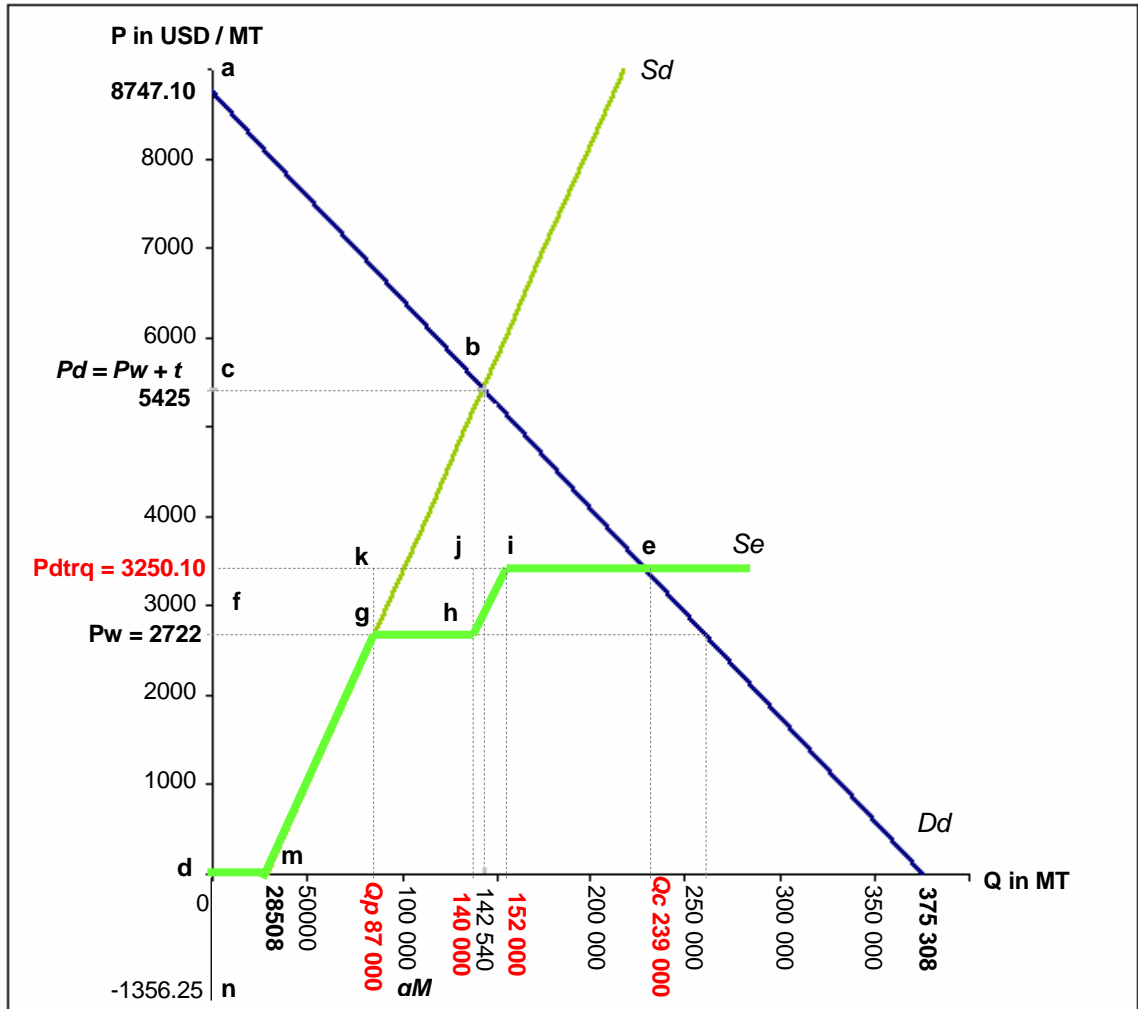


Figure 5.12 estimates equilibrium under a TRQ policy. Local producers supply the first 87,000 metric tons competitively, after which the TRQ takes place. The TRQ agreement provides for an in-quota of 53,000 metric tons at a zero percent tariff. When the quota is exhausted, imports are banned for a short period of time to allow for seasonality and local producers start supplying the market again with 12,000 metric tons (152,000 MT – 140,000 MT). Afterwards, the above-quota imported quantity (99,000 metric tons) is

supplied at a very preferential tariff of 20 percent, making final equilibrium price $P_{dtrq} =$ USD 3250.10 per metric ton. Overall, the total quantity of imports in such a scenario can reach 140,000 metric tons (53,000 MT in-quota and 87,000 MT above-quota) covering 58 percent of total consumption.

We assume that import quota licenses do not generate revenue to the Government. However, the difference between P_w and P_{dtrq} (in-quota tariff) will generate cash revenue to the Government.

Figure 5.13 Empirical Equilibrium under a TRQ Policy – Consumer Surplus

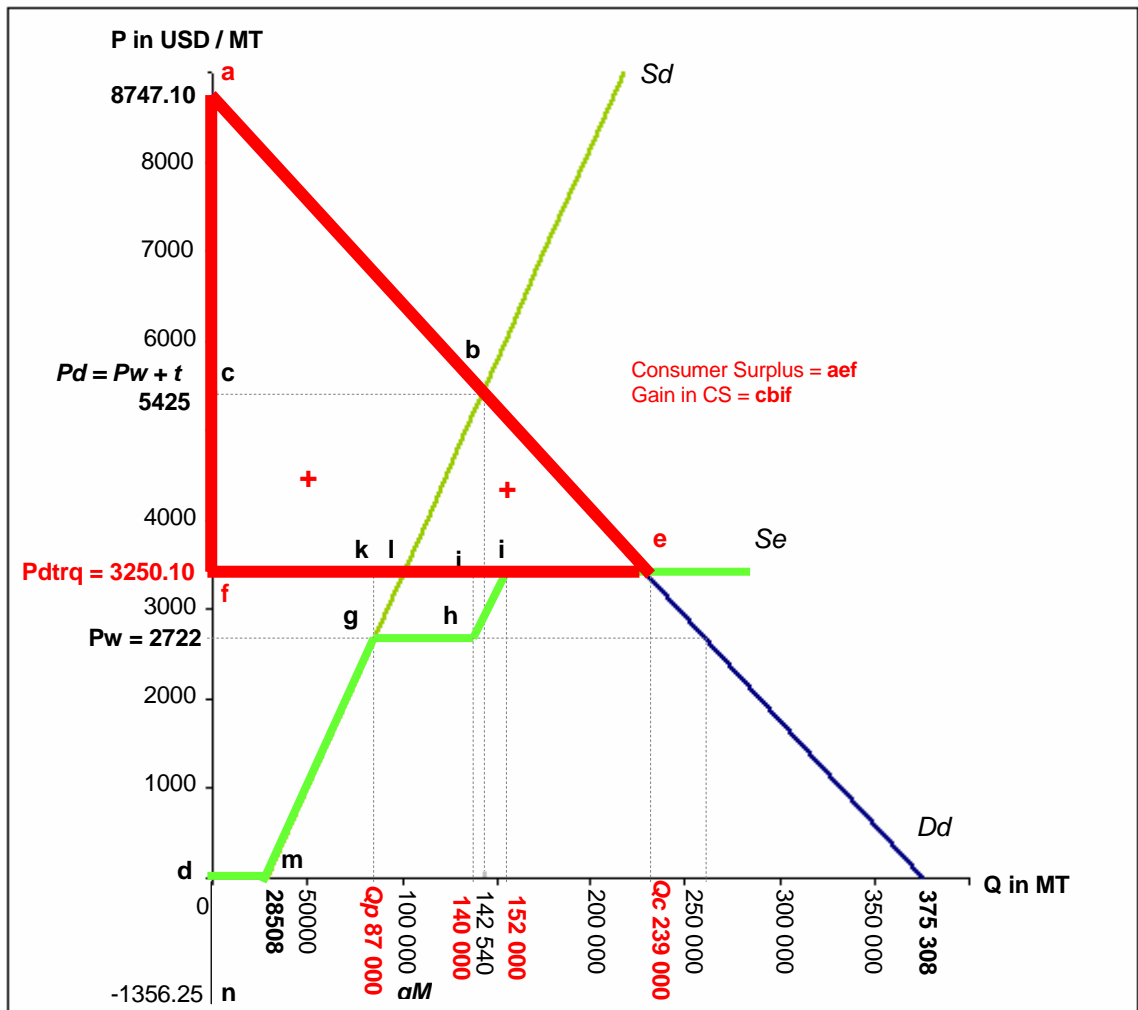


Figure 5.13 estimates consumer surplus basis a TRQ policy. CS would grow compared to autarky and will cover area *aef* by gaining area *cbef*. This will translate into the following monetary figures:

CS = USD 656,891,500.00
CS gain = USD 420,125,433.00

Figure 5.14 Empirical Equilibrium under a TRQ Policy – Producer Surplus

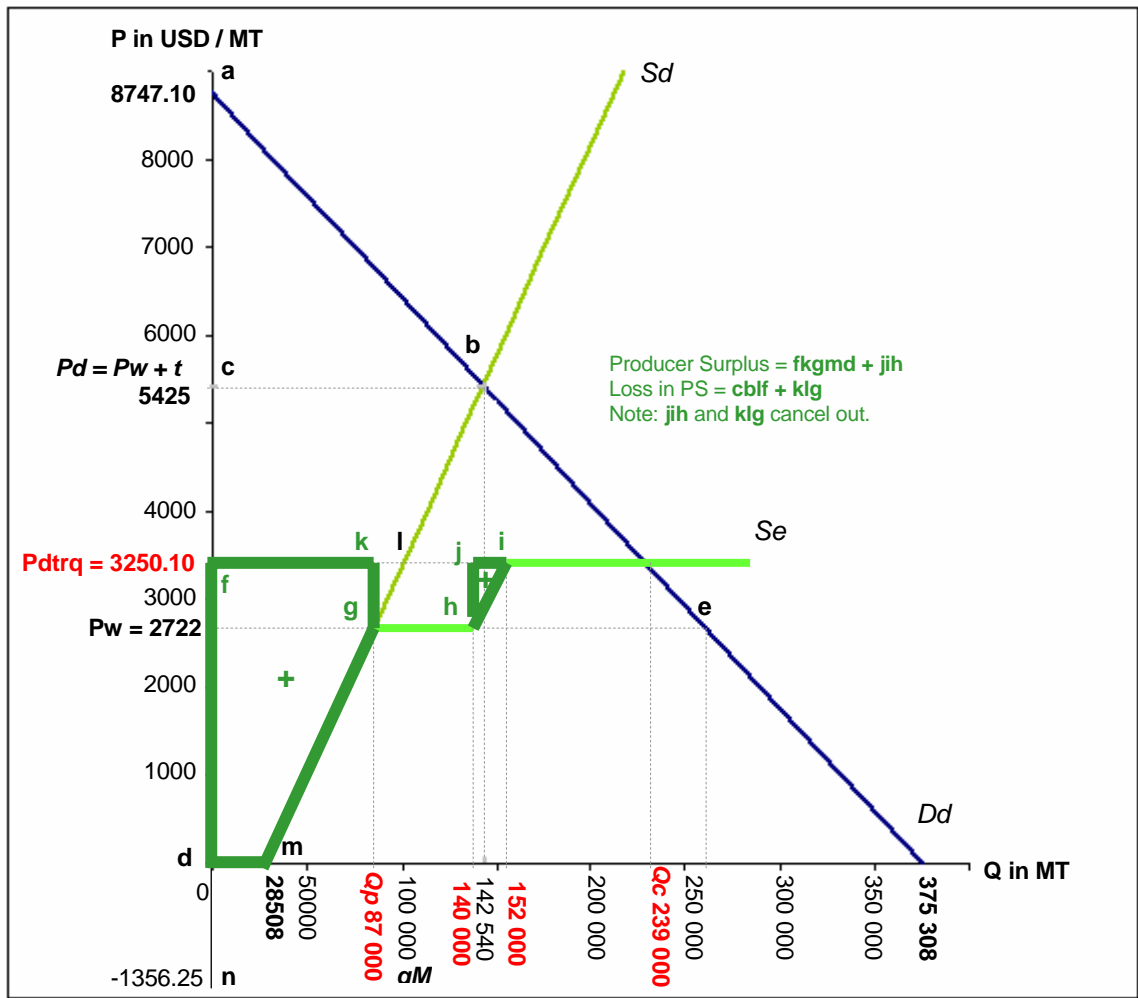


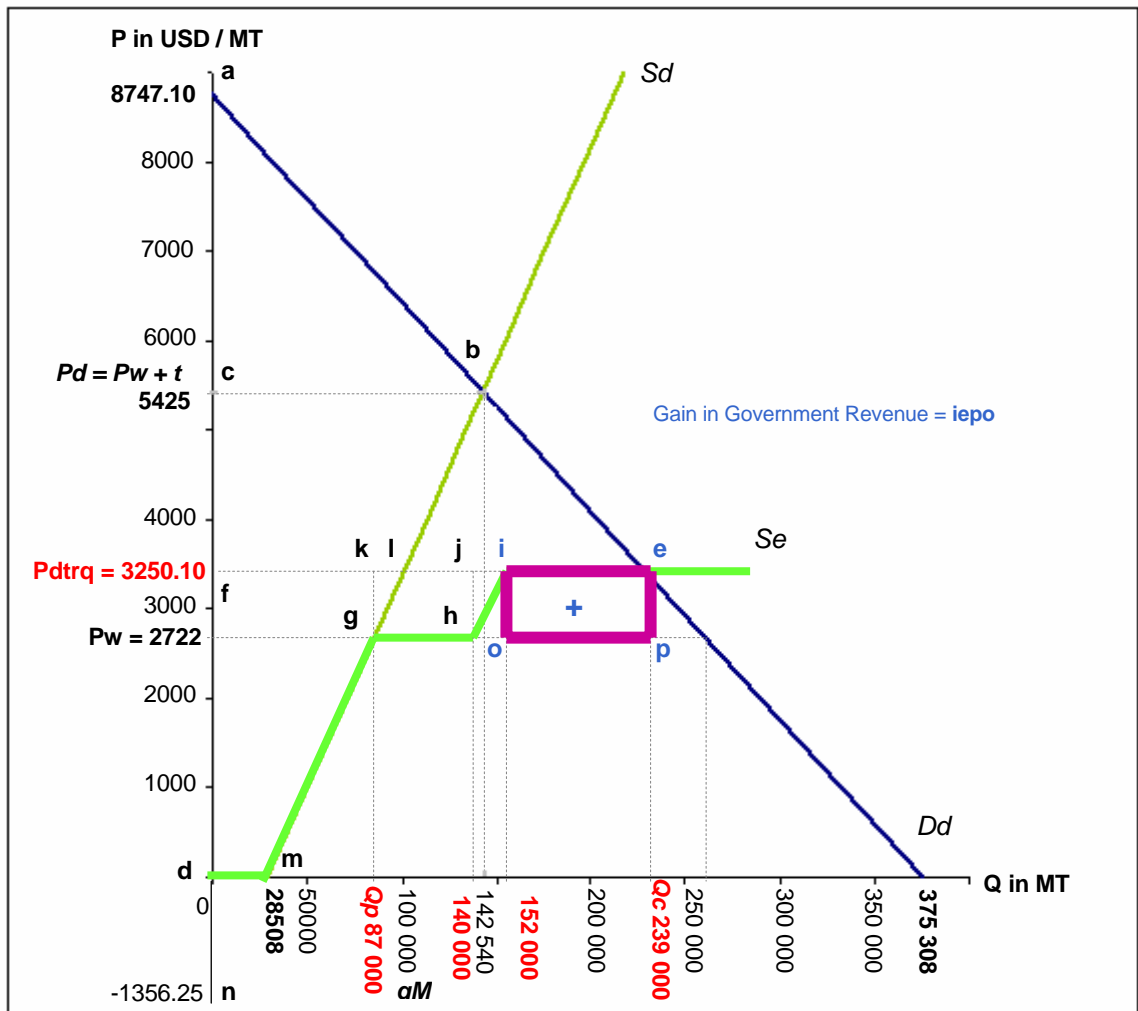
Figure 5.14 shows a change in producer surplus with a TRQ policy and in comparison with a state of autarky.

The results give the following estimates:

PS equals area *fkcmd* and *jih*. Area *jih* cancels out with area *klg*. Net PS would be equal to *fkcmd*. PS = USD 45,944,700.00 + USD 177,403,875.00 – USD 19,331,987.50

PS = USD 204,016,587.50
PS loss = USD – 259,951,112.5

Figure 5.15 Empirical Equilibrium under a TRQ Policy – Government Revenue



A 20 percent preferential above-quota tariff under the described TRQ policy will lead to a gain in Government revenue of USD 528.10 per metric ton multiplied by 87,000 metric tons (area *iepo* in Figure 5.15). This revenue was inexistent under the protectionism policy.

$$GR = GR \text{ gain} = \text{USD } 45,944,700.00$$

Figure 5.16 Empirical Equilibrium under a TRQ Policy – Net Social Welfare

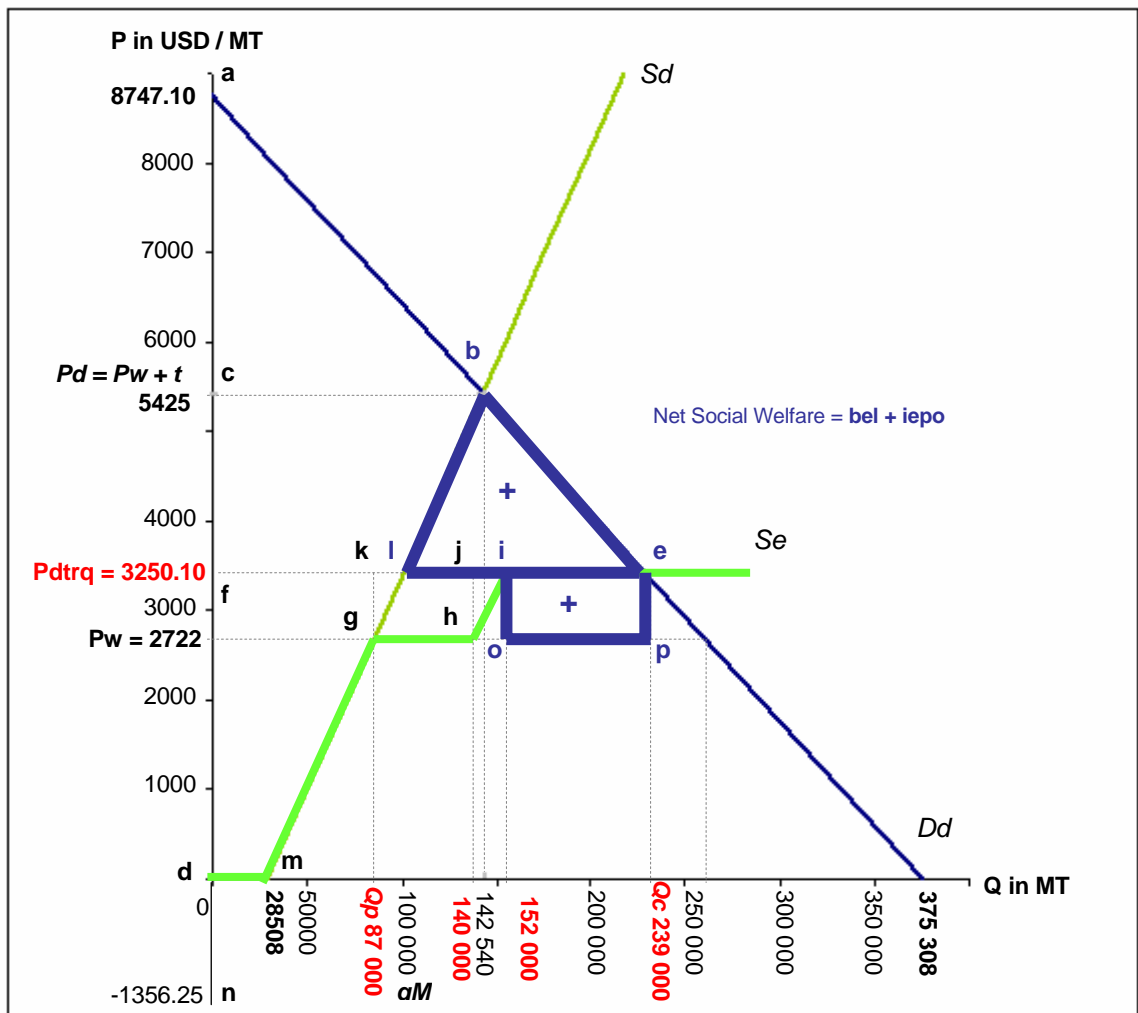


Figure 5.16 finally calculates the net impact on social welfare given a TRQ policy (areas *bel* + *iepo*). Since CS gain is greater than PS loss, the net result on welfare is positive. In addition, the Government revenue made through the over-the-quota tariff is a significant contributor to the net gain in social welfare under a TRQ policy.

$$\text{SW gain} = \text{USD } 160,174,320.50$$

5.4 Model Closure: Policy Analysis Matrix – Simulation Results

Table 5.4 Policy Analysis Matrix – Simulation Results

	Policy 1 *	Policy 2	Policy 3	Policy 4
	Protectionism	Free Trade	Import Quota	TRQ
Variables				
% Change in Domestic Consumption	na	84%	30%	68%
Change in Consumption in Kg/Capita	na	9.20	6.50	8.40
% Change in Domestic Production	na	-39%	-7%	-31%
% Change in Terms of Trade	na	-50%	-17%	-40%
Size of Imports in MT	na	175 000.00	53 000.00	140 000.00
Imports as a % of Consumption	na	67%	28%	58%
Consumer Surplus	\$236 766 067.00	\$789 288 100.00	\$393 587 500.00	\$656 891 500.00
Producer Surplus	\$463 967 700.00	\$158 071 887.00	\$312 070 587.50	\$204 016 587.50
Government Revenue	na	na	na	\$45 944 700.00
Change in Consumer Surplus	na	\$552 522 033.00	\$156 821 433.00	\$420 125 433.00
Change in Producer Surplus	na	-\$305 895 813.00	-\$151 897 112.50	-\$259 951 112.50
Change in Government Revenue	na	na	na	\$45 944 700.00
Change in Net Social Welfare *	na	246 626 220.00	4 924 320.50	206 119 020.50

* P1 is the basis of comparison

Table 5.4 combines the final results of our empirical model and trade policy simulation. Policy 2 (Free trade) results in the highest gain in social welfare (one quarter of a billion US dollars), while a TRQ comes in closely in a second place followed by far by the quota policy.

Free trade policy also results in the highest increase in consumption and nutritional intake (84%), followed by TRQ (68%), and import quota policy (30%).

Domestic production decrease is also the highest in a free trade scenario (-39%), then in a TRQ scenario (-31%), while an import quota leads to a mere decrease in production (-7%).

Terms of trade are also highly affected when there is an open market (-50%). A TRQ would also decrease terms of trade significantly (-40%). On the other hand, the import quota policy leads to a weak price fall (-17%).

It is also worth putting these welfare economics results in terms of agricultural GDP. Since agricultural GDP fluctuates strongly depending on weather conditions, we used two reference years:

- Year 2000 (drought year): Agricultural GDP was equal to USD 5.5 billion.
- Year 2006 (bumper year): Agricultural GDP was equal to USD 10.2 billion.

Table 5.5 Net Social Welfare Gains in Terms of Agricultural GDP

	Policy 1 *	Policy 2	Policy 3	Policy 4
	Protectionism	Free Trade	Import Quota	TRQ
Change in Net Social Welfare	na	\$246 626 220.00	\$4 924 320.50	\$206 119 020.50
In terms of year 2006 Agricultural GDP	na	2.5%	0.05%	2.1%
In terms of year 2000 Agricultural GDP	na	4.5%	0.1%	3.7%

Net social welfare gains under free trade and TRQ policies have very close percentage equivalence of agricultural GDP.

5.5 Sensitivity Analysis Matrix

Table 5.6 shows the impact of different levels of price elasticity of demand and supply. The results are a good indicator of the importance of price elasticity factor within our welfare analysis case. We used P2 (Free Trade) as a basis of our analysis, since the direction of sensitivity to a varying price elasticity should be very similar across different policies.

Table 5.6 Sensitivity Analysis Matrix – The Case of Free Trade Policy

		Price Elasticity of Demand			
		-1.00	-1.25	-1.63	-2.00
Price Elasticity of Supply	0.25	\$119 980 072.68	\$143 976 087.22	\$180 450 029.31	\$215 964 130.82
	0.50	\$143 976 087.22	\$167 972 101.75	\$204 446 043.85	\$239 960 145.36
	0.80	\$172 771 304.66	\$196 767 319.19	\$246 626 220.00	\$268 755 362.80
	1.00	\$191 968 116.29	\$215 964 130.82	\$253 205 945.38	\$287 952 174.43

The above matrix shows that a larger price elasticity of demand and supply (in absolute value) increases the net gain in social welfare. In other terms, the higher the responsiveness consumers and producers have to price change, the higher is the gain in social welfare brought by more trade openness.

CHAPTER VI: CONCLUSION AND IMPLICATIONS

This study was conducted with the purpose of evaluating economic evidence that bovine meat import liberalization would result in net benefits to society, contrary to the general perception which implies that opening up borders for imports will dramatically impact society due to losses incurred by producers.

The empirical model enabled us to see a broader picture, one that includes consumers as a main component of society. In fact, all players in a society are consumers, while not all consumers are producers. The fact that bovine producers in Morocco detain on average a small number of heads (less than 2) leads us to conclude that Moroccan bovine producers can be “net” consumers of bovine meat.

By looking at the Policy Analysis Matrix (PAM), it is in the nation’s interest to consider freer trade for bovine meat. The PAM can be valuable evidence in the hands of trade negotiators representing bovine meat exporting nations. The matrix will also allow identifying the best route to take while negotiating an agricultural trade package that includes bovine meat. Potential trade negotiators could use the PAM to evaluate and simulate changes in terms of trade, consumption and imports by altering the agreement conditions of an import quota or a TRQ.

It is clear that the best negotiation option for an exporting country is Policy 4 (P4) which consists of a TRQ agreement that will allow for a null in-quota tariff in addition to an above-quota preferential tariff rate of 20% and down from the actual 254% rate. The main reasons for considering P4 are:

- Including seasonality factors into the agreement will allow local competitive producers to offer their meat during key production periods and partly appease the Moroccan side that opposes liberalization.
- A full free trade agreement will be harder to negotiate and conceive especially in the medium term.
- P3 (import quota) will not be attractive for the Moroccan Government simply because it does not show any significant improvement in social welfare.
- P4 will also be the most attractive to the Moroccan Government since it is the only trade policy that would generate State revenue.
- As far as export opportunities are concerned, a TRQ in our case is much closer to P2 (free trade) in terms of potential exportable quantities (140,000 MT versus 175,000 MT).
- The net gain in social welfare is important and not much different than that of P2 (USD 246 million versus USD 206) and could be quantified as about 4 percent of agricultural GDP.

Although this research was based on a partial equilibrium model where we have to keep external variables constant, we have made it clear throughout our study that certain variables are of major concern and importance when it comes to affecting demand. Our research led to the identification and understanding of two main variables that will certainly become of major importance in affecting demand in the medium to longer run. These

variables deserve further analysis and we do recommend their inclusion within future research:

- **Tourism factor:** As we have mentioned, tourism has become a major component of Moroccan demand for bovine meat. In order to assess its size and importance within total demand, an independent estimation of its price elasticity and consumption in Kg per visitor can be very useful. Building a demand curve that will include tourism will have much more significance and impact on the shape of the curve especially when the country will start exceeding the 10 million visitors per year (one third of the Moroccan permanently resident population). It is also worth noting that the a sustained growth in tourism will be gradually shift the demand curve to the right, resulting into a larger and larger consumer surplus and increasing the gain in net social welfare. The Sensitivity Analysis Matrix could be used to account for the change brought by the growth in tourism to the nature of demand. This is because the price elasticity of tourism demand will be different than the price elasticity of Moroccan residents demand.
- **Food safety, consumer awareness and eating quality:** The increase in consumer awareness regarding food safety, bio-security and animal disease has never been of such an importance. It is just a matter of time when Morocco will need to seriously upgrade its poor sanitary control system, especially if the country wants to keep up with the tourism growth strategy. On the other hand, eating quality which has also become part of the international red meat grading systems could not be possibly improved without a major change in the breeding selection of cattle, pasture

management and fattening processes. Further research on the share of these variables in driving demand will be useful as far as estimating a more representative demand curve. The benefits that consumers perceive from these variables could be quantified and included in the welfare analysis.

Finally, it is necessary for exporting nations who see interest in the bovine meat market in Morocco to understand that trade openness will also have social implications on domestic producers apart from economic consequences. The Government of Morocco would obviously prefer to avoid such social implications. Negotiating a trade package that opens a door for exports while preserving a certain balance in societal parameters is a safer option to consider and the most likely to result in an agreement. In addition to the measurable advantages brought by the TRQ terms as determined in this thesis, the policy would also allow for long-term gains in domestic productivity and the implementation of higher sanitary and quality standards as competitive producers would seek to adjust to the new market rules.

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APPENDIX A: MOROCCO TARIFF SCHEDULE – CHAPTER 2, EDIBLE ANIMAL MEATS

Codification			Désignation des Produits	Droit d'importation	Unité de Quantité Normalisée	Unités Complémentaires
02.01			Viandes des animaux de l'espèce bovine, fraîches ou réfrigérées.			
	0201.10	00	– En carcasses ou demi-carcasses			
1		11	--- de l'espèce domestique :			
1		19	---- de veau.....	254	kg	–
1		90	---- de gros bovins.....	254	kg	–
			---- autres.....	254	kg	–
	0201.20		– Autres morceaux non désossés			
		11	--- de l'espèce domestique :			
			---- de veau :			
1		10	----- morceaux de haute qualité visés à la note complémentaire n° 2 du présent chapitre.....	254	kg	–
1		90	----- autres.....	254	kg	–
		19	---- de gros bovins :			
1		10	----- morceaux de haute qualité visés à la note complémentaire n° 2 du présent chapitre.....	254	kg	–
1		90	----- autres.....	254	kg	–
		90	--- autres :			
1		10	----- morceaux de haute qualité visés à la note complémentaire n° 2 du présent chapitre.....	254	kg	–
1		90	----- autres.....	254	kg	–
	0201.30		– Désossées			
		11	--- de l'espèce domestique :			
			---- de veau :			
1		10	----- morceaux de haute qualité visés à la note complémentaire n° 2 du présent chapitre.....	254	kg	–
1		90	----- autres.....	254	kg	–
		19	---- de gros bovins :			
1		10	----- morceaux de haute qualité visés à la note complémentaire n° 2 du présent chapitre.....	254	kg	–
1		90	----- autres.....	254	kg	–
		90	--- autres :			
1		10	----- morceaux de haute qualité visés à la note complémentaire n° 2 du présent chapitre.....	254	kg	–
1		90	----- autres.....	254	kg	–
	02.02		Viandes des animaux de l'espèce bovine, congelées.			
	0202.10	00	– En carcasses ou demi-carcasses			
1		10	--- de l'espèce domestique.....	254	kg	–
1		90	--- autres.....	254	kg	–
	0202.20		– Autres morceaux non désossés			
		10	--- de l'espèce domestique :			
1		10	----- morceaux de haute qualité visés à la note complémentaire n° 2 du présent chapitre.....	254	kg	–
1		90	----- autres.....	254	kg	–
		90	--- autres :			
1		10	----- morceaux de haute qualité visés à la note complémentaire n° 2 du présent chapitre.....	254	kg	–
1		90	----- autres.....	254	kg	–
	0202.30		– Désossées			
		11	--- de l'espèce domestique :			
1		00	---- viande hachée présentée sous forme de galettes de 45 gr à 150 gr, en sachets en polyéthylène, d'une teneur en matière grasse de 17,5% à 21% (a) ..	17,5	kg	–

(a) Tolérance commerciale usuelle de 10% en plus ou en moins sur le poids des galettes.

Source: Morocco Customs Administration, 2006

**APPENDIX B: HISTORICAL PRODUCTION OF LIVESTOCK IN MOROCCO
(NUMBER OF HEADS)**

Year	Stocks of Cattle	Stocks of Sheep	Stocks of Goats
1961	2 801 000	13 041 700	7 000 000
1962	2 564 000	10 268 100	6 000 000
1963	2 686 000	9 123 500	6 500 000
1964	2 871 000	10 362 900	6 400 000
1965	3 044 000	11 990 300	6 540 000
1966	3 277 000	12 569 700	6 980 000
1967	3 377 000	13 408 000	7 630 000
1968	3 315 000	14 750 000	8 176 000
1969	3 580 000	16 000 000	8 750 000
1970	3 600 000	17 000 000	8 500 000
1971	3 670 000	18 260 000	8 150 000
1972	3 500 000	16 500 000	8 000 000
1973	3 600 000	16 000 000	7 500 000
1974	3 400 000	16 000 000	7 000 000
1975	3 620 000	14 800 000	6 800 000
1976	3 620 000	14 270 000	5 750 000
1977	3 400 000	14 300 000	5 600 000
1978	3 600 000	14 300 000	5 972 000
1979	3 460 900	13 500 000	5 702 440
1980	3 376 200	16 509 808	6 153 500
1981	3 247 870	15 675 000	5 462 260
1982	2 536 530	10 155 000	4 092 000
1983	2 430 900	12 611 000	4 911 000
1984	2 362 880	11 493 179	4 222 000
1985	2 501 000	12 862 000	4 662 000
1986	2 851 339	14 544 940	5 276 260
1987	3 177 540	16 135 660	5 806 900
1988	3 136 926	12 733 345	5 030 495
1989	3 324 240	13 761 368	5 281 310
1990	3 346 258	13 514 426	5 335 093
1991	3 182 920	13 307 557	4 560 995
1992	3 004 830	13 153 700	4 673 676
1993	2 348 258	11 868 070	3 867 420
1994	2 343 200	13 308 900	3 973 000
1995	2 370 800	13 388 600	4 014 400
1996	2 408 400	14 536 100	4 594 700
1997	2 547 200	15 286 700	4 789 900
1998	2 568 600	14 783 900	4 959 200
1999	2 565 500	16 576 400	4 704 400
2000	2 674 600	17 299 700	4 930 700
2001	2 647 100	17 172 300	5 133 300
2002	2 669 600	16 335 500	5 090 400
2003	2 688 600	16 743 000	5 208 300
2004	2 728 800	17 026 300	5 358 600
2005	2 721 700	16 872 000	5 331 600
2006	2 721 700	16 872 000	5 331 600

Source: FAOSTAT,
ResourceSTAT

APPENDIX C: ALL RED MEATS PRODUCTION HISTORY IN MOROCCO

(In 1000's of Metric Tons)

Year	Bovine meat	Ovine meat	Goat meat	Camel meat	Horse meat	Pig meat	All Red Meats
1961	67 080	45200	20000	3400	1190	2200	139 070
1962	67 730	36900	17900	3300	1630	1850	129 310
1963	67 800	30800	18000	3300	1300	1035	122 235
1964	63 660	33160	18000	3400	1440	1000	120 660
1965	72 300	38660	19000	3400	1640	995	135 995
1966	79 100	40000	20000	2700	1400	700	143 900
1967	81 100	42700	22000	2700	1400	800	150 700
1968	87 000	47000	24000	3400	1800	1200	164 400
1969	92 000	45000	24000	3400	1900	1800	168 100
1970	92 000	46300	24500	3700	2970	1650	171 120
1971	90 000	49000	25000	3902	4100	2185	174 187
1972	93 000	50000	26000	4000	4210	2374	179 584
1973	92 000	50000	26000	3609	4863	1884	178 356
1974	90 000	50000	25000	4468	3794	1103	174 365
1975	81 400	43300	23000	3900	3100	600	155 300
1976	79 400	40600	12970	3200	3500	540	140 210
1977	90 000	47000	14150	2157	4000	750	158 057
1978	95 000	50000	18000	2266	2640	638	168 544
1979	100 000	50000	19000	1780	3600	576	174 956
1980	107 000	52000	19000	1800	4400	580	184 780
1981	131 000	65000	15000	1700	6000	600	219 300
1982	150 000	46000	13000	3780	4300	650	217 730
1983	124 000	47400	11290	2733	3360	660	189 443
1984	114 900	49970	11060	2197	2100	660	180 887
1985	85 000	54440	12100	1657	1700	410	155 307
1986	103 000	51030	16000	1700	1800	455	173 985
1987	118 000	64200	20000	2000	2000	600	206 800
1988	122 100	90995	20000	1750	2400	600	237 845
1989	150 045	103120	23400	1800	2400	640	281 405
1990	144 890	100335	21500	2200	2500	700	272 125
1991	149 000	99214	20800	2000	2500	700	274 214
1992	145 000	108805	19500	2200	2400	719	278 624
1993	150 000	102459	20000	2150	2300	710	277 619
1994	125 000	104570	20000	2250	2200	730	254 750
1995	122 100	112000	20000	2050	2100	730	258 980
1996	103 000	90000	22000	2000	2100	730	219 830
1997	125 000	120000	22000	2000	2000	750	271 750
1998	120 000	115000	22000	2120	2000	560	261 680
1999	135 000	126000	20000	2000	2000	600	285 600
2000	140 000	125000	22000	2000	2000	600	291 600
2001	145 000	125000	20500	2000	2000	600	295 100
2002	170 000	110000	15000	2000	1900	600	299 500
2003	150 000	105000	13000	2000	1900	600	272 500
2004	140 000	105000	18000	2000	1900	581	267 481
2005	150 400	108000	16000	2000	1900	568	278 868
2006	150 000	112000	17000	2000	1900	568	283 468

Source: FAOSTAT,
ProdSTAT

* Based on Dressed Carcass Weight: Excluding Offals and Slaughter Fats.

Bovine includes Veal and Ovine includes Lamb.

**APPENDIX D: HISTORICAL CATTLE MEAT YIELD IN SELECTED
COUNTRIES: KG/HEAD⁽¹⁾**

Year	Morocco	Australia	France	USA
1961	114	150	182	214
1962	109	157	178	213
1963	120	156	180	223
1964	123	155	186	224
1965	124	149	189	218
1966	126	149	180	228
1967	119	155	182	235
1968	119	159	186	238
1969	117	166	189	243
1970	116	172	193	255
1971	112	178	198	256
1972	111	181	206	263
1973	105	176	217	269
1974	110	182	219	264
1975	105	183	201	240
1976	116	173	206	249
1977	136	165	201	246
1978	146	168	221	254
1979	149	177	228	268
1980	136	176	234	271
1981	147	173	238	271
1982	157	181	233	265
1983	177	169	237	267
1984	170	183	241	264
1985	170	186	241	274
1986	167	187	245	275
1987	167	190	249	280
1988	167	195	243	287
1989	186	205	255	292
1990	162	211	286	296
1991	163	210	288	306
1992	134	205	271	307
1993	131	215	273	304
1994	152	220	273	313
1995	154	218	280	310
1996	160	219	282	304
1997	176	215	278	307
1998	178	209	278	317
1999	192	221	281	322
2000	175	229	278	327
2001	180	236	280	327
2002	178	236	283	336
2003	185	224	286	328
2004	194	231	292	340
2005	194	244	287	345
2006	194	247	288	351

Source: FAOSTAT, ResourceSTAT

(1): Based on Full Carcass Weight.

**APPENDIX E: BOVINE MEAT PRODUCTION IN ROW IN METRIC TONS
(1991-2006)**

Year	France	USA	Argentina	Australia	Total Production
1991	2 026 068	10 534 000	2 918 000	1 759 569	17 237 637
1992	1 876 800	10 612 000	2 784 000	1 790 870	17 063 670
1993	1 703 800	10 584 000	2 808 000	1 825 813	16 921 613
1994	1 626 800	11 194 000	2 783 000	1 824 805	17 428 605
1995	1 683 300	11 585 000	2 688 000	1 803 417	17 759 717
1996	1 737 000	11 749 000	2 694 000	1 744 696	17 924 696
1997	1 720 000	11 714 000	2 712 000	1 810 300	17 956 300
1998	1 632 000	11 803 000	2 469 169	1 955 253	17 859 422
1999	1 609 000	12 123 000	2 719 784	2 010 530	18 462 314
2000	1 527 600	12 298 000	2 718 000	1 987 902	18 531 502
2001	1 566 000	11 982 000	2 461 000	2 119 000	18 128 000
2002	1 640 000	12 427 000	2 493 000	2 028 000	18 588 000
2003	1 632 000	12 039 000	2 658 000	2 073 000	18 402 000
2004	1 565 492	11 180 700	3 024 000	2 033 000	17 803 192
2005	1 516 912	11 242 900	2 980 118	2 161 958	17 901 888
2006*	1 473 097	11 910 000	2 980 118	2 077 072	18 440 287
10 last yr avg	1 588 210	11 871 960	2 721 519	2 025 602	18 207 291

* Estimate

Source: FAOSTAT, ProdSTAT

**APPENDIX F: BOVINE MEAT PRODUCER NOMINAL PRICE IN ROW IN
USD/MT (1991-2006)**

Year	France	USA	Argentina	Australia	Weighted Average Price
1991	3 773.41	3 082.00	1 572.02	1 712.94	2 767.91
1992	3 983.89	3 023.00	1 902.81	1 559.14	2 792.29
1993	3 784.06	3 078.00	1 646.74	1 400.15	2 730.55
1994	3 928.28	2 828.00	1 605.59	1 719.61	2 619.46
1995	4 004.22	2 620.00	1 623.41	1 638.21	2 500.67
1996	3 745.93	2 513.50	1 728.58	1 432.08	2 409.70
1997	3 444.25	2 684.60	1 936.97	1 289.17	2 503.77
1998	3 608.60	2 530.80	2 248.12	1 217.47	2 446.42
1999	3 383.96	2 684.60	1 689.85	1 323.27	2 450.76
2000	2 933.81	2 900.00	1 847.92	1 343.90	2 581.55
2001	2 551.18	3 019.20	1 630.82	1 445.61	2 606.35
2002	2 716.01	2 823.10	1 055.74	1 760.88	2 460.72
2003	3 399.64	3 392.30	1 395.22	1 826.95	2 928.15
2004	4 003.19	3 632.70	1 706.39	2 262.03	3 181.56
2005	4 162.82	3 811.50	2 094.18	2 619.98	3 411.49
2006*	3 354.49	2 931.46	1 791.31	1 778.33	2 651.11
Last 10 yr avg	3 355.80	3 041.03	1 739.65	1 686.76	2 722.19

* Estimate

Source: FAOSTAT, PriceSTAT

**APPENDIX G: BOVINE MEAT PRODUCER NOMINAL PRICE IN MOROCCO
IN USD/MT (1991-2006)**

Year	USD/MT
1 991	4 250
1 992	4 568
1 993	4 377
1 994	5 640
1 995	5 855
1 996	6 540
1 997	5 353
1 998	5 602
1 999	5 487
2 000	4 442
2 001	4 273
2 002	4 891
2 003	5 995
2 004	6 770
2 005	6 069
2 006	5 364
Last 10 years average	5 425

Source: FAOSTAT, PriceSTAT