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碩 士 論 文

利用定價與營收最佳化技術之實施以評估總合支持措施之最適性 – 以中國的小麥為例

Implementation of basic Pricing and Revenue Optimization technique

to assess the optimal total aggregate measure of support -total AMS-

in wheat commodity for China

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CHINESE ABSTRACT

商業概念通常被直覺地排除在政府的決策過程。的確，二者的決策分析受到一些刻板模式、先入為主之成見、以至範例所制約。本論文提出一項概念，每個國家必須像一個大企業般地運作：促成高品質、低成本的生產(也就是極大化最終消費者的財務價值)，並專注於達成上述目的的相關政策與法規。供需的力量以及隨後價格的形成，即 Adam Smith 所謂的無形之手，全賴我們對市場經濟的了解。這些機制根植於「理性」(利潤極大化)公司的概念，也定義了市場均衡的方式。

另一方面，農業方面的支持也被視為在農糧研究上最為廣泛討論的課題之一。尤其，在某些個案所造成的供給過剩、傾銷，更被視為相當負面的影響。本論文提出一個概念性的模式，其牽涉政治的、經濟的與經濟計量的指標。在此架構下，利用一基本的定價與營收最佳化(Pricing and Revenue Optimization, PRO)技術，可對補金額建立一適當的評估，並藉以促使一個貿易模式(在本論問係以中國的小麥為例)可行且合理地運作，以達到確保價格穩定、避免市場扭曲的目標。小麥的國內價格在各國，尤其是在中國，一向低於國際的指標價格，顯示國內政策與貿易政策已造成農民無法獲得其作物在全球市場應得的報酬。

補貼後的食物價格被預期可能將增加食物需求量，進一步提高食物價格，以至造成潛在性的通貨膨漲循環。然而，供給與需求的變動性最終會達到一個新的平衡，其所對應的最佳消費者價格將確保食物供給的安全與生產者的獲益。多邊的農業補貼機制將改善國外市場的可及性並提高全球農產品價格。以本研究的案例而言，最終不僅中國農民收益將提高，在各國同意適用相同政策於農民時，將使農業的生產與需求在無形之手的影響下，使供給與需求達到平衡。

ENGLISH ABSTRACT

There is an intuitive tendency to isolate business concepts from Governments policy making. Indeed, the way both parts analyze their strategies is conditioned by stereotypes, prejudges or merely by paradigms. From this thesis proposal, every country has to work as a big corporation, promoting the high quality and low cost of its production (maximizing monetary values for the final consumers) and has to focus all its policies, laws, and regulations in order to achieve that goal. "*The forces of supply and demand and the resulting process of price formation –the <invisible hand> of Adam Smith – lie at the heart of our current understanding of market economics.*" They are embodied in the concept of the "rational" (profit-maximizing) firm, and define the mechanism by which market equilibrium are reached.

On the other hand, "*agricultural support is considered one of the most discussed subjects for researches in agriculture and food. In particular, its impacts were classified negatively in some cases (among countries) where agricultural support results in overproduction and causes dumping in other countries markets.*"

The thesis proposal is a conceptual model, which involve political, economical and econometric measures. In this sense applying a basic Pricing and Revenue Optimization technique, it's possible to formulate a right assessment on the subsidy quantity that make a trade model (in this case for wheat in China) to work feasibly and logically in order to assure price stabilization and avoid distortions in the market. For wheat, and particularly in China, domestic prices were lower than the international indicator price, suggesting that domestic and trade policies prevented farmers from receiving as good a return on their wheat crop as was possible on world markets.

The subsidized food prices could be expected to increase the demanded quantity of food, thus increasing prices further, and potentially contributing to an inflationary spiral. Nevertheless, production and demand volatility eventually will find a "new equilibrium" and the resulting optimal price for customer can assure food security and profitability for producers. Multilateral subsidization in agriculture would improve access to overseas markets and stabilize world market prices for agricultural commodities.

DEDICATION

To:

Jehovah: "He that dwelleth in the secret place of the most High shall abide under the shadow of the Almighty. I will say of the LORD, [He is] my refuge and my fortress: my God; in him will I trust." Psalms 91: 1-2

Jesus Christ: "And ye shall know the truth, and the truth shall make you free." John 8: 32

My father Edgar David Lira Saavedra: I'm always trying to following you and make you proud…I love you Papa.

My mother Iracema Arellis Sosa Carpio de Lira: You gave me the most precious gift and the most important lesson; I will always have you in my heart. Love you Mama.

My brothers Luis Alberto, David Alejandro & Jose Estuardo: Each one of you taught me with wisdom and humbleness, my appreciation forever. Love you guys.

My wife Ana Bridzeyda Fuentes Ramirez de Lira: Baby, there is no one beautiful and tender as you. I remember you like that, your hair free, burning ice, different from other…I remember you like that, letting you admire, untouchable, inaccessible, unreal…unreal. I will love you forever.

My relatives: So proud of my blood, of my roots.

Fuentes – Ramírez family: you guys stayed and supported me all this time.

Guatemala: The bird-snake mansion. My Macondo, someday you'll fly like a Royal Eagle.

Republic of China: Ilha Formosa…
台灣是生咱的所在，感念感恩在阮心內，付出情意付出愛，代代花蕊代代栽。

My friends: I'll confide 'cause you'd been on my side. I know you did, I know you will.

My country mates: I keep you in my mind & heart, like a brother that suffers with you from unfairness. Hasta la victoria siempre!!

AND TO ALL THE PEOPLE THAT IN ONE WAY OR ANOTHER MADE ME SMILE AND PROVIDED ME THE MOTIVATION TO CONTINUING WITH MY HEAD HELD HIGH DURING THE JOURNEY…

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1:   INTRODUCTION

1.1. Background

Quoting Agricultural support indicators: "*Agricultural support is considered one of the most discussed subjects in organizations and institutes that research in agriculture and food because of its impacts which classified negatively in some cases (among countries) where agricultural support results in overproduction and causes dumping in other countries markets.*" (Mouhamad, A., 2008. 1 pp.) Not so long ago (June 2008), the monetary values of basic agricultural commodities on global markets reached their highest levels for 30 years, threatening the food security of the poor worldwide.[w]

From that time, values have been decreasing, driven lower by the economic crisis, rising world recession, falling oil prices and an appreciating USD. Though, they are still elevated by up to date chronological values and the structural troubles underlying the vulnerability of undeveloped nations to global price increases remain. Various factors contributed to the significant increase in world food monetary values, but recent bio-fuel demands and elevated oil prices were the main reason, making some researchers to ask whether lately linkages between food and energy markets have broken down the long-run descending tendency in real agricultural commodity values.[v]

The sharpness of the monetary value increases and their pushiness, which left various undeveloped nations harassed to manage with the consequences, make this event unusual from precedent events of food monetary value increases. Social and political constancy was challenged all over the world as rising food values and falling purchasing capacity sparked unfortunate events and social disorder. One is supposed to picture the shock on the poor in undeveloped nations who were already spending, in some cases, almost 80 percent of their insufficient incomes on food.[d] Monetary values are still considerably over the levels we have seen in up to date years and are expected to stay high by previous experiences. In Various

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[w] Turvey, R., Cook, E. 1972.   1

[v] Undeveloped nations according to Trade and Markets and Agricultural Development Economics Division. 2008.

undeveloped nations, food values continue at exceptional elevated levels. In fact, high goods prices have not disappear, nor have the fundamental causes of the food disaster they created. Soaring food monetary values and the food crisis remarked the pressure to global food security and the critical necessity to empower the international food system.[c] The negative consequence of high food values on the food security of poor consumers around the world is obvious. Though, one would have anticipated the impact on producers to be constructive and to persuade them to invest more and boost production. This did not happen.

Years of low agricultural prices justifiably gave farmers little motivation to spend in means of production, but why did the peak food prices in recent years fall short to give that encouragement? The answer relies in the government support.[*] In principle, high food values represent an opportunity to reverse that decades-long decline in investment in agriculture and secure a sustainable future for world food supplies. "In principle" because peak food values itself are not enough and this thesis proposal is to assure the global subsidy policy under revenue management principles. Some of the incentive to produce more has been battered by growing input costs – fertilizer prices have constantly risen much quicker than producer monetary values.[v]

1.1.1. Most important indicators used to estimate agriculture support

The Aggregate Measure of Support (AMS) stated inside the WTO's agreement on agriculture, is parallel with the figure of Producers Support Estimate (PSE) for OECD nations, as a result are essentially the same in terms of economic and financial support but differs in some important issues, that later on are defined in the table PSE vs. AMS.[m]

Citing the OECD Glossary of Statistical terms the *"Aggregate measurement of support (AMS) is the indicator on which the domestic support discipline for the Uruguay Round Agreement on Agriculture is based. It is determined by calculating a market price support estimate for each commodity receiving such support, plus non-exempt direct payments or any other subsidy not exempted from reduction commitments, less specific agricultural levies or fees*

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[m] Organization for Economic Co-operation and Development (OECD). 2004.

[*] Author's personal opinion and further explanation. 2010.

paid by producers. It differs from the Producer Support Estimate (PSE) in many respects. The most important difference is that price gaps in the AMS calculation are estimated by reference to domestic administered prices and not to actual producer prices, and that external reference prices are fixed at the average levels of the 1986-1988 base period. In addition, many budgetary transfers included in PSEs are excluded from the AMS."

✓ Producer Support Estimate (PSE):

The Producer Support Estimate has been developed by the OECD as an indicator to observe agricultural strategy improvement in some developed nations and some non-OECD nations. PSE in addition to Total Support Estimate are considered as the two key indicators used by the OECD to assess agricultural support. The focal reason of calculating PSE is to present support approximation each year and to make a judgment among nations aiming at controlling and evaluating agricultural plan strategies in such nations where support estimates gives a significant contribution to the discussion associated to agricultural policies and commerce.[l]

PSE is expressed by fixed assessment ($ billion) or as a percentage of farm revenue which make the assessment satisfactory on large scale and helpful to evaluate agricultural support between nations and by time, for example a PSE of 20% means that 80 cents of every dollar of farmer's gross revenue comes from sales at global market prices while the 20% presents the support obtained by farmer.

PSE consists of the following components that put together the measure:[m]

Producer Support Estimate (sum of A to G)
A. Support based on commodity output
A. 1 Market Price Support
A.2 Payments based on output
B. Payments based on input use
B.1 Variable input use

B. 2 Fixed capital formation

B.3 On-farm services

C. Payments based on current area / animal number/ receipts / income production required

C.1 of a single commodity

C.2 of a group of commodities

C.3 of all commodities

D. Payments based on non- current area / animal number/ receipts / income production required

E. Payments based on non- current area / animal number/ receipts / income production not required

E.1 Variable rates

E.2 Fixed rates

F. Payments based on non-commodity criteria

F.1 Long-term resource retirement

F.2 Specific non-commodity output

F.3 Other non-commodity criteria

G. Payments which is not classified under the appropriate categories because of a lack of information

Figure 1: OECD PSE components. Source: OECD, 2004.

As for support estimates gave to a particular commodity, OECD calculated PSE for each commodity (in fixed and percent value) until 2005. After 2005 OECD changed in categorizing PSE the Single Commodity Transfers (SCT) aiming at reflecting the flexibility given to farmers' production decisions inside the various policy actions.[m]

✓ Single Commodity Transfers (SCT):

The yearly monetary value of gross transfers from policies connected to the production of a single commodity which means that producer have to work with the selected commodity

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in order to obtain the transfer.

✓   Total Support Estimate (TSE)

Annual monetary value of all gross transfers from consumers arising as of policies support agriculture and includes transfers to producers and common services provided to agricultural segment. TSE presents the total support as a percentage of Gross Domestic Product –GDP.

> **Total Support Estimate** = Producer Support Estimate + General Services Support Estimates (GSSE) + transfers to consumers from taxpayers taking into account that General Services Support Estimates includes research and development + agricultural school + inspection services – infrastructure – marketing and promoting – others.

Figure 2: OECD Total support estimate. Source: OECD, 2004

1.1.2. Other indicators used to estimate agricultural support

OECD uses other indicators to assess agricultural support where PSE and TSE the two mentioned previously are extensively used. Other indicators can be mentioned also:[y]

✓   Consumer Support Estimates: annual monetary value of all gross transfers to consumers of agricultural commodity arising as of policies that support agricultural despite of their goals and impacts on expenditure of farm products.

✓   General Service support estimates: annual monetary transfers to agriculture not to particular producers which grant monetary disbursement for the provision of such services as research, development, guidance, check up, advertising and sponsorship, and agricultural school.

✓   Nominal Protection Coefficient: is the ratio between producer and boundary monetary values for a particular commodity.

✓   Nominal Assistance Coefficient: is the ratio between farm revenue (including support) and those generated in the market without support.

1.2. WTO & OECD domestic support and subsidies overview

1.2.1. Defining and measuring agricultural support

OECD defines agricultural support (as the figure of Aggregate Measure Support –AMS- inside WTO) is the annual monetary value of all gross transfers from taxpayers and consumers arising from policy actions that sustain agriculture which increase farmers' incomes and diminish their production costs, regardless of their goals and impacts on farm production and income, or expenditure of farm products. Agricultural support is measured by adding up two elements:[y]

✓ *The difference between domestic and world prices for commodities multiplied the produced amount.*

✓ *Budgetary payments may be granted to farmers groups which are based on a group of factors such as production, planted area…etc.*

Inside WTO agreement on agriculture (AoA), the aggregate measure support is defined as follow:[b]

"Aggregate Measurement of Support" and –AMS- mean the annual level of support, expressed in monetary terms, provided for an agricultural product in favor of the producers of the basic ag*ricultural product or non-product specific support provided in favor of agricultural producers in general, other than support provided under programmes that qualify as exempt from reduction under Annex 2 to this Agreement, which is:*

(i) with respect to support provided during the base period, specified in the relevant tables of supporting material incorporated by reference in Part IV of a Member's Schedule; and

(ii) with respect to support provided during any year of the implementation period and thereafter, calculated in accordance with the provisions of Annex 3 of this Agreement and taking into account the constituent data and methodology used in the tables of supporting material incorporated by reference in Part IV of the Member's Schedule…"

And later on, defined the total AMS as *""Total Aggregate Measurement of Support" and*

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[b] Agriculture Commission, WTO. 1995

-Total AMS- mean the sum of all domestic support provided in favor of agricultural producers,

calculated as the sum of all aggregate measurements of support for basic agricultural

products, all non-product-specific aggregate measurements of support and all equivalent

measurements of support for agricultural products, and which is:

(i) with respect to support provided during the base period (i.e. the "Base Total AMS") and the

maximum support permitted to be provided during any year of the implementation period or

thereafter (i.e. the "Annual and Final Bound Commitment Levels"), as specified in Part IV of

a Member's Schedule; and

(ii) with respect to the level of support actually provided during any year of the

implementation period and thereafter (i.e. the "Current Total AMS"), calculated in

accordance with the provisions of this Agreement, including Article 6, and with the constituent

data and methodology used in the tables of supporting material incorporated by reference in

Part IV of the Member's Schedule..." (Agriculture Commission, WTO. 1995, 44-45 pp.)

Digging inside the concepts of AMS and PSE (both figures are needed to take the right picture of the concept, and complement each other, but then again we emphasize on AMS which is the formal figure for WTO, the top authority in world's trade), in both cases, the consumer frequently pays a monetary value which enables the domestic producer monetary value to be sustained over on the world markets. Yet, in the case of an exporter, there is a fund outlay (export subsidy) where in the case of an importer; there is a fund inflow (import tax receipt) or a supplementary transfer to importing agents and export suppliers (import quotas, VRAs).

For a given level of domestic monetary value maintained above that on the world market, the per unit rate of PSE from these policies is calculated by the monetary value gap, no matter of whether the country is an exporter or importer. Even though the total PSE is the per unit PSE multiplied by the amount produced, no matter of which part is provided by consumers and by taxpayers, the method has the capacity to break down the sources of

transfers to producers between consumers and taxpayers. Furthermore, it avoids equating support to agriculture with funds outlays on agricultural subsidies. This issue is illustrated to the scrutiny of market monetary value support for an importing country and shortage expenditure for an exporting country. The analysis can effortlessly be extended, to exporting and importing nations, respectively.[s]

PSE by definition is the annual monetary value of all gross transfers from consumers (arising from policy that keeps domestic values above world prices) and from taxpayers (arising from monetary policies) to producers measured at the farm and arising from policy actions that support agriculture not considering of their objectives and impacts on farm production and income.[1]

Various policies are executed as incorporated packages of various instruments and consideration of the joint effect of evaluating avoids and double-counting. For example, some nations provide safeguard at the border in the form of both tariffs and quotas, but at any one time it is possible that only one action is responsible for the experienced value effects. If the quota is filled, this is a suggestion that the tariff is not high enough to control imports at the level of the quota or less, and the quota is therefore the restrictive measure. According to this thesis proposal, later on, this will be considered as a constrain and also can be included under the figure of advance purchase (already developed inside particular trade agreements between nations). The quota is the measure which allows the internal monetary value to be maintained, and the tariff becomes a way to make sure that some of the economic fee (in the form of the difference between import and domestic selling values) from the quota goes to the government rather than to importers.

The consequence of the tariff is not additive to that of the quota, but acts as a very important trade barrier. If the quota is the required constraint, the elimination of the tariff would not affect internal monetary values or prices. On the other hand, if the quota were to be flexible, there would be a point at which, setting the level of the tariff, the quota would no

longer be filled - the tariff would then become the efficient limit on imports. *The definition of the external reference price has been the most controversial issue because, in practice, it is the most important parameter in determining the magnitude and the trend in total AMS (total PSE).* (E) Primary problems focused on the argument that standard values are themselves distorted, and that a "better" measurement should be the world equilibrium prices estimated to overcome in the absence of the policies concerned.

Still, the method assumes the small nation case and in so far as possible, standard values are selected from actual values at a country's own boundaries or derive from nations whose own policies only lightly assist the commodity (any such assistance being netted out of the standard price) and who do not compromise in export subsidization. It is, though, documented that the price obtained by a non-subsidizing, competitive price taker will be mostly established by the performance of "large nations" which subsidies exports using the world market as a remaining beneficiary of surplus production. So, as a brief introduction to this thesis proposal, there is a necessity of an international consented system to subsidize agricultural commodities in terms of a sustainable and practicable method, avoiding speculation and distortion.

On the other hand, is important to cite that stocks participate in equilibrating markets and smoothing monetary value variations. If stocks are low comparative to use, markets are less capable to manage with supply and demand shocks and supply shortfalls or demand increases will lead to bigger monetary value increases. There have been many changes in the policy environment since the Uruguay Round Agreements that have been helpful in sinking stock levels in most important exporting nations: the extent of assets held by public institutions; the high cost of storing perishable products; the improvement of other less costly tools of risk management; increases in the number of nations capable to export; and improvements in information and transportation technologies.

When production reductions occurs in successive years in key exporting nations under

such conditions, global markets tend to become less open and price unpredictability and the magnitude of monetary value changes become exaggerated when unexpected events happen. Certainly, there is a statistically considerable negative correlation between marketing season beginning stocks (expressed as a percentage of projected use in the resulting season) and the cereal monetary values produced during the same season.[h]

1.3. General problem description and approach

All arguments in favor of agricultural support adopted by governments can be summarized in food security and self sufficiency of nations which can be achieved by farmer who deserves support since he produces the main commodities needed for human life through his hard work within the special structure of rural communities that lack Various services and facilities in Various nations especially undeveloped nations in addition to the risk of work in agricultural sector resulted from weather conditions which may negatively affect production and lead to fluctuations in revenues. [q]

Elevated product monetary values did not demonstrate to be a chance for farmers in undeveloped nations. They did not grab hold of that opportunity to empower and boost their production and yield since the high monetary values did not strain through to them, their access to inexpensive inputs was restricted, their available technology was feeble, indispensable infrastructure and institutions were absent and some policy responses (such as value controls and tariff reductions) in fact diminish the incentives. *There the poor country dilemma.*

The assessment of agricultural support via the concept of total AMS was developed and has evolved as a reaction to the requests of policymakers. As a product, the procedure required to be direct, easily to understand and practical, if it was to be show to policymakers the levels of transfers arising from the execution of agricultural policies. The AMS/PSE concepts provide a balanced structure to study, in a planned and consistent way, all of the policies influencing agricultural production, consumption and commerce. As proposed before,

subsidies are necessary for all the countries*, but the big challenge comes from the amount of money to assign (avoiding the market price distortion) and to whom (to make it sustainable). In calculating the monetary transfers that result from agricultural strategies, it has enabled a more meticulous and disciplined evaluation of those policies than would be given by a purely qualitative evaluation. Under that perspective, revenue management can be a feasible alternative.[f]

Nevertheless, the straightforwardness of the AMS and PSE assess defines the confines of the model. In particular, it is not a measure which can present answers to all questions that had been inquired of it. The measure is most significant as a measure of relative, but not absolute, levels of transfers and in presenting the transfers resulting from changes in policies. *As a comprehensive measure, in which the transfers from each policy are uniformly weighted in the computation, it is not valuable as an indicator of the singular production, consumption or commerce incentives of explicit policies. It is helpful as a measure of the transfers between consumers, taxpayers and producers, but it does not transmit much clarification on the effects on net incomes of particular sectors in the whole economy, since it is not a welfare indicator. As it does not comprise the effects of non-agricultural policies on the agricultural segment, it is not a measure of the supply incentives of policies.*[n] Finally, although changes in AMS due to world monetary value movements are indicators of domestic market filling in nations where those movements arise from changes in exchange rates or "large country" policies, the AMSs are only a rough indicator of the degree of market orientation and might have only a restricted role in a negotiating perspective.

That being said, no alternative measure of assistance is unaffected from the effects of "exogenous changes" and no other indicator, given the techniques and existing information, has the assortment of coverage and practicality of a "realistic" AMS. While there are some better ways to measure the incentive effects of policies, the market monetary value support element of the AMS is an evaluator to the degree of price distortion. In any event, there are

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* Author's personal opinion, based on further material presented later. 2010.

[n] Organization for Economic Co-operation and Development, 2005.

alarming data problems to prevail over in moving towards a realistic indicator. The work on the dimension of agricultural support using AMS is continuously developing in the light of continuing negotiations within OECD and WTO nations in terms of theoretical developments. Their progression reflects innovative insights into the methods of computation, improvements in policies, data accessibility and the questions to which the AMS is required to contribute answers.

AMS and PSE are at the present or will be soon, considered for almost every country, both the WTO member and the whole of the OECD area, for approximately three-quarters of agricultural production and for the latest years. The prospect guidelines future research and analysis include extending the policy, commodity, and country treatment, and improving the suitability and quality of the data used for the AMS and PSE computations.[s] A number of areas might conveniently be explored. Initially, in order to recognize the motivation effects of agricultural policies more accurately, the PSE can be developed to estimate more directly an effective rate of support. This would, on the other hand, need a development of available resources and records and is not possible immediately. Secondly - and this is already being considered - the components of the AMS could be scrutinized in terms of their effects on production, consumption and trade. *This is critical to the deliberate on moving towards alternative methods of support to farmers which are, as far as possible, "production neutral" or least-distorting to resource distribution.*

Thirdly, in combination with modeling developments, the AMSs may be projected for particular segments of farms or regions in terms of both on the whole stage of transfers and the effects of those transfers on their revenue. This is vital information in any argument of alternative methods of support.[c]

While the Effective Rate of Assistance is a superior measure of the inducement effects of policies, the market price support component of the PSE is an indicator to the level of monetary value distortion. In any incident, there are big data challenges to beat in moving

[s] Summer, D. 2000.

[c] Agriculture department, FAO. 2005.

towards an ERA measure. Their advancement presents new insights into the methods of calculation, developments in strategies, data availability and the questions to which the AMSs and PSEs are required to contribute answers.[l]

1.3.1. The Role of Speculation

Previous considerations above of high food values have integrated a increasing interest in the potential effects of speculators and institutional investors – "non-commercial traders" – buying into agricultural commodities on futures markets as returns on other assets have become less attractive. There has been some concern that speculation has contributed to increasing food prices. The downturn in the global properties and securities markets resulted in an inflow of funds into agricultural commodity futures markets looking for profits, both from traditional institutions such as hedge funds and pension funds and from newer commodity-linked and exchange-traded funds. Global trading activity in futures and options combined has more than doubled in the last five years. Investments by institutional investors can be large. However, the volume of these investments in agricultural commodities has not been as significant as in other commodities such as metals.

The raise in the shares of non-commercial traders in maize, wheat and soybean markets coincided with the raise in monetary values of these commodities in the physical markets. However, it is not evident whether speculation on agricultural commodities was motivating values higher or was attracted by monetary values that were rising anyway; in general it was the high values that were motivating inflows of investment funds into futures markets for agricultural commodities. Large inflows of funds could provide a further explanation at least for the persistence of high food values and their apparently increased volatility.[f]

Especially, when is discussed the speculation in the agricultural commodity markets, commodity exchange markets offer risk management tools such as futures and options to enable market actors like farmers, processors, producers or traders – "commercial   traders" –

to evade in opposition to the risk of monetary value fluctuations in the future. Speculation is important for the efficient performance of markets because it brings liquidity into the market and helps farmers and other sectors to balance their exposure to future monetary value fluctuations in the physical commodity markets. However, speculation can occasionally play a perverse role in markets. For example, disproportionate levels of speculation can lead to unexpected or unreasonable fluctuations or unnecessary changes (in one particular direction) in commodity monetary values.

Thus, the approach of unnecessary speculation is counterproductive to future markets because the risk of price instability is an elementary condition that these markets attempt to obtain. The level of speculative movement can be restricted by regulating commodity markets. One way is through preventing the number of futures contracts that one contributor, other than a participant qualified for evade exclusion, can seize, thus restraining the capacity of a single member to influence the market.[h]

1.3.2. Several explanations for the same global concern

The quick leap in the USD monetary values of food, which topped in the first half of 2008, can be described as the most considerable point since the 1970s. *The cause for this progress was supply and demand imbalances in several of the most important commodity markets, remarkably cereals and oilseeds.*[d] The primary agents of escalating monetary values on the supply side tend to be short-period and are linked to production diminish and to policy procedures such as limiting export policies by main merchants. On the demand side, factors causing to the latest increase in world food prices are little. Contrasting with supply, changes on the demand part are in general neither fast nor unanticipated. The core agents of demand in food markets are populace and earnings enlargement. Most of the time, these two essential variables make noticeable an ongoing (and predictable) growing demand succession and, in this sense, permit for supply to regulate. Speculation and inflows of budgetary outlays are more expected to have followed the growing monetary values than to have caused them. Only

[d] Agriculture department, FAO. 2009.

the quick extension in demand for bio-fuel feedstock underlines a central different approach from past experience.[v]

The abrupt boost in food prices on global markets cannot be accredited to any one single cause. Each one of those reasons normally mentioned cannot of itself make clear the path and degree of latest price movements. The economic crisis and, more considerably, the global downturn have evidently contributed to the remarkable fall in agricultural commodity monetary values. *Agricultural markets and prices will be influenced on both the demand side and the supply side, not merely through diminution in economic growth rates and demand but also through exchange rate variations, changes in the accessibility and cost of credit and changes in the accessibility of other outer financial support, including assistance.*[m]

Nevertheless, the decrease in global economic growth will be the most important influential agent on agricultural commodity markets and undeveloped country agricultural projections in the short term. *Hopes that commodity demand and prices may be constant by ongoing elevated growth rates in China and other fast growing economies in the developing world currently look not as much of acceptable as their anticipated growth has been revised downwards. Accessibility of credit and liquidity is constraining agricultural traffic, adding to the descending pressure on global prices but also dropping trade volumes.*[n]

Inferior monetary values in common are excellent news for customers but will influence incentives for producers to formulate the funds required to accomplish greater food security in the middle and long term.

When the motivation for producers is reduced, some restrain in production may be anticipated, also falling capacity for upgrading grain stocks. Various undeveloped nations are also highly reliant on transfer of funds, so recessions in the developed economies might have a not direct influence on domestic demand in undeveloped nations as employment and incomes of immigrant recruits fall. Payments also give budget for investment, together with agriculture.

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[m] Organization for Economic Co-operation and Development, 2004.

[n] Organization for Economic Co-operation and Development, 2005.

1.3.3.   The Poor country paradoxes

Inside the economics theory, there is a phenomenon refers to that countries and regions with an abundance of natural resources and are agricultural dependant tend to have less economic growth and worse development outcomes than countries with fewer natural resources. This can be attached to several reasons, but the most common can be classified in internal conflicts, bad taxation, revenue volatility, excessive borrowing, corruption, and so on.

Obviously, the influence of elevated food values on consumers is unmistakably negative. On the other hand, in principle, elevated values ought to have been good news for farmers all over the world. Theoretically, higher food prices boost the existing budget for producers to invest, promoting the increase of agricultural commodities production and poverty declination. Admission to means of production and resources such as land is a decisive aspect in determining who collect the profit of upper food prices.

Outsized landholders will benefit most. Domestic ones very specialized in agriculture are also possible to be winners, even though these comprise a somewhat tiny fraction of the population, compared to the rest. Still, it seems that the elevated food prices have not been an opportunity for most undeveloped country farmers and a supply reaction has not accomplished. Producers in undeveloped nations have challenged real turn downs in monetary values in mainly of the final 50 years.[d] The outcome has been a shortage of investment in agriculture and inactive production. So, on the face of it, the high food values, and the option that they may continue, looked like an opportunity for little poor producers. Nonetheless, *most undeveloped country producers are far reserved from what happens on global markets, so increasing food prices there do not essentially signifies higher prices for poor producers. For this to be the situation, those high global prices need to be transmitted throughout national boundaries and throughout marketing chains.*[c]

Producers require entrance to reasonably priced inputs. They also need admittance to reasonable credit. Yet where sufficient inducements are in place, a positive supply reaction

[d] Agriculture department, FAO. 2009.

[c] Agriculture department, FAO. 2009.

16

from producers can be barren by a variety of supply-side constraints, especially a deficiency of transportation and market communications for carrying any small increase in production to marketplace. In various undeveloped nations, none of these circumstances is effectively met. In theory, prices in a nation that is connected to the world market in a free-trade atmosphere will go together with global monetary values expressed in the equivalent common exchange values. If the national value is above the global price, imports will take place until the national monetary value becomes equivalent to the global price after permitting for any transport expenses. Increased exports fulfill the same balancing role if the national monetary value is beneath the global price. Under these circumstances, "price transmission" is absolute – the monetary value of a commodity sold on competitive world and national markets can only vary by the logistic cost of transporting it.

Commodity forecasters sight fast and complete monetary value transmission as a sign of the well-organized performance of a market. But, in practice, a number of aspects can circumvolve the size to which world monetary value changes "pass through" to the national stage. An augment in the global value will result in a relative boost in the domestic monetary value at all points in time presented that tariff levels remain unmoved. Especially in undeveloped nations, poor communications, transportation and infrastructure services give increase to big marketing margins due of the elevated costs of distribute the locally produced commodity to the border for export or the imported commodity to the local market.[e] Other factors, such as consumer choice for particular characteristics of locally produced food or quality disparities among domestic and globally traded commodities settle on the level to which locally produced food can be replaced by food purchased in the world market and, therefore, influence price transmission.

alterations in the monetary value in one market may take a little time to be passed on to other markets for several motives, such as policy interference, regulation costs, and complexity of the marketing chain, contractual planning between economic representatives,

storage and inventory property, interruptions in transportation or processing or still simple disinterest. As a result, price passing on is not often absolute or fast. That modification to world market price alteration can be quick, in particular when such changes occur at the same time with low stocks or shocks in local food supply or demand. Even if there is conduction of global price changes to the national level, this does not inevitably denote that value increases will get to all producers or consumers, even if consumers in urban districts may be more rapidly showing to value raises.

How much producers are influence relies on the degree to which they contribute in local markets and the degree to which local markets are connected with broader national, regional or global markets. In various undeveloped nations, these suppositions merely do not sustain.[c] Smallholders are normally attached in a special value chain from more commercial farmers. The latter may be associated to large grain-trading, dealing out and transaction firms, commodity interactions, networks of integrated silos, millers, and supermarket sellers, occasionally with large-scale companies ownership, reachable market information, large business volumes, well-specified grades and principles, and legal systems that contain more complicated contracting preparations.

This contrasts with the more informal chains in which smallholders are characteristically concerned and which are distinguished by spot market business, small percentages of production sold off the farm, frail road and communications infrastructure, fragile information systems and inadequate management between input deliverance, credit and sales.

No matter what enhancement elevated product values might have prepared to the revenue of producers, enlargement in input costs have worked in opposition to it or even cancelled it out. Input costs have been escalating progressively for various years and several farmers saw rising output monetary values as a provisional break from retreating margins over costs until input prices blast up significantly in 2007, outpacing productivity prices.

Additionally, there are several indications that while productivity price amplifies are not fully and quickly transmitted to producers, rising in the prices of inputs, especially where these are imported, are transmitted on fully and quickly.[d]

1.4. Organization of this thesis

This thesis provides a comprehensive review based on several researches related with the subsidies and domestic support and the emergency of the issues surrounding the soaring food values and their consequences. It tries to explain in terms of revenue management how budgetary support can increase productivity and revenue of the producers, despite the fact of why food prices increased and what steps undeveloped nations and the international community need to take in order to ensure that high food values are turned into an opportunity for undeveloped country farmers to help safeguard world food supplies at affordable monetary values.

This thesis is organized as follows: Chapter 2 describes the problem statement and the motivation for this research. Chapter 3 identifies the most important issues related with domestic support and subsidization theory applied to agricultural commodities market. Chapter 4 introduces revenue management and how it can be adapted to suit the agricultural commodity subsidies problem. Chapter 5 presents the Pricing and Revenue Optimization concepts, regarding the typical agriculture commodities characteristics as well as very important concept like willingness to pay and higher fares for the global supply offer, constrained with factors such time, offer & demand, and price. Chapter 6 presents the results obtained with the respective analysis and make comparison among to launch the advantages of using the subsidy policy founded in the revenue management principles. Chapter 7 presents conclusions and suggests further research opportunities regarding the concept of optimality to promote a more accurate way to define pricing strategies to maximize revenue for producers. Finally, Chapter 8 presents the recommendations of this study.

Chapter 2:   PROBLEM STATEMENT

2.1. Introduction and Motivation

Although changes in AMS due to world price movements are indicators of domestic market insulation in nations where those movements arise from changes in exchange rates or "large country" policies, the AMSs are only a rough indicator of the degree of market orientation and may have only a limited role in a negotiating context. That being said, no alternative measure of assistance is immune from the effects of "exogenous changes" and no other measure, given the techniques and data available, has the range of coverage and practicality of the AMS. While there are some better indicators of the incentive effects of policies, the market price support element of the AMS is a guide to the degree of monetary value distortion. In any event, there are formidable data problems to overcome in moving towards a realistic measure.[d]

The work on the measurement of agricultural assistance using AMS is constantly evolving in the light of ongoing discussions within OECD and WTO nations in terms of theoretical developments. Their evolution reflects new insights into the methods of calculation, developments in policies, data availability and the questions to which the AMS is required to contribute answers. AMS and PSE are now, or will shortly be, calculated for virtually both, the WTO member and the whole of the OECD area, for around three-quarters of agricultural production and for the most recent years. The future directions of the work include expanding the policy, commodity, country coverage, and improving the timeliness and quality of the data used for the AMS and PSE calculations. A number of areas could usefully be explored. Firstly, in order to identify the incentive effects of agricultural policies more precisely, the PSE could be developed to approximate more closely an effective rate of assistance measure.[1]

This would, however, require an expansion of resources and data and is not feasible in

the short-term. Secondly - and this is already being explored - the components of the AMS could be examined in terms of their effects on production, consumption and trade. *This is crucial to the debate on moving towards alternative methods of support to farmers which are, as far as possible, "production neutral" or least-distorting to resource allocation.*[u] Thirdly, in conjunction with modeling developments, the AMSs may be estimated for particular groups of farms or regions in terms of both the overall level of transfers and the effects of those transfers on their incomes. This is important information in any discussion of alternative methods of support.

The necessity to shield the final (and usually poor) consumers from elevated food values have to be reasonable in opposition to sustain incentives for productivity raising investment and supply reaction. Policy strategies require being direct, non-distortionary and helpful towards agricultural investment. Several undeveloped nations need global support to defeat budgetary constraints and to recognize and execute suitable policies. Developed nations also need to keep in mind the impacts of their agriculture, trade and energy policies on global food prices and accessibility. Several poor consumers still face high or rising food values. Moreover, while global food values may have going down, several of the unfavorable supply and market circumstances linger without any changed. The drop in monetary values was not provoked by any extensive development in food accessibility. In most undeveloped nations, there was no constructive supply response to high food prices. Although the remarkable monetary value rising and the dilemma of poor consumers subjected the world's news, the impact on poor agricultural producers engrossed far fewer awareness.[d]

Subsequent years of low agricultural product monetary values, elevated values should have been a chance for poor producers to progress their technologies and incomes and a motivation to augment their output for the welfare of all. Agricultural commodity monetary values have constantly been extremely inconsistent, but around a long-run downward tendency. Nonetheless, a number of observers and forecasters have advised that there are now

[u] Tokarick, S., 2003.

novel factors at work to be considered, particularly the development of bio-fuel production, that promote that food prices will not come back to their historical tendency. The negative food security impact of higher food prices is greater on undeveloped countries' poor consumers, who include several of the rural areas.

Various undeveloped and least-developed nations are food importers and have seen their annual food import bills more than double since 2000.[c] On the positive side, higher food values should enable producers to invest in raising productivity and production. Whether high food prices can be turned into an opportunity for producers in undeveloped nations depends on their ability to respond. This is far from guaranteed. The monetary values of key inputs such as energy and fertilizer increased along with product monetary values – sometimes faster – so the incentive to produce more actually weakened.

Furthermore, the capacity to produce more is limited for undeveloped country smallholders with weak technology and limited access to inputs. How to help producers to produce more is one policy problem facing governments in undeveloped nations. *How to ensure consumers have access to food at affordable prices is a more immediate one.*[d] In most cases, understandably in view of the social unrest that high food prices provoked, the policy measures introduced focused on the immediate short-term food security problems by attempting to slow price increases and increase food availability. The medium- and long-term needs to support producers were neglected, and some of the short-term measures – notably trade measures –were likely to have a negative impact.

It is required for a complementarily measure and uniformity among objectives measures presented to concentrate on urgent necessities and longer-term strategies to address the considered call for long-run food security. They merely cannot pay for to ensure food supplies for the poorest parts of population, convene with higher food import bills and overturn, immediately, years of disregard of their agriculture sectors. The global support that has been structured is immediately needed to offer technical assistance and policy support, and as the

"right" policies have the propensity to cost more, there is the necessity of additional budgetary funds. Soaring food monetary values and the resulting food crisis is subject of global concern that require global action.[h]

2.1.1. Indicators of assistance

An enhanced system is needed to prevent global food crisis and help to enlarge and realize the required policies at national, regional, and international levels. In addition, regulations and mechanisms need to be planned to ensure not only free but also fair trade in agricultural products -a system that offers farmers in both developed and undeveloped nations- the resources of earning a respectable income that is similar with their fellow citizens in the secondary and tertiary sectors. As PSEs, CSEs & AMSs are now the foremost indicators of support to agriculture in both WTO and OECD nations; *it is important to outline what the calculated "transfers" in fact can be used for. Of particular significance, is the extent to which they can be compared among goods, nations and throughout time in estimating policy changes and in the explicit negotiating context of the GATT.*[r]

The connection among the currency and commodity monetary values is a complex system of factors in estimating agricultural commodity monetary value increases. It also has implications on how diverse nations are influenced by the policies. While almost all agricultural product values augmented at least in supposed terms, the rate of increase diverse considerably from one commodity to another. Particularly, global monetary values of basic foods, such as cereals, oilseeds and dairy goods, enlarged far more considerably than the monetary values of tropical goods, such as coffee and cocoa, and raw materials, such as cotton or rubber.

Therefore, undeveloped nations dependent on exports of these latter goods set up that at the same time as their export incomes may have been growing; this was at a not so fast rate than the cost of their food imports. As several undeveloped nations are net food importers, this imposed a serious balance of payments dilemma.[n] Every single policy are estimated in

[r] Schnepf, R., 2006.

monetary terms in local currencies and added for each commodity. No judgment is ended in the computation as to whether a particular strategic policy has more or less manipulation on production, consumption or trade. In other words, the production impact of a unit of exchange transfer gave from a policy is measured the same as a currency unit provided from another policy. A dollar of research and development spending is equivalent in the computations to a dollar of market price assistance.[m]

2.1.2. Necessity of adjust the balance of support

Attempts to use the PSE, CSE or AMS as indicators of whether assistance has been reduced or whether commitments to reduce assistance have been respected, and have highlighted a number of issues. "*Reference prices may change as a result of an exchange rate change, a change in the trade practices of a large country or a non-policy related change in the supply and demand conditions prevailing in world markets (such as adverse weather conditions).*"[x] The estimation of policy reform in the OECD controlling and feedback process would be improved if PSE changes from period to period were disaggregated into policy and non-policy parts. Work is at present in progress to develop a method which can be useful methodically to through all the nations, at least for the market and producer value assistance component of the PSE (at this time accounting for around 75 per cent of the total PSE for the OECD but with discrepancy among nations).[l]

The negative food security impact of higher food values is greatest on undeveloped countries' poor consumers, who include several of the rural poor. Various developing and least-developed nations are food importers and have seen their annual food import bills more than double since 2000. On the positive side, higher food prices should enable producers to invest in raising productivity and production. Whether high food values can be turned into an opportunity for producers in undeveloped nations depends on their ability to respond. This is far from guaranteed. The monetary values of key inputs such as energy and fertilizer increased along with product values – sometimes faster – so the incentive to produce more

[x] World Trade Organization, WTO. 2001.

actually weakened.[d]

Furthermore, the capacity to produce more is limited for undeveloped countries smallholders with weak technology and limited access to inputs. Affordable food supplies need to be made available for poor consumers to avoid increasing the incidence of malnutrition. Some nations already have safety net mechanisms in place; others need to establish them and may need global assistance to do so. *The experience of high food prices resulted in the widespread recognition that the structural solution to the problem of food insecurity in the world lies in increasing production and productivity in the developing world, notably in low-income and food-deficit nations. Investments need to be boosted significantly and sustainably for improved productivity and increased food production.*[k] Supply-side limits require to be prevailing over crosswise the board and suitable policies and institutions necessitate to present a favorable atmosphere for a supply reply to subsist. With no these in place, investments in agriculture will not be imminent.

High-price periods, like low-price periods, are not unusual incidents in agricultural markets, even though elevated prices regularly lean to be short-time evaluated with low prices, which continue for longer periods. What has illustrious this event was the consensus of the trek in world monetary values of not just a few but of nearly all major food and feed goods and the prospect that the monetary values may continue high after the influence of short-term shocks dissolve. The price boom was also accompanied by much elevated value and volatility than in the past, especially in the cereals and oilseeds sectors, remarking the greater ambiguity in the markets.[g]

2.1.3. Constrained supply and control

The way to support producers to invest more in production is one strategic problem challenging governments in undeveloped nations. How to assure consumers have full accessibility to food at affordable monetary values is a more urgent one. Most of the time, justifiably in view of the social turbulence that elevated food prices provoked the policy

[k] Master, W. 2008.

actions introduced target on the urgent short-term food security issues by intending to slow monetary value increment and boost food accessibility. The medium- and long-term necessities to assist producers were abandoned, and some of the short-term strategies – especially trade policies –were likely to have a negative impact.

Whether these measures effectively reflect the influence of supply control policies has been a key concern in the lasts periods specified the escalating significance of such controls in world trade (WTO & OECD nations).[p] *A good approach to estimate the credit for both large and small nations executing supply control strategies would be to launch, with the correct elasticities of supply, the guaranteed monetary value which would take onward the similar output as accomplished with the supply control, the monetary value gap being the disparity among the observed world price and this national value.*

But this, again, would minimize the real transfers. Moreover, consumers keep on disbursing the observed, upper value. *Nevertheless, insofar as the quantity is reduced, the total AMS measure is reduced when multiplied by any given price gap, although not the percentage AMS except as a result of world prices changing - which is common to all nations.*[y] In terms of the transfer measurement there is no need to estimate the level of production which would occur in the absence of the supply control. The complicatedness arises in intending to use the PSE as an indicator of trade distortion. obviously there might be a considerable dissimilarity among the trade effect of an open-ended market price support programmes and one managed in combination with a supply constrains. Various thoughts have been put ahead which, starting with the basic PSE facts, would outcome in a resulting measure which would not indicate transfers or support but rather the "production incentive" or the "trade distortion equivalent" (TDE).

The TDE attempts to identify the theoretical "shadow" monetary value which would have brought forth the actual level of production taking place under the supply control and the monetary value gap is calculated by indication to this theoretical shadow monetary value.[e]

[y] World Trade Organization, WTO. 2000.

It calls for complementarity and consistency between targeted measures introduced to address immediate emergencies and longer-term measures to address the strategic need for long-run food security. They simply cannot afford to ensure food supplies for the poor, meet higher food import bills and reverse, overnight, years of neglect of their agriculture sectors.[h] These restrictions have to be overcome to permit a considerable supply reaction, and appropriate policy involvements are considered necessary to break out of this cruel circle that has rapt small producers in poverty and left several undeveloped nations strongly dependent on imported food and more susceptible to monetary value hikes.

If value incentives do become visible, the lack of incorporation into markets of various small producers averts them from take action. In several undeveloped nations, the organization of smallholder agriculture has a considerable impact in confining supply response and it is changing – land– labor ratios are decreasing as population enlarges – in a way that could more poorer smallholder producers' ability to react to elevated prices. Agricultural gains have stayed reasonably unaffected, with much farming performed by the elderly with little or no understanding of current farming practices and techniques.[m]

Even though accessibility to inputs has enhanced in some nations with subsequent reforms, with more certified traders and smaller amount of products existing for obtain, input use by smallholders continues at low level and then again constrains productivity. The small amounts of products available from the supply side to sell and a repeated lack of association between smallholders to bulk these jointly into more profitable volumes, together with the elevated cost of marketing due to fragile infrastructure and communications, denote it is not astounding that supply answer to better prices is not enough. Yet without that supply reaction, funds are not created for invest to enhanced production. All through the production and marketing system, a shortage of accessibility to reasonable credit, in addition to limits of the achievability of productivity-enhancing investments.

In Guatemala, agricultural credit accessibility is small and on the way out. The majority

of existing credit is channeled towards export products (traditional and non-traditional) with modest assistance for basic grains production.[c] A large amount of the credit to the agriculture segment currently comes from commercial banks and private investment, with very high rates of interest. And there was a remarkable decrease in the number of small farmers assisted by the formal financial system all through the 1990s.[g]

On the other hand, in numerous situations, realizing this supply reaction will necessitate overcoming a variety of supply-side limits. These include not only high input costs and a diversity of infrastructural obstacles but also institutional lacking of aware that lead to incompetent marketing systems and problems of access to inputs, credit and technology. Institutional incompetence is a foremost cause of reduced performance of undeveloped country agriculture, if implemented successfully; these direct interventions can boost the income of small producers and might diminish monetary value increases in local markets, thereby contributing to improvements in the nutritional status of net food-buying families. Yet, the budgetary costs of programmes to get better accessibility to inputs can be elevated. Such programmes can contain productive protection nets (e.g. seed and fertilizer supply), smart subsidies to diminish systematically the cost of fertilizers and seeds, and assist to finance institutions to help lessen credit constraints.[f]

But, if local output markets are not well integrated, such measures, in endorsing increased production, possibly will result in a fall in local food values to the damage of producers and earnings laborers. Short-term actions to progress accessibility to inputs need to be combined and assisted by longer-term strategies to deal with institutional weaknesses, together with facilitating the support of the private sector. These strategies can contain research and distributions of enhanced technologies through more efficient expansion systems, support of market and credit and capacity building. Support requirements have to target specifically on enabling poor rural producers – those least able to face the challenging fluctuating market signals – to boost their production and market their supply. Frequently,

they do not have even the most basic data necessary to rational make decision and efficient risk taking about what commodities to produce and in which manner. Agricultural research requires giving all the efforts on the necessity of these poor rural producers, and their capability to take benefit of research outcomes to be empowered through more successful extension clusters. For example, there are important economies of scale in the logistic of fertilizers, and it may be uneconomic to supply individual smallholders whose necessities are small. They also require assistance to reinforce their ability to fulfill these roles.[c]

2.1.4. Support to investment in Agriculture

The elevated food price event exemplifies as something to keep in mind about the vulnerability of the equilibrium among global food supplies and the growing necessity of the world's population for eat, and also of the fact that agriculture has been abandoned in global efforts to diminish poverty. Thus, while the urgent necessity is to prevent human pain from hunger and underfeeding as well as to persuade a fast supply response to reinstate a better equilibrium between food supply and demand, these must be combined by strategies in the medium term that will result in continued agricultural growth.

There is sufficient capacity for considerable increase in agricultural production and productivity in undeveloped nations. Production and productivity have not grown because assets channeled to agriculture have fall down. *There is a necessity to increase public and private investment in undeveloped country agriculture.*[d] Much more investment is required, particularly for water management. In addition, there has been a slowdown in investment in global agricultural research centers even as new challenges, such as climate change and increased demand for bio-fuel feedstock, have arisen. More generally, the global community needs to take concrete steps to increase its capacity to respond in a coordinated and expeditious way to requests from undeveloped nations not only for financial support but also for technical assistance to revive agricultural growth over the longer term. However, undeveloped country governments also need to act by allocating additional resources to

agriculture from their national budgets and by putting in place policies that are conducive to private-sector investment in agriculture. There is an urgent need to establish a comprehensive and reliable global market information system to provide a stronger basis for more efficient policy choices.

The use of trade policy measures to increase domestic food supply may also have implications for other nations, notably in the case of export restrictions. This suggests the necessity for better organization of policy globally, which the global organizations can facilitate. Global trade policies are under the jurisdiction of the WTO, whose rules, at present under negotiation in the Doha Round, provide the context for trade policy actions to elevated food prices.[y] WTO rules regarding subsidies are already debated above. It is not just in poor undeveloped nations that policy changes might be introduced to boost food supplies and slow the enhance in monetary values. One issue being debated actively is the WTO compatibility of the bio-fuel subsidies.[v]

The other associated subject is the indirect effect on food prices of subsidies on bio-fuel production and whether this quantities to cross-subsidization from the point of view of the WTO Agreement on Agriculture or other Agreements. away from these legal aspects, there is also the moral concern of whether subsidies that are absolutely legal from the WTO perception should be eliminated and if they have a negative impact on food supplies, poverty and food insecurity.[c] Finally, is important to consider one of the problems addressed by the Uruguay Round Agreement on Agriculture (UR AoA) was excessive production and the resulting trade distortions caused by domestic and export subsidies. The Doha Round is continuing the reform process along similar lines. A question being asked in the context of the high food values is whether some of the trade rules require rethinking so that governments and the global community can respond better to future food crises. The current crisis of high food prices has been used both to argue for an immediate motion of the Doha Round discussions and to dispute in opposition to any additional reductions in protection that might

[c] Agriculture Department, FAO. 2009.

result from a new agreement.

Those in dispute for a substantive agreement for additional liberalization of agricultural markets have recommended that present levels of protection and support have depressed global market monetary values and shortened incentives for investment in increased food production in various food-importing nations, causing to up to date surges in import bills. Those in disputes in opposition to have pointed to proof that liberalization would result in growing pressure on values as surplus production in subsidizing nations' falls.[1]

2.2. Research Objectives

Every country has to work as a big corporation, promoting the high quality and low cost of its production (optimizing monetary values for the final consumers indeed) and has to focus all its policies (and regulations) in order to achieve that goal. Quoting the theory and practice of revenue management (Talluri, K., Van Ryzin, G., 2004, 4 pp.): *"The forces of supply and demand and the resulting process of price formation –the <invisible hand> of Adam Smith – lie at the heart of our current understanding of market economics." They are embodied in the concept of the "rational" (profit-maximizing) firm, and define the mechanism by which market equilibrium are reached."*[t]

The major criticism regarding policies which sustain domestic monetary values, or subsidize production in some other way, is that they promote over-production. This squeezes out imports or leads to export subsidies and low-priced dumping on world markets. The Agriculture Agreement differentiates among support programmes that encourage production directly, and those that are regarded to have no direct effect. Local policies that do have a direct influence on production and trade have to be cut back. *WTO members computed how much support of this kind they were giving per year for the agricultural sector (using computations known as total aggregate measurement of support or total AMS) in the base years of 1986-88.*[b] Developed nations decided to diminish these numbers by 20% over six years starting in 1995. Undeveloped nations approved to make 13% cuts over 10 years.

[t] Talluri, K., Van Ryzin, G. 2004.

[b] Agriculture Commission, WTO. 1995.

Least-developed nations do not require making any cuts. (This category of local support is from time to time called the amber box as a indication to the amber color of traffic lights, which suggest slow down).[c]

Strategies with minimal impact on commerce can be used freely (they are in a green box (green as in traffic lights). They include government services such as research, disease control, communications and food security. They also contains direct expenditures made directly to farmers that do not encourage production, such as certain modalities of direct income support, support to help farmers reorganize agriculture, and direct payments under environmental and regional support programmes.

Also allowed, are some kind direct payments to farmers where the farmers are asked to limit production volumes (sometimes called blue box measures), certain government support programmes to enhanced agricultural and rural development in undeveloped nations, and other support on a small level (the minimis) when confronted with the total value of the product or products supported (5% or less in developed nations and 10% or less for undeveloped nations). The issue comes from each modality of nations policies. On one hand, developed nations "filtrates" large quantities of money under the concept of the amber boxes (occasionally even over covering the total production cost) and on the hand, undeveloped nations applied minimal (or null) support and funds to its productive sectors. With a well probed mathematical modeling (with its respective simulation) under the revenue management concepts, it's possible to establish the right amount of subsidy in terms of offer and demand in a free market of commodities that basically depends on fixed cost and a projected production.[g] Under this precept, price (that usually is highly distorted) can be establish by the normal process of commerce (the invisible hand of Adam Smith) but this time without the "dumping effect" of exaggerated subsidies and in an optimal quantity to satisfied the market.

The mainly significant argument against agricultural support is that one says

agricultural support is opposed to fair and free trade values that help farmers to earn more from agricultural production and exports particularly in undeveloped nations. Another significant reason is the correlation between agricultural support in developed nations and poverty in undeveloped ones as suggested by some facts such as:[1]

• *"Public support for farmers in developed nations costs a family of four on average nearly US$1000 per year in higher prices and taxes.*

• *More than 70% of farm support in OECD nations is provided in the form of trade distorting market price support and payments linked to production, all of which are inefficient in terms of bolstering farm incomes: according to the OECD, of every US$1 in price support, only US$0.25 ends up in the farmer's pocket as extra income. The rest is absorbed by higher land prices, fertilizer and feed costs and other factors.*

• *Dairy sub-sector in France, is supported by two dollars for every cow / day while 2 billion of world humans live under poverty line (2 $ US/ day), one billion of them live on 1 $US."*

On the other hand, is important to connect what is theory with practice. In this sense, the impact of high food prices is obviously most severe for the poor who rely on purchased food. Thus, higher values affect not only their food consumption in terms of quantity and quality, but also their spending in general. The impact of higher food prices on the poor depends crucially on whether they are net food sellers, in which case the impact could in principle be positive or net food buyers, in which case the impact is unequivocally negative. The evidence suggests that most households in the developing world and especially the poor are net buyers of food, and this holds even for rural households that are mostly engaged in agriculture. Faced with sharply rising food values, poor households had to adjust their food consumption patterns.

Besides, rising food values contribute to the overall rate of inflation in most nations, including developed nations. The greater the share of food in the household budget, the more rising food prices fuel general inflation. For most developed nations, food expenditure shares

[1] Mouhamad, A., 2008.

range between 10 and 20 percent. In undeveloped nations, the share of food expenditure in household budgets is much higher, absorbing more than half of family income in poor nations. In addition to commanding an intense load on the cost of living, growing food values can have further indirect influence on inflation if they punctual pay increases – elevated wage demands have been at the center of several arguments.

An inflation-targeting central bank might have to restrain inflationary pressure from elevated food prices when the effect on non-food values is considerable, and this would mean increment interest rates.[q]

2.2.1. Is it possible through subsidies & domestic support respond to high food prices?

It is argued that the recent elevated food prices shown an opportunity for the agriculture sector in undeveloped nations to enhance production, raise profits and reinstate itself as an engine of expansion. While there is several proof that productivity reacts in a positive way to real monetary value increases and negatively to decreases, this is not all the time establish to be the case. A wealth of FAO case study proof that monetary value arises alone and is not enough to enhanced productivity and supply. On the whole, the portrait is diverse concerning how undeveloped country farmers are likely to response to elevated product values. What is apparent is that superior output values alone are not enough to motivate a considerable growth in food supplies. A considerable supply response demand investment to enhance smallholder productivity.[c]

Increasing production into new land will not be sufficient to fulfill future food requirements. furthermore, productivity-led enhances in food and agricultural production will increase not only farm incomes, but will also encourage backward and forward associations in the rural and local economy and lead to a decrease in poverty. Important supply response founded on productivity upgrading needs a positive and stable incentives situation in which upper commodity monetary values are transmitted to the farm level and producers have access to reasonable price inputs and can transport their output to market.

Successful government policies have a role in making sure that the required conditions are met. While elevated food values can be seen as an prospect to startup agricultural expansion, the agriculture sector and commodity-producing households could fall short to benefit in the long run if the high monetary value extras are consumed right away instead of reinvested.[f] Governments participate in critical role even if the sector is not sheltered or characterized by monetary value or free commerce policies. Commodity monetary value booms have to be properly managed by producers, consumers and governments if they are to produce in constant profit for commodity-producing nations and minimum costs for importing nations. This requires macroeconomic as well as sectorial policy actions. Unpredictability in agricultural commodity values creates risks for market members and sectors whether as producers or as consumers.

Growing global food prices prompt the fascinating inquiry of the degree to which commodity reliant and net food importing undeveloped nations may gain in the future from an amplified use of market base risk management instruments to hedge in opposition to world market instability. Prospect options and other forms of derivative contracts can be considered as tools to hedge against unpredictable changes in both import and export values.[h]

However, such instruments are not designed to stabilize export revenues or import bills but only to make them more predictable. This can be beneficial to the extent that it allows proper planning of financial and other resources. In theory, the unpredictability of the import bills and export revenues of undeveloped nations might be reduced through appropriate hedging. However, in most nations, a number of institutional obstacles need to be overcome before hedging the national import or export positions with the aim of promoting food security would become feasible.

2.2.2. Policy changing

Facing with fast growing food prices, various nations completed policy changes or launch new policy strategies. Elevated food values create a succession of interconnected

policy challenges. Most noticeably, there is the short-run urgent situation of ensuring reasonably priced food supplies for poor consumers in order to evade escalating the incidence of malnutrition. Whereas this can be accomplish in some degree at least with the availability of food supplies, there may also be some approach to measures to growing food production and balance the prices even in the short term. Anyway, the principal approach for a considerable supply response and more affordable prices is in the medium to longer term. Elevated prices can be an incentive and also an opportunity to producers in undeveloped nations but, as remarked above, there are several limitations to be passing over if a considerable supply response is to become visible in the medium to longer term. Current policy inference by governments all over the globe have emphasized a restricted range of easy, quick acting and not so expensive measures (especially trade policy measures) to ensure food supplies for local markets and to smooth the cost to consumers.

This short period actions, though completely understandable in perspective of the urgent circumstances, means that in Various cases medium- and longer-term needs to raise production have been abandoned. *Efforts to protect consumers from higher food prices need to be balanced against maintaining incentives for producers to achieve the productivity and production increases that are necessary to stabilize prices and supplies.*[d] Various of the short-term policies launched by governments to heal the urgent food security necessity of poor consumers have held down prices for producers and, thus, motivation to invest in growing productivity and production. There is a necessity for policy indicator to be approach, non-distortionary and ongoing towards agricultural investment.

Elevated food values also have macroeconomic impacts. For food importers, these include balance of payments issues with the subsequent food import bills and incremental inflationary pressure due food is such a vast element in the consumer's basket of goods. Food exporters enjoying upper benefits from elevated food values on global markets may require analyze which is the best way to manage growing export profits in order to make sure that

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[d] Agriculture department, FAO. 2009.

they are addressed into productive investments budgets to stimulate long-run growth. Establishing the appropriate policy solutions to the global challenges provoked by the lately and continuous elevated food prices is not directly given the necessity both for quick response and action to protect the food security of susceptible groups and for launch a foundation for more balanced monetary values and supplies in the future.[e] There is a crescent powerful connection among policies, strategies and actions to protect consumers against elevated food values and the improvement of agricultural productivity. Still, if poorly planned or executed, they can disfigure incentives, discourage investment and be unsustainable in conditions of budgetary funds. Undoubtedly, this group of policies clashes necessities to be disregard. Nevertheless, budgetary costs can be unaffordable for not few governments and the scope for raise funds such schemes through internal or external borrowing can be restricted. Therefore, there is a call for global support.[m]

2.2.3. Approaching a realistic way to respond to agricultural market challenges

State policy actions to elevated food values have been remained changing in nature and success. In various cases, governments have used accessible policy strategies already in place. The policy responses done can be grouped into three wide segments, targeting utilization, commerce and production, respectively. *There appears to have been relatively little action on longer-term measures. Consumer price subsidies, particularly for the major food staples, have been extensively used.*[d] Meanwhile, not few nations have also tried to reduce consumption taxes. That is the case of monetary value controls, through sales from public stocks at pre-set prices or simply remain constant the retail values by ruling, have also been used. *A FAO study of 77 nations demonstrate that 55 percent of them have used price restrictions or consumer subsidies in an effort to decrease the transmission of price increases to consumers.*[c] Though such actions can be useful in restrict prices in the short run, they are costly in terms of in short supply budgetary funds and can distort food markets. Monetary value regulations can lead to rationing and repress incentives to producers. This also applies

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[d] Agriculture department, FAO. 2009.

[c] Agriculture department, FAO. 2009.

to other safety nets such as food and nutrition programmes. Various nations have launched trade policy actions to restrain monetary value arising and attempt to organize supplies on local markets. In the short term, these trade actions are reasonable, inexpensive and simple to put into practice.

Nonetheless, they may have unfavorable effects on incentives to enlarge food supplies through greater than before local production and on world markets by more restricting supplies and making pressure up to monetary values even more. While imposing export taxes raises some additional government income, a number of exporting nations have reported that export regulations and, hence, low output prices joined with elevated input prices in fact led to decreased productivity of cereals.[n]

2.2.4. The final objective: Food security

Dropping producer taxes, especially on grain production, has been an extensively used policy to boost production in both low- and middle-income nations. Production subsidies, especially on grain production, have been used to strengthen incentives. Subsidies on inputs such as fertilizer and seeds have also been frequent. *While such subsidies and the allocation of productive inputs (e.g. seeds and fertilizers) can give a short- or medium-term incentive to production, these methods can be costly and may guide to suboptimal use of these inputs, particularly if they are sustained over a long period.*[c]

In malice of an apparent need to secure sufficient food supplies, some nations maintain to regulate producer monetary values, establishing the price lower than the free market value, or obtain grains from local suppliers at low monetary values for stockholding. Furthermore, the discharge of grain stocks at low prices puts descending stress on prices, dispiriting increases in domestic production. Governments all over the world have taken action to elevated food prices with a variety of policy strategies. Reasonably, these have emphasized a partial range of fast acting policies to secure food supplies for local markets and to moderate the cost to local consumers.

[c] Agriculture department, FAO. 2009.

On the other hand, the medium- and longer-term necessity to increase food production and the global implications of unilateral national policy choices should not be unnoticed. These prompt two basic challenges. The first is to offer direct assistance to consumers, especially those in susceptible groups, to help them preserve their food consumption levels through so-called "safety net" policies. The second is to increase supplies of food on domestic markets through controlling food stocks or commerce or by encouraging a short-run supply action from the local agriculture sector. Eventually, it is raising agricultural productivity and production that is the basis for attempt an adequate and balanced food supplies and values in the medium and long term, and care must be taken to ensure that short-run urgent situation procedures do not compromise this goal. *"Safety net" is an umbrella term that covers various programmes aimed at assisting vulnerable population groups.*[c]

Several nations have one or more safety net programmes with different levels of treatment of the population and the degree of support delivered. In the subject for targeted measures to interfere can be made on funding cost foundation or to evade escape to non-poor populations. Of course, they can be managed onerous; they can be barely reach on the beneficiaries without promote distortions in the markets. In the context of high food values, one of the problems usually remarked is that not all nations have safety net programmes in place because of their funding costs and administrative intricacy. Where this is the case, it will be very difficult to put in place a scheme in a short period, given the administrative, institutional and other supports required for this.

Such measure from government to interfere can also promote local market development in food and other goods by giving greater incentives to the private sector to connect in higher-volume, more balanced marketing channels. However, where markets perform imperfectly, that is the case, where they are inadequately integrated with other markets or where there is limited supply response to increased values, such measures can result in price inflation as the increased expenditures power bids up the monetary values of limited goods.

Where food values are growing rapidly, amendment to the value of transfers will be desirable in order to uphold purchasing power, and this can be governmentally difficult.[k]

In the case of cash transfers, these policies are suitable where local food markets work and enhancing access to food is the goal. The absorption of market power, experienced characteristically for semi-processed or processed agricultural products, is perceived by society at large – as well as by the government – as a chief starting place of the problem. *The answer again can be in the way of successful pro-competitive strategies that are absent in several undeveloped nations.*[c]

2.3. Delimitation and methods

2.3.1. Policy coverage

Since the beginning, policy treatment was proposed to comprise "all procedures which control production, consumption and commerce". Resource limits and information accessibility produced a pragmatic working arrangement of strategies to be enclosed. A major subject was to reduce disparities in treatment and hence maximize consistency in an exercise where uniformity across a large number of nations was critical to its tolerability. From this point, there are a number of key problems that emerged:[f]

i. *"Only policies specific to agriculture are included in the calculations. Policies which convey a subsidy to all users in the economy are excluded.*

ii. *Data availability results in somewhat uneven coverage and hence inconsistent treatment for a number of policies. Most affected have been credit subsidies, sub-national expenditures and taxation concessions.*

iii. *Storage costs and export subsidies, which can sometimes represent a significant part of agricultural budgets, are already included in the measurement of monetary value gaps."*

Elevated food values came as a shock partially since consumers all through the world had turn into familiarized to the notion of so-called "cheap food". Technological

[f] Commission Staff Working document, CEC. 2009.

improvements reduced the cost of producing in a great manner, products and this, together with extensive subsidies in nations of the Organization for Economic Co-operation and Development (OECD) that provided more efficient and low cost production elsewhere unprofitable ingrained the role of a few nations in supplying the world with food. This supply-driven agricultural model sent valid monetary values enlarge downward on a tendency durable for decades. In addition, changes in the market and policy setting have been tools in dropping stock levels and have led to far more considered reliance on imports to meet food necessities.[c] Gathering everything inside, these improvements have provide as a result in a considerable role for most important exporting nations to supply global markets as time demand for a necessity. Consequently, it is not surprising the fact when production shortages happened in such nations, especially in consecutive years, global supplies are extended and the resulting market tension is evident in both higher prices and higher volatility. That's why the necessity to include minor exporting countries to make a counter balance of the supply side and avoid this kind of events.

In a counterpart of this recession, the world's growing demand for agricultural commodities, driven by growing global incomes and population and therefore the expansion in bio-fuel production, left key exporters with little chance to stock up. Extremely high price volatility for several goods was another factor demanding for attention and creating a fear atmosphere of a wide-scale crisis. In terms of unpredictability, it is very hard and represents a big challenge to recognize among market instability and fundamentally higher monetary value levels. Episodes of disproportionate market commotion do not automatically result in an elementary, enduring shift in the trajectory of monetary values. *"Econometric techniques can be used to detect these structural breaks in agricultural commodity prices."*[p]

Just after the eventually and periodically economic crisis passed, monetary values simply start to follow their preceding trend. While this is difficult to determine according to their individually contributions in term of amounts produce, some of these factors could stay

remain and provide an effect on the average level of monetary values.

2.3.2. Product and nation treatment

The first approach to define a policy framework and evaluate economical strategies in terms of apply subsidies under revenue management principles is to set of range commodities with most relevance to OECD and WTO nations in terms of production and trade, to make a first approach of the consequences they can produce in the instability of the agricultural commodities market. The second condition is related to the ease or achievability of computation. In this sense, the result of this course has been the designation of a standard list of commodities which includes the main temperate-zone products. Within the standard list, a commodity can be included in each country priority list and if it accounts for at least one per cent of the total value of agricultural production as measured at the farm gate, is worth for further analysis.[g]

A huge percentage of assistance that is not given by market price support and direct payments with budgetary source is not commodity specific. This subjective method possibly will guide to some misallocation of support and to a little instability in PSE elements which a priori would be projected to be rather constant, the typical case can be the R&D subsidies which by this method will raise and fall within the level of production of a commodity.

"But if such subsidies are provided to encourage producers to switch resources to another commodity, then they would be assigned to this alternative commodity".[j] A similar issue pops up regarding with direct income support particularly designed to be "decoupled", this mean, not to provide an incentive to the production of a specific product. While such support is not designed on the basis of single group commodities, it does deliver transfers to farmers. Currently, the pragmatic solution to this and other distribution problems is taken on the basis of the proposal of each policy programme, but is still topic to deliberation. In future it can be enviable to move in the direction of assessment of a sectoral or non-commodity specific PSE to which all such subsidies would be designated. This PSE would be aggregated

[j] Josling, T., 1990.

42

with commodity-specific PSEs to establish the overall averages and aggregates. Very high unpredictability is equal to uncertainty, which makes harder the decision-making process for buyers and sellers.

Greater uncertainty restricts opportunities for producers to have access on credit markets and provides the tendency to result in the adoption of low-risk production technologies at the expense of innovation and entrepreneurship, that's where the whole dynamic of the market start to get stuck and is not smoothly anymore.[s] Additionally, the wider and more unpredictable the monetary value fluctuations in a commodity are, the bigger is the opportunity of realizing large gains by speculating on future monetary value fluctuations of that commodity, something similar to stockholders market.

Bigger the risk, bigger the gain. As a result, unpredictability can attract considerable speculative movement, which in turn can begin a vicious cycle of destabilizing fluctuations in cash monetary values, just like in stocks when speculation arises. At the national level, several undeveloped nations are still highly reliant on primary commodities, either in their exports or imports. Several of the poorest nations are food importers, heavily dependent on cereal imports.

At the national level, the impact of high commodity monetary values depends, among other things, on whether a country is an importer or an exporter, what it imports or exports, its trade policy and its exchange rate policy. In addition, the financial crisis could have serious implications for food security in several undeveloped nations. The tight credit situation may restrict access by poor nations to finance, thus limiting their ability to import food.[u]

2.3.3. Selection of reference value

To define the external reference monetary value, this has been one of the most controversial issues because, in the real world, it is the most important parameter in estimating the magnitude and the tendency of subsidies, whether in the figure of AMS or in PSEs. Initial problems related to this definition centered on the argument that reference

monetary values are themselves distorted, and that a "better" way to measure should be the world equilibrium price estimated to prevail in the absence of the policies concerned, just like in the invisible hand of Adam Smith proposal. However, *"the methodology assumes the small country case and in so far as possible, reference prices are chosen from actual prices at a country's own borders or originate from nations whose own policies only lightly assist the commodity (any such assistance being netted out of the reference price) and who do not engage in export subsidization. It is, however, recognized that the price received by a non-subsidizing, competitive price taker will be largely determined by the behavior of "large nations" which subsidies exports using the world market as a residual recipient of surplus production"*.[r] So the main question is: in several nations, with several agricultural commodities…which nations can be "representative" of the proposed theory and under which conditions and commodities to make the theory practical? *The answer underlies in China. China has become the world's largest economy and second largest recipient of foreign direct investment. Nevertheless, the country stills an emerging economy. China's size and performance is all the more remarkable in that its reforms have been gradual and its development has occurred despite extensive, though declining, state ownership, and intervention in the economy.*[n] The increase in world population requires higher food production if consumption requirements are to be met. Increasing incomes generally also lead to changes in diets, often reflected in stronger demand for higher-value foods. Therefore, the widely accepted notion that rising demand in nations such as China, one of the most populous nations with rapid population and income growth, is a reason for soaring food prices warrants re-examination. *Emerging economies, particularly China, are certainly playing an important role in global agricultural commodity demand and supply.*[d]

　　Wheat use in China has in fact been growing more slowly than in the rest of the world. This means that the growth in Wheat feed demand in these two nations, at least until recently, has been met mainly from domestic sources. Moreover, while China has become a major

[r] Schnepf, R., 2006.

importer of oilseeds, vegetable oils and livestock products, the country's overall agricultural

trade balance has remained largely positive in most years since the mid-1990s.[c]
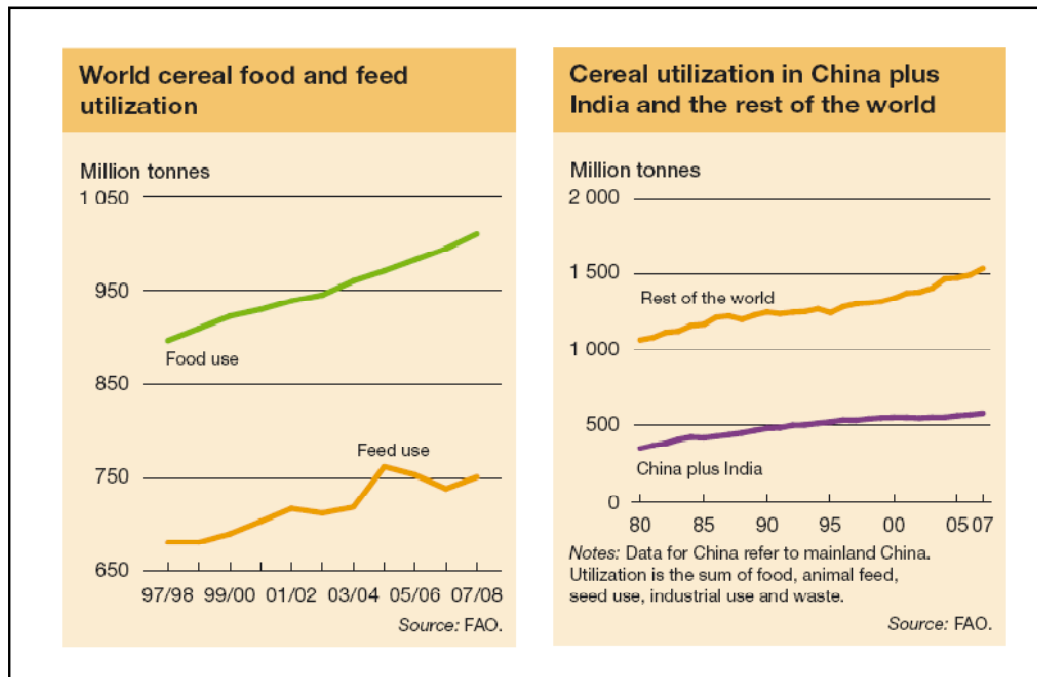
Figure 3:

2.3.4. Hom

The pro   nity cost at a

country's bo   n should be

representativ   omogeneity

between loc   re are often

allocation co   he producer

monetary value (at the farm gate). Attempts have been made to define an acceptable common

reference monetary value, thereby ensuring that the monetary value comparison for each

country would have the same base or referenced monetary value is a significant challenge.[u]

This value must, therefore, be representative of production in each nation or of a adequately

large proportion of production that it could be used as the foundation of the estimate for the

whole production. The problem of homogeneity has therefore generated constant debate about

the question of quality regulation. These have been powerfully conquered by nations who

perceive that the locally produced commodity has special distinctiveness and is not able of being produced in other place. There is several reasons under the food prices (and distortions) can be explained, especially when is concerning about food crisis and prices peaks, these consist of an inflow of speculative funds into agricultural commodity futures markets as the global financial recession destabilized more than usual connection and equity markets.

Once world values began to recover considerably, the market and policy reactions to this motivated the addition to the inflationary pressure, e.g. hoarding against prospect of additional price peaks,   iing up food values. It wa

These   opposing to the backgro   griculture – slowing gro   riculture in developmen   ich not only exacerbated   handle for undeveloped
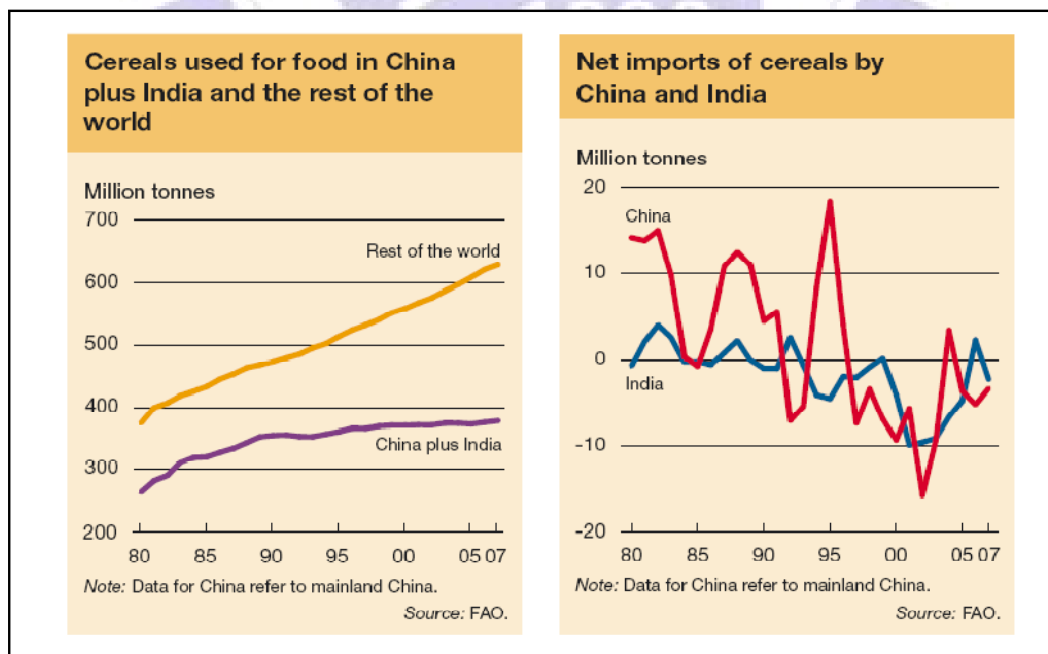
Figure 4: Cereals used and net import for China & India. Source: FAO

The values of the product support measures (both in OECD or WTO) are designed to measure transfers to primary agriculture and not to the processing and distribution sectors. Hence specific subsidies to these sectors are excluded. The comparison between domestic wholesale prices and the border monetary value generates monetary value gaps which are then converted to their equivalents at the primary sector level using appropriate technical (yield or conversion) coefficients. *Agricultural commodity prices are defined by a mixture of the well regarded known market basics concepts of demand and supply and exogenous event (typical or atypical) related to factors such as the weather.*[r]

Previous experiences, shows that technological progress reduced costs and promote supply expansion at a faster rate than population and income growth expanded demand, guiding to a long-run relative decline slope function in agricultural commodity monetary values. Recent conditions may have differ in that demand growth, as a result of income growth in up-and-coming promising economic industries and bio-fuel demand, may run straight forward to supply expansion, so promoting the monetary value increases.[v]

Unpredictability in prices relies from supply and demand atypical event. In the short run, supply and demand for agricultural products are inelastic and do not respond much to monetary value changes, so supply and demand shocks can turn out wide changes in prices. Supply volatility is perhaps most important because of the dependence of agricultural production on the weather, although demand shocks can be important too, especially for particular raw materials.

Consequently, the level of stocks in relation to demand is a significant factor in commodity monetary values. Markets and monetary values for agricultural commodities do not amend right away to supply or demand shocks. Monetary values of different commodities are linked through possible replacement or complementarities in consumption or production. These lead to "cross" effects of value changes from one commodity to another.[h]

[r] Schnepf, R., 2006.

2.3.6. Choice of domestic value and comparability

Local monetary values are estimated as close to the farm-gate as possible and as close to the raw or primary commodity as feasible. The local monetary values used to compute monetary value gaps are not always identical to those used to compute the value of local production, due to the different levels of transformation from raw material of farm and traded agricultural commodities as a finished product. In these cases, monetary value gaps are transformed to their farm-gate equivalents.

Growi   uay Round
negotiations   ions to the
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nations and
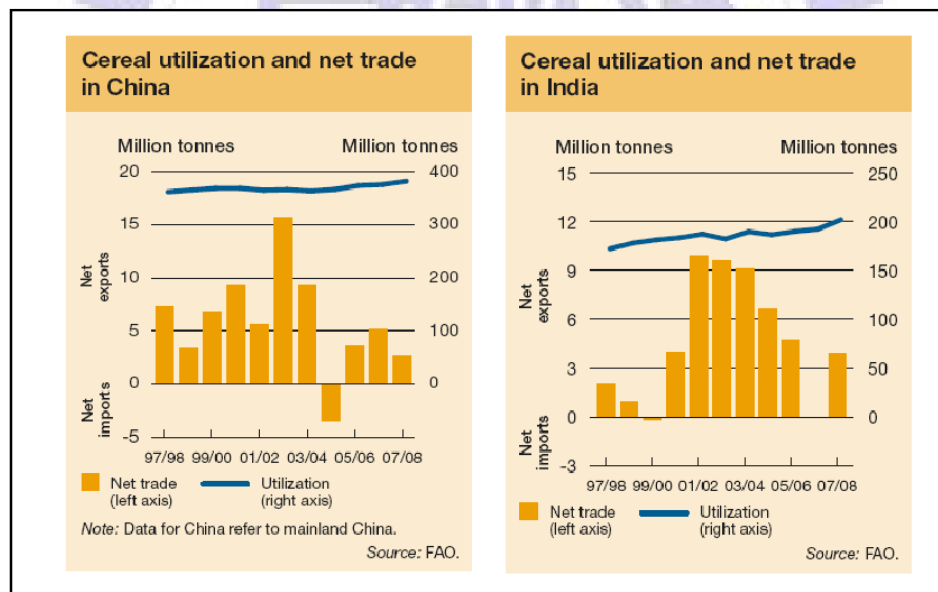
Figure 5: Cereal utilization and net trade for China and India

2.3.7. To practice the principle, every country need to apply the same standard

There it seems exists a expanding consensus and interest to find that the proper policy response to constant elevated food values must be a enclose of safety net strategies to deal with urgent food security necessities and targeting those worst affected, accompanied by actions to promote and facilitate supply response to soothe supplies and prices in the medium

and longer terms. But, it is also accepted that not all undeveloped nations will have the resources, institutions or knowledge to design and put into practice such policies.

Safety nets have an elevated budgetary cost and are administratively troublesome. Policies intended at sustainable expansion of food supplies are also challenging in budgetary terms, requiring a turnaround in the descending tendency in investment of agriculture. Therefore, various nations need global support in the structure of funds and technical support.[d]

The local policy problem also has a global aspect in that, the majority in the case of export restrictions; policies launched by one country may increase local food accessibility and restrain monetary values and can reduce accessibility and rise values to other nations. The issues of elevated food prices and its relevance of policy are not only to maintain of undeveloped nations. Developed-country policy choices are also relevant to the debate of what should be done. *More generally, various aspects of global food market developments and policy are the concern of the WTO and under negotiation in the Doha Round. Disciplines agreed in the WTO have a posture on the choice of policy responses and later action to elevated food prices.*[c]

Elevated food values are a concern of global dimension and, therefore, a matter for global debate and global action. The urgent food necessities of the poor are being addressed through short-term measures that include rising funds in undeveloped nations, providing more balance of payments and budget assistance to help meet increased food and energy bills, and financing emergency programmes intended at increasing agricultural production in food-deficit nations. In the medium term, hard work are being made to reinstate agriculture to the centre of the development agenda, reversing the long-term turn down in agricultural investment to make sure that it can keep on to meet the demands of a world population that is increasing and becoming more urbanized and wealthier. At the end, the top urgent main concern is to guarantee access to food for the most helpless populations.[p]

Chapter 3: LITERATURE REVIEW

3.1. WTO domestic support and subsidies history

The use of the Producer and Consumer Subsidy Equivalent (PSE/CSE) method to estimate support to agriculture was initially developed by Professor Tim Josling for the Food and Agriculture Organization of the UN in the early 1970s. The accomplishment of this directive required:[m]

i. *Assess of the sources of assistance on a commodity-by-commodity basis in OECD countries; and*

ii. *A technique for estimate the impact of a continuous and objective decrease in aid upon local and global markets, which would consent the integration of inter-commodity connections and would permit an assessment of the diverse ways in which agricultural policy goals could be met.*

The dimension of support using the PSE/CSE method satisfied the first condition, while the development of the Ministerial Trade Mandate (MTM) model*, explained in another way in this volume, was developed to satisfy the second. The choice of the PSE/CSE method was determined by a number of considerations. Principal among these was the necessity to capture in single, all- inclusive actions the transfers to farmers from agricultural policies, implemented with a wide range of often complex and inter-related instruments.

The concurrence of a parallel debate on assessing support and the deliberation of an "aggregate measure of support" as one of the possible advances in the Uruguay Round trade dialogues has destined that considerable assessment of the method of calculation continues within OECD, both at the broad conceptual level and at the practical level of choice of data series.[e]

The measure supports are thus now widely compared across commodities, nations and through time. The notion of subsidies to agriculture as entirely budget-based has been

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* MTM model is a representation of the world crop and livestock economy developed by OECD, 1987.

[e] Cahill, C., Legg, W. 2003.

confirmed to be tremendously confusing; on the contrary, transfers from consumers account for the foremost share of the total subsidize calling base support. In the Uruguay Round, the explicit inclusion of local policy in the agriculture negotiation round was at least in part stimulated by the examination which has been carried out in OECD on the basis of PSEs/CSEs. The EC's proposal for an Aggregate Measure of Support is resulting from the OECD PSE. The proposal of the Cairns Group of so-called "fair trading" nations also contains a specific role for PSE or related measures. The mid-term review of the Uruguay Round, completed in April 1989, reiterated the role of an aggregate measurement of support.[m]

3.2. Domestic support and subsidies concept definition

Despite the involvedness and variety of policy tools considered to achieve agricultural policy goals (as well as the frequently puzzling classification to illustrate the same policy in different nations), they finally present support to the owners of factors of production affianced in the agricultural sector. A variety of measurement concepts have been developed to estimate assistance, the choice of which depends on the purpose of the measurement, the level of refinement, the detail desired and the availability of data.

It is value mentioning that World Trade Organization uses in assessing agricultural support the Aggregate Measure Support (AMS) which is distinct in the agreement on agriculture. AMS includes budgetary outlays and returns transfers from consumers to producers as a effect of policies distort market prices represented in straight payments such as finance insufficient payments, input subsidies, market price support, and interest subsidies on goods credit programs.[1]

Producer Support Estimates (PSE) VS Aggregate Measure of Support (AMS)	
The purpose of PSE is to monitor and evaluate progress in agricultural policy reform.	The AMS is the basis for legal commitment to reduce domestic support in WTO agreement on agriculture.

PSE covers all transfers to farmers arising from agricultural policies whether it is direct or indirect transfers. Market monetary value support in the PSE is measured at the farm gate level using actual producer and reference prices for commodities in a given year.	AMS covers only domestic policies tied to the production and trade, it excludes trade policies related to market access, export subsidy disciplines, production – limiting policies with non or least trade distorting in addition to specified policies distort trade (e.g. input subsidies) **Market price support is measured by the difference between annual prices fixed by policy makers (administrated prices) and world prices in the base period 1986 – 1988.**

Figure 6: Product Support Estimates VS Aggregate Measure of Support. Source: Mouhamad, A. 2008.

In other words, AMS differs from PSE by excluding benefits or costs to certain non-commodities policies such as research – environmental programs – inspection services by using single resolutions defined in WTO for direct payments and market monetary value support while PSE includes costs and payments for those programs supposed to offer remuneration to agriculture.

3.2.1. Producer and consumer subsidy equivalents

The PSE is an indicator of the value of the transfers from domestic consumers and taxpayers to producers resulting from a given set of agricultural policies, at a point in time. Thus the PSEs are aggregate measures of the total monetary value of the assistance to output and inputs on a commodity-by-commodity basis, associated with agricultural policies. Five categories of agricultural policy measures are included in the OECD calculations of PSEs:[m]

i. *All measures which simultaneously affect producer and consumer monetary values (Market Price Support);*

ii. *All measures which transfer money directly to producers (Direct Payments) without raising monetary values to consumers;*

[m] Organization for Economic Co-operation and Development, 2004.

iii.   *All measures which lower input costs (Reduction in Input Costs) with no distinction being made between subsidies to capital and those to other inputs;*

iv.   *Measures which in the long term reduce costs but which are not directly received by producers (General Services);*

v.   *Finally, other indirect support (Other), the main elements of which are sub-national subsidies (i.e. measures funded nationally by Member states in the case of the EC or regionally in the case of other nations) and taxation concessions.*

Market price support policies provide support through consumer- making available transfers which create a lock between local and world market monetary values and are estimated as the difference between these two sets of monetary values, multiplied by the amount that is subject to those indicators. In most OECD nations, market values are increased by these policies, but the discussion can be the case from time to time, particularly in undeveloped nations.

All other measures provide assistance by budget-delivered transfers and do not create a wedge between local and world market monetary values. The value of production can be estimated at local values (as in the OECD calculations) or at world prices.

The exposure of these transfers as total, per unit or percentage quantities relies on the type of judgment being made. Clearly, the total PSE for a commodity and country will reflect not only the rate of support but also the amount of agricultural production.[1]

The per unit PSE, when expressed in an ordinary currency exchange, permits comparisons between nations and within a time frame of the rate of support to a single commodity.

In algebraic form, where the level of production is Q, the domestic market price is Pd, the world price is Pw, direct payments are D, levies on producers are L and all other budgetary-financed support is B, the PSE expressions, as measured by OECD, are:

> Total PSE (TPSE) = Qp* (Pd - Pw) + D - L + B
>
> Total unit PSE = TPSU/ Qp
>
> Percentage PSE = 100 (TPSE) / [Qp(Pd) + D - L] (at domestic monetary values)

Measured at world prices, Pd in % PSE would be replaced by Pw.[u]

The CSE is a measure of the value of transfers from local consumers to producers and taxpayers arising from a known set of agricultural policies at a point in the timeline. The CSE assessment, in the OECD computations, is not planned to capture all policies that affect utilization from consumers but is restricted to the effect on consumers of agricultural policies only. Particular consumer subsidies from government funds, paid in applying agricultural policies, partially counterbalance consumer taxes. In an algebraic expression, this can be defined as follow:

> Total CSE (TCSE) = - Qc * (Pd - Pw) + G
>
> Per unit CSE = TCSE/ Qc
>
> Percentage CSE = 100 (TCSE) / [Qc (Pd)] (at domestic monetary values)

Policies normally engage both consumer and taxpayer transfers to producers. This is clearly seen in those policies which guarantee a local market value for a commodity above world market values, the domestic value being preserved by restraining supplies to the local market. In the case of an exporter, this is achieved by subsidizing export sales.

In both cases, the consumer typically pays a monetary value which enables the domestic producer monetary value to be preserved over that on world markets. Although, in the case of an exporter, there is a budget outlay (export subsidy) whereas in the case of an importer, there is a budget inflow (import tax receipt) or an additional transfer to importing agents and export suppliers.[a]

In Figure 4, production is Q1, consumption is Q2, the supported domestic price is Pd and the world price is Pw. The difference between Pd and Pw involves several factors that can

be barriers to commerce, competitive differences, and logistic procedures among others. The Area A is the transfer to producers (Total PSE), the area A+B is the transfer from consumer prices to domestic producers price and the area B is the transfer from consumers to budgets (import tax) or to importer agencies/export suppliers (import quota, VRA). The area A+B is the consumers' payments over the world price due to import tariff or other non-tariff barriers from consumers (Total CSE). Whether the country is an importer of the commodity in question (as shown in the Figure 4), or an exporter, the market price (Pd) is the monetary

value receiv   The rate of

PSE (the m   ends on the

relevant qua   e importing

(budget infl   *ral support*

through defi   *'e producers*

are guarant   *porter or an*

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and there is
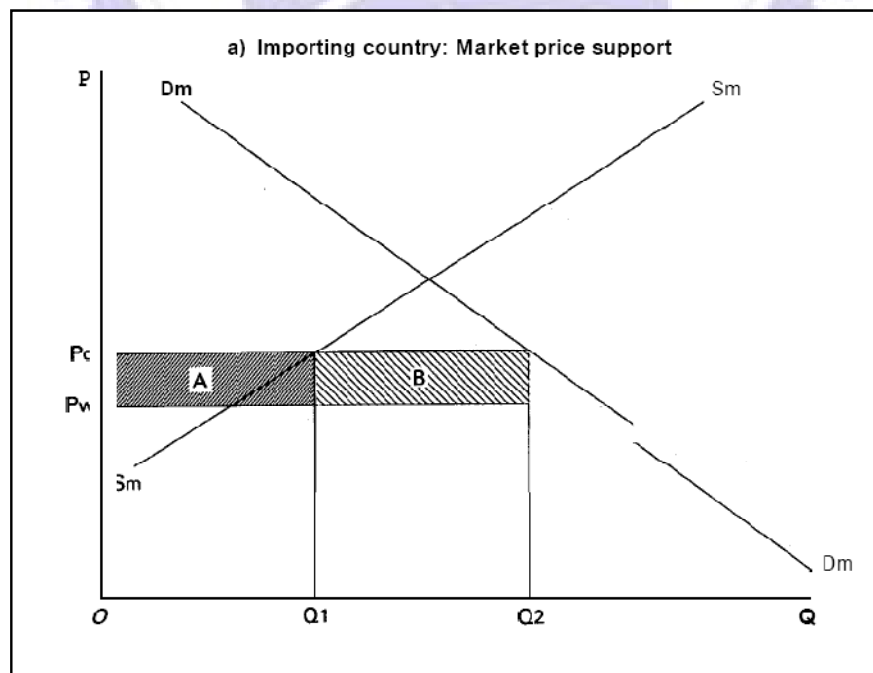
Figure 7: Market price support in an importing country. Source: Abel, M. 1989.
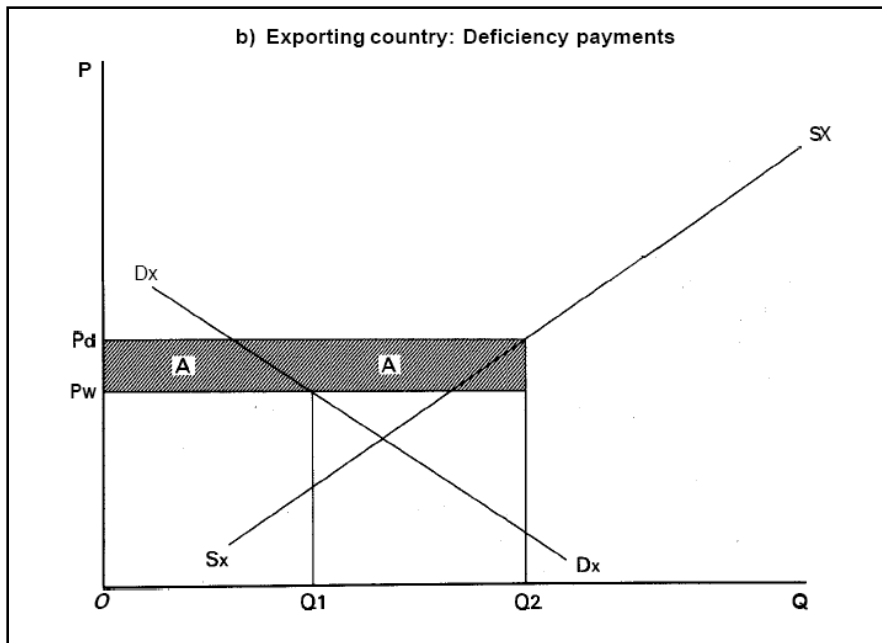
Figure 8:

From ⬚⬚⬚⬚⬚⬚⬚⬚⬚ that sustain producer mo ⬚⬚⬚⬚⬚⬚⬚⬚⬚ sulting from either the di ⬚⬚⬚⬚⬚⬚⬚⬚⬚ ry data. The monetary va ⬚⬚⬚⬚⬚⬚⬚⬚⬚ come in the total PSE a ⬚⬚⬚⬚⬚⬚⬚⬚⬚ olicies. The budget expe ⬚⬚⬚⬚⬚⬚⬚⬚⬚ esult in the equivalent ⬚⬚⬚⬚⬚⬚⬚⬚⬚ axes for an importing c ⬚⬚⬚⬚⬚⬚⬚⬚⬚ nt monetary value gap.[e]

3.2.2. Supposition underlying the computations of PSEs/CSEs

The essential distinctiveness underlying the computations of PSEs and CSEs are a downward-sloping demand (just like in the pricing and revenue optimization principles) and upward-sloping supply curve which determine equilibrium (partially) monetary values that reflect the private and social benefits and costs (the so called "invisible hand"). In particular, values in the world market are supposed to express the opportunity costs to local producers and consumers of a particular commodity.

In practice, local prices are frequently distorted by agricultural policies and might not reflect the social remuneration and costs. Also, world prices are frequently distorted by agricultural and non-agricultural policies. But those prices define the actual transfers that take place, whether as a result of an import tax, export subsidy, insufficient payment or an arrangement of other local policies.[k]

PSEs and CSEs are measured within a partial equilibrium framework. In other words, values and quantities in the rest of the economy are implicit, and therefore, to be constant and not influenced by alteration in agricultural markets. The partial equilibrium nature of the calculations means that neither macro-economic policies distressing the agricultural sector (specifically the effect of changes in exchange rates) nor the effects of support to agriculture on the rest of the economy are calculated.[u]

A particular characteristic of the partial equilibrium assumption is that the calculation of PSEs and CSEs assumes zero substitutability in production and consumption. In other words, that no cross-commodity effects are included in the computations based on observed monetary values and quantities. The calculation of PSEs and CSEs assumes the small-country case. This means, no account is taken of the effect of any country's policies on the world market value. In a realistic scenario, achievement of policies in some large OECD nations affects the level of world prices.

Consequently, if a policy were changed it may result in compensating changes in world monetary values which partially "balance" producers or consumers (in terms of the value gap) for that policy change. But, in so far as changes in world prices for a commodity have an effect on all nations for which computations are made, this remains the right relative level of assistance.[g]

The measurement of PSEs and CSEs assumes homogeneity in terms of the commodities produced and consumed. This applies both to the commodities defined for reference (world) monetary value purposes and domestic commodities.

[k] Master, W., 2008.

[u] Tokarick, S., 2003.

3.2.3. Other measurement concepts

Indicators of support have their foundations in global trade theory and practice. Traditionally, the most general forms of support have been commerce barriers, especially tariffs, intended to shield higher-priced local production from more inexpensive imports.

The prevalence of trade barriers and the consequential distortions to the quantity and direction of commerce called awareness on assessing the gaps generated between local and world values for agricultural commodities. All of the frequently used actions, which are remarked below, approximate the level of support to production. These indicators should be observed as correspondents rather than as substitutes in that they each serve to describe awareness to the different effects of a set of policies.

The simplest and most extensively used indicator is the nominal rate of protection (NRP), which only capture description of trade barriers, and assess the wedge between local and world prices.[e] It is defined as the percentage difference between the domestic market price (Pd) and the world price (P,) of a given commodity, measured in a common currency:

$$NRP = [(Pd- Pw)/Pw].\ 100$$

More extensive than the NRP, in terms of its policy coverage, the nominal rate of assistance (NRA) (or the so-called "monetary value adjustment gap") takes consideration of all policies which increase prices perceived by local producers, and where Rd is defined as the unit gross returns to producers:

$$NRA = [(Rd - Pw)/Pw].\ 100$$

Neither the NRP nor the NRA includes any local or national protection or support on inputs. The effective rate of protection (ERP) is the percentage divergence between the value added per unit of output at local monetary values (VAd) and the value added at world monetary values (VAw) estimated in an ordinary currency:

$$ERP = [(VAd – VAw)/ VAw].\ 100$$

Nevertheless, the ERP only takes in considerations policies that influence output and

inputs through trade barriers. A more wide indicator is the effective rate of assistance (ERA), which is the percentage differentiation among the value added per unit of output estimated by counting support on all outputs and inputs (assisted value added, AVA) and the value added at world monetary values (VA) measured in a common currency.[e]
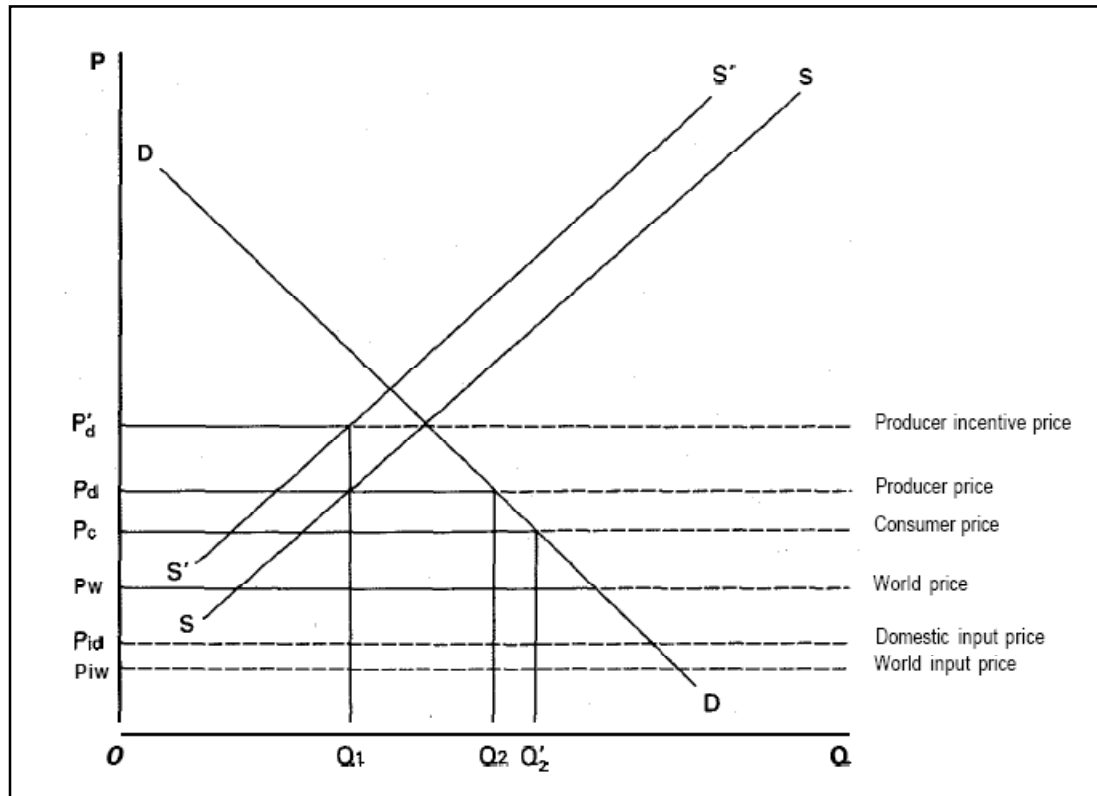
Figure 9: NRP, N

Gover   that may be called "market management policies". These could contain actions such as price management through organizational guidelines, limitations on stockholding by private dealers, limitations on inter-district dynamics of foods, anti-hoarding policies, limitations on future commerce of basic commodities and open market operations selling unrestricted stocks of foods with a view to lowering market monetary values. Knowledge has shown that quite a lot of these actions may work for a very short time. Nonetheless, they possibly will also be destabilizing factors, as economic instruments frequently react by hoarding and thus add to additional value

59

increases, overcoming the essential reason of such strategies. The absorption of market power, experienced characteristically for semi-processed or processed agricultural goods, is professed by society at huge – as well as by the governments – as a key cause of the problem. *The answer relies in effective pro-competitive strategies that are absent in several undeveloped nations. Given the high costs related with open market transactions and the potential for unplanned negative effects, several governments have tend to rely less on stocks transactions and more on trade policy actions to support imports or restrict exports for price balance.*[p] Trade measurement is examined above.

Though, where governments do not aware commerce to be a trustworthy foundation of food at short time period, various stockholding and open market transactions are still ongoing. Furthermore, there is the topic of Tariff as a barrier. In addition, dropping local values and, consequently, the motivation for farmers and food manufacturers to empower and produce more, decreasing import tariffs represents to the local agriculture and food sectors to greater global competition.

Upward competition can represent a challenge to face toward local food production to provide additional efforts to boost competitiveness for the benefit of the final consumers. But then again, in various undeveloped nations, the agriculture and food manufacturing sectors are fragile and may not be able to survive competition with no trouble, particularly where it is from imports whose production receives government support under the figure of subsidies. Therefore, there is the danger of compromise efforts to extend local agriculture and food segments. If agricultural inputs are imported and paid for in progressively more high-value foreign currency, then the risk of elevated food prices could re-emerge, cancelling out the monetary value diminution effects of the import tariff cut.[w]

[p] Rakotoarisoa, M., 2008.

Chapter 4:   REVENUE MGMT. CONCEPTS & APPROACH

4.1. Introduction

Revenue management by nature has been applied intuitively from long time ago, but just recently has becoming a proved science, and due to its relevance (everything has to be with money) had been growing so fast and undeveloped several new techniques that is quite established and an emerging science related with business. The theory is founded in the simple fact that take for granted that all goods had an intrinsic value in the same sense has they have features like shape, color, weight and so on. Research on revenue management started in 1960's with the problem of overbooking in the Airlines companies.   After airlines adopted the policy that a customer can cancel a ticket at any time without penalty, airlines were faced with the problem of overbooking and bumping.

Researchers have studied the revenue management problem using a variety of approaches. The important elements of the revenue management problem that have been investigated are: Pricing and revenue optimization, differentiation, network management, overbooking, markdown management and so on. Therefore, is mandatory to include some knowledge about probabilistic modeling and optimization theory and related with basic calculus. Because the concept of revenue management invoke itself the concept of "maximizing" or "minimizing", that means there is a full background of calculus theory behind. As pricing and revenue optimization (Phillips, R., 2005, 3 pp.) mention, "*in pricing and revenue optimization, as in other applications of management science, what is theoretically elegant is so often not practical and what is practical usually not theoretically elegant*"[o] and from that point is where I start my proposal to find an optimal AMS under the Revenue Management theory.

4.1.1. Demand Forecasting

Demand forecasting and willingness to pay (in terms of this thesis proposal) is of

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[o] Phillips, R., 2005.

critical importance in the revenue management application model because can support to determinate the optimal assessing in the variable demand, significant investment, limited capacity/resources, and perishable nature of the commodities which performs badly. Compare different distributions to fit the market in terms of offer and demand has been the ultimate challenge from long time ago and also the available data (demand distributions) to analyze the whole frame picture. However, demand has also been studied using historical data. In fact is important to measure in here, that besides the concepts of offer and demand, price, cost and all "normal" related variables, there are several variables that make the whole system more complex, these variables usually can be included in the constraints sections and as the name suggest, usually are the limits of the approach in real world scenario for any mathematical or theoretical tool applied to explain a phenomena. On the other side, there is a considerable amount of books and research intending to describe the use of traditional regression techniques for aggregate offer and demand forecasting, depending on the nature or the commodity. Furthermore, the use of regression techniques can conclude that regression techniques outperform traditional time series models or historical averages.[o] The same can be applied as well in commodities competing in the same market, facing different price-response curves.

4.1.2. Pricing

Pricing strategies are used in revenue management as a mechanism to respond to market demand. The objective of pricing models is to find the optimal combination of price adjustments to maximize revenue. Economists have long advocated that pricing is an effective strategy for strategic and marketing decisions. Phillips (2005, 12 pp), concluded that "*firms, who offer products at different prices and control the capacity for the low prices, are in a unique competitive equilibrium.*"[o] Other authors already proposed a deterministic model to study pricing and market segmentation. The model is able to capture demand dispersion and demand recapture, but most of all, the majority of researchers presented a model that

[o] Phillips, R., 2005.

assumes normally distributed demands in terms of explain the distribution of segment in a commodity market. The mean demand is modeled as a linear function of price.

The goals of market segmentation are to understand how customers are buying, what they value and how much are they willing to pay.[t] To differentiate between the various segments; the firm must define a set of product attributes or customer characteristics for a given segment. For example, in the agricultural commodities market, buyers are willing to pay higher rates for the best quality product (in the case there is differentiation in terms of quality or aggregated value), but usually in the case of raw material, the interesting to pay maintain constant or decrease with time, due to seasonal motives, perishable nature of the products and so on.

4.2. RM applied to the Total Aggregate Measure Support – Total AMS

Revenue Management originated with the deregulation of the US airline industry in the late 1970's. The entrance of new airlines offering extremely low fares created a complex challenge for major airlines. Revenue Management was introduced as a competitive tool to respond to the new challenges. It allowed companies to compete on all levels of the market without compromising or decreasing revenues.

In addition, it enabled companies to better match the supply and demand by introducing pricing strategies. Today, revenue management has increased in popularity and is used not only inside corporations & firms, but also in any market (service or commodity) with constrained capacity. The application of a revenue management system is not appropriate for all industries. Businesses (or institutions) that have successfully embraced revenue management have various or all of the following characteristics:

✓ Limited capacity or resources – only a fixed amount of products/resources is available, and additional inventory cannot be added without a significant capital investment.

✓ Variable Demand – low demand and high demand times can be identified.

✓ Perishable Product/Service – at certain point in time the product or service will become

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[t] Talluri, K., Van Ryzin, G., 2004.

worthless and it can no longer be sold.

- ✓ Market segmentation –some customers are willing to pay different prices for the same product or service.
- ✓ Advanced sales – through reservation systems combined with other technologies, selling products or services in advance.

The agricultural commodities market & industry has some similarities with the above features and shares a lot of the intrinsic nature where revenue management is mostly used.

Every country agricultural production (commodities) have a fixed number of land to produce or an estimated fix number of metric tons to sell (limited capacity). Also, some production may stay longer in a warehouses or sills than others, even between nations or regions, due to policies or seasons (variable demand). Volumes produces have daily opportunities to be sold but cannot stay longer for such extended periods (perishable product). When the seasonal offer is on, a customer (buyer) who is late for make business may be willing to pay more for a high quality commodities due to season or any delayed volume of commodity out of season but that fit in a necessity to fulfill a particular market niche (market segmentation).

4.2.1. Supporting the producer

Forecasting and optimal trade systems are being established and implemented in the world from long time ago. The problem is that these systems don't include the most important part upstream: the producer. The producer is the key element under the whole trade machinery work domestically and globally. Evidently, the agricultural trade of commodities can be pictured as the figure of industry and represents a potential area to apply revenue management techniques for improvement. Agriculture plays a major important role in the world daily trade system since all humanity needs to eat and the important nature of agricultural products is out of any discussion regarding its approach and consequences for humanity, previously discussed in other chapter.

On the other hand, require a physical storage location when they are not being used to trade or been consumed, this also represent a high cost in the whole system. The world agricultural markets (as any commodity) experiences peaks and lows demand periods. The problem increases during peak periods when it becomes challenging to the low purchase power capacity nations (or consumers) to find an affordable price to buy a product part of its daily diet. One alternative to this problem is to stimulate investment (in terms of subsidies) and diversify the demand with the introduction of global pricing strategies applied by all nations. Pricing is an important element that can be used to increase profits by better matching supply and demand, and most of all, fitting with every country (and world's) food security. That is the ultimate reason to maintain the levels of agricultural products high and at affordable prices to everybody.

The use of pricing strategies to increase the profit of a limited supply of assets is a common practice of Revenue Management. The manager (president, leader or any policy decision taker) in a country or global institution can use several revenue management concepts to stimulate and diversify the production of agricultural commodities, matching offer and demand but under well founded concept of "profitability" in all the sectors, especially the producer (well regarded as one of the most punished in the whole process). For example: A big producer country of a particular good can stipulate a subsidy to its sector regarding the optimal price (under that moment –or even projected- conditions of offer or demand) for institutional or particular consumers willing to trade their products far in advance in the global market and a lower price for (and it's respective subsidy) for buyers looking for trade at the last moment when season already passed.

Country can also apply a lower price subsidy for its production sector when for buyers with long-term contracts demand high volumes and a higher price subsidy to producers for customers looking for trade at the last moment of the season. Of course, everything is price dependent, but mostly all the RM models have the natural tendency to emphasize on offer and

demand, and from there project the right adjusted price whether commodity has constrains or not. Government can charge higher price subsidies during periods of high demand and lower prices during periods of low demand. All of these are strategies that can be used to stimulate and diversify the production and therefore world demand. However, before they are applied, a sounded procedure must be developed. The following section presents a specific methodology designed to implement revenue management techniques into the world trade of agricultural commodities problem:

4.2.2. Implementing the RM

A necessary characteristic to implement revenue management is an advance purchase system. This is a very common practice between nations with previous Trade agreements, with very clear trade conditions and with well established volumes of trade. Following examples from the governments, companies or institutions, lately more and more nations are concluding free trade agreements, and regions present the tendency to get more and more close with the finality to establish more intimate and "free of restrictions" trade systems that allow governments to estipulate with anticipation the volume of agricultural commodities they want to trade. Advance purchase systems are seen as a competitive tool for nations and companies who want to provide and assure better quality life or service to their populations and/or customers.

However, there are two major problems with the system. First, the advance purchase systems (previously settled inside the agreements) shows consumers the availability of commodity and this information only shows the availability at "a point in time"; therefore, consumers can purchase commodities only for that period of time. In other words, consumers are not able to purchase agricultural commodities two or three seasons in advance because the information is unavailable. The reason: there are always policies, catastrophes and any other big issue that can change the availability of production offered in the market. The second problem is that consumers usually have to pay more for the commodities when

they make advance purchase (because is restricted under that moment conditions of the market) as well from the final sellers speculation. In all this process, the key element "the producer" remains constant and is out of the price movement.

In other words, imposed measures, speculation, subsidies and added value at the agricultural goods global market that tends to distortion the markets at the end, are exempt from the producer influence. This can be partially true, of course, because the producer can be a price setter, but usually because each producer provides a minuscule part of the whole world total production and is a small part of the total value chain, usually doesn't have inference of the consumers' prices. Through revenue management these problems are addressed, and solutions to enhance a correct revenue management system to producer are developed. After the market has been segmented, the next step is to well establish the previous demand and predict through forecasting models the future demand (for every market segment) and supply availability in terms of constrains.

4.2.3. The importance of international estimations for Food Security

In the case of the agricultural commodities, governments need to forecast only the demand of customer for different price according to season and availability. Since the capacity of a government to produce varies from "surplus" and "deficit" after a producing season, productive sectors do not need to forecast the volumes of agricultural production, they just produce and the decision takers need to follow well founded policies to fit the offer with demand regarding previous agreements or strategies. On the other hand, International institutions (FAO, WTO, IMF and so on) need not only to forecast demand for different country/customer segments, but also food availability.

Again, the bottom line is to maintain the food security for humanity, and this can be a very respectful and important constrain and measure, providing a "close to reality" volume and subsidies to apply. It is necessary to forecast food availability because one country demand may stay longer according to their national policies, different from other nation

seeking for a different development strategy. This is very similar in the case of very important industries also involved in the global commerce, with lacking relevance inside WTO agreements and /or importance for humanity. Therefore, for agricultural commodities it is necessary to forecast country/customer demand and supply availability.

Traditionally, companies that have implemented revenue management use several forecasting models to predict customer demand. These companies usually do not share their forecasting models for obvious reasons. However, it is known that the most popular models used in practice are linear regression, moving average, and exponential smoothing. As this thesis proposes, due to the current world competitiveness and the pressure of growing population, production means have been accelerated and governments have the mandatory responsibility to act as companies assuring "profit" to the key elements in the whole food production system and providing to the poorest sectors a dignified quality of life. All these models can be used to predict consumers' demand and supply availability.

4.2.4. Why wheat in China?

This thesis explores these models under the Price and Revenue Optimization techniques –PRO- and suggests some others and to test which one is better and if any outperforms the current ways all nations mistakenly are subsidizing its agricultural sectors. Particularly is considered the productive sector of Wheat for China (regarded as the as part of an initiative to provide analyses of agricultural policies for four major agricultural economies outside the OECD area, with Brazil and South Africa).Moreover, wheat always has been considered a very price sensitive product in terms of offer and demand, especially in the difficulty to establish for it a constant tendency and price behavior. The thesis itself wants to present the revenue management (pricing optimization) as a tool to predict correct amount of subsidy in terms of demand and supply availability.

In following chapters, is intended to discuss the role of Basic Price Optimization, and discrete optimization applied for government domestic support and subsidies, finally

comparing it with the other traditional models. The forecasting model is the base of a successful revenue management model because this information will be latter used by leader/planners to implement an adequate pricing strategy. Therefore is also here important to remark the use of Agling-Cosimo FAO-OECD two partial equilibrium model, to establish the projection of the futures supply, demand and price for the following year till 2017. This is the third step of the revenue management process to adjust the optimal pricing to subsidize producers. Leaders/planners must decide how much subsidy they need to apply to fulfill is previous commitments with other nations in terms of supply, for full paying customers, and how many available offer need to leave to provide the out of season offer with low price (and sub-consequent subsidy).

This can be seen as a price optimization problem and later on defined as a problem with supply constrain if we include the Food security levels required by World Organizations. Later on, as soon as other "real variables" are included, the model get not only more complicated also can present other ways to approach a realistic value to subsidies addressing the supply inventory problem.

Chapter 5: RESEARCH METHODS & MODELING

5.1. Basic Price Optimization

Under the revenue management theory, is well regarded that basic pricing revenue and organization problem can be formulated as an optimization problem, but always regarding the decision variables and constraints the affect the model output (subsidy). The objective is to maximize profit: *total revenue minus total incremental cost from sales*. This can be well applied to a producer of an agricultural good. As Landburg, 1989, cited (Phillip, R., 2005, 12 pp.), "*a standard example used in economics text to exemplify the price response function is wheat: The best example to keep in mind is that of a wheat farmer, who provides a minuscule percentage of the wheat grown in the world. Regardless of whether he produces 10 bushels or 1,000, he remains too small to have any impact on the going market price… If he tries to charge even a fraction of a penny more, he will sell no wheat, because buyers can just as easily buy from someone else. If he charges even a fraction of a penny less, the public will demand more wheat from him than he can possibly produce.*"[o]

The key elements of the optimization problem are the price-response function in terms of willingness to pay and the incremental cost of sales. In the case of agricultural commodities, the second part is easy to cover, and in the case that can be dependent on the fluctuation of prices in agricultural supplies, usually don't represent a big gap between the normal and well establish cost of producing a commodity. This thesis is intended to formulate and solve the pricing and revenue optimization problem for a single product (wheat) in a single market (China) without supply constraints. Although this doesn't match the real world circumstances, is a good approach to define and present the revenue management techniques as a good alternative option at the moment of define an agricultural support policy.

A fundamental input to any price and revenue optimization (PRO) analysis is the *price-response function* (or *curve*) *d(p)*. There is one price-response function associated with

[o] Phillip, R., 2005.

each combination of product, market-segment, and channel in the price response curve that in the case of a perfectly competitive market has the shape of a square (cube depending on the dimension evaluated). In this sense is very important to remark that *the price-response function, d(p), specifies demand for the product of a single seller as a function of the price, d, offered by that seller.* This contrast with the concept of a market demand curve which specifies how an entire market will respond to changing prices. In the case of agricultural commodities trade, different nations competing in the same market face different price-response functions because the price-response functions may differ due to various factors, such as the effectiveness of production, their international trade agreements, perceived customer differences in quality, product differences, volumes, location, etc.[i]

Commodity producers, such as the wheat farmer, have no pricing decision –the price is set by the operation of the larger market, and these operations are dependent on domestic and global policies. I.e., in a competitive market, each country only has to worry about how much output it wants to produce. Whatever it produces can only be sold at one price: the going market price.

Therefore, sellers of true commodities in a perfectly competitive market have no need for pricing and revenue optimization (PRO). But in reality is not the case, true commodities are surprisingly rare: The price-response curves which face most nations demonstrate some degree of smooth price response: As the price increases, the demand declines and demand reaches zero at some *satiating price P*. That what all the heart of revenue management relies, and quoting for second time the same source (Talluri, K., Van Ryzin, G., 2004, 4 pp.): *"The forces of supply and demand and the resulting process of price formation –the "invisible hand" of Adam Smith – lie at the heart of our current understanding of market economics. They are embodied in the concept of the "rational" (profit-maximizing) firm, and define the mechanism by which market equilibrium are reached."*[t]

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[t] Talluri, K., Van Ryzin, G., 2004.

Typical price-response curve.

Figure 10

Impor... ...RO analysis

are time-dep... ...*riod of time*

and at the e... ...nd expected

to see at a g... ...be in place.

In example... ...nterval, and

that's why i... ...producers.
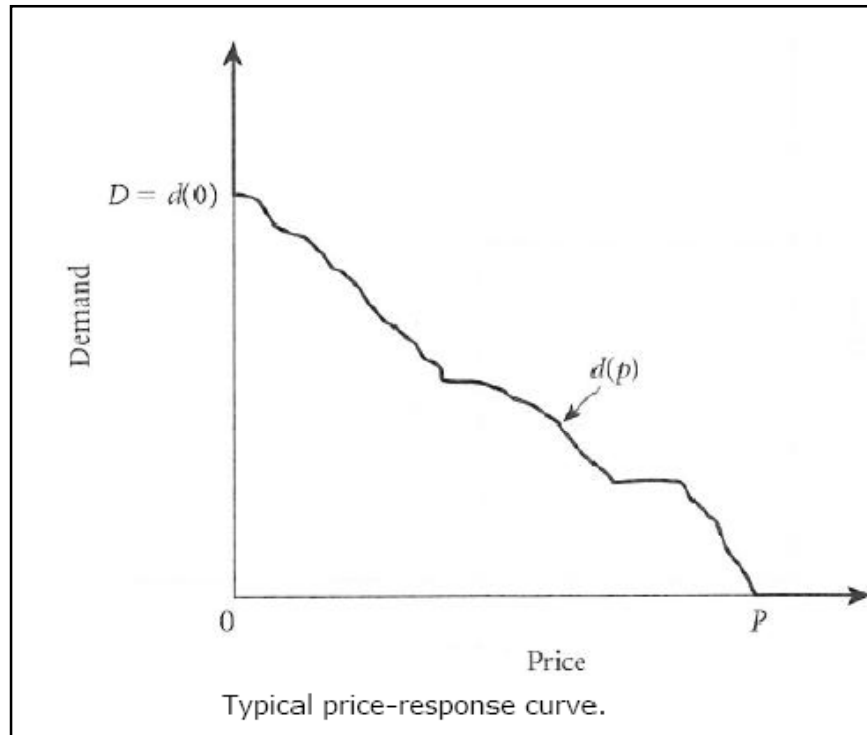
There are r... ...response to

changing prices but all price-response functions are assumed:

✓ Nonnegative price (p≥0).

✓ Continuous (there is no gaps in market response to prices).

✓ Differentiable (smooth and with well-defined slope at every point): Nevertheless this implies imprecision since the concept use derivatives rather than difference equations.

✓ Is a downward sloping (raising prices decreases demand), the foundation for further analysis.

72

✓ *And finally, and most important, the market is completely competitive perfect or close to it. It is well known that in a perfectly competitive economy market, the market prices and shadow prices will coincide, if we ignore complications introduced by issues of income distribution. The revenue-cost analysis and all the calculations in order to maximize profitability will yield the same result in this case. Market distortions, however, will cause shadow prices and market prices to differ but in a very small amount to be considered for this thesis analysis.*

The two most common measures of price sensitivity are the slope and the elasticity of the price-response function: The slope measures how demand changes in response to a price change and equals the change in demand divided by the difference in prices and the price elasticity is defined as the ratio of the percentage change in demand to the percentage change in price. Under these concepts, is important to set the formulas regarding these principles:

✓ The slope equals the change in demand divided by the change in prices:

$$\delta(P_2, P_1) = [d(P_2) - d(P_1)] / (P_2 - P_1)$$

✓ Downward sloping: $P_1 > P_2$ implies $d(P_1) \leq d(P_2)$, i.e. $\delta(P_1, P_2) \leq 0$

✓ The slope at a single price, P_1, can be computed as the limit of the above equation as P_2 approaches P_1:

$$\delta(P_1) = \lim (h \rightarrow 0) [d(P1 + h) - d(P_1)] / h$$

Where d'(P_1) is the derivative of the price-response function at P1.

✓ For small price changes is possible to write: $d(P_2) - d(P_1) \approx \delta(P_1) = (P_2 - P_1)$. Just to exemplify, a large slope means that demand is more responsive to prices than a smaller slope.

On the other side, there is the price elasticity of price response functions, the most common way to measure the sensitivity on demand to price, defined as the radio of the percentage change in demand to the percentage change in price. The elasticity equals the percentage change in demand divided by the percentage change in prices:

$$\in(P_2, P_1) = \frac{100\{[d(P_2) - d(P_1)]/d(P_1)\}}{100\{(P_2 - P_1)/P_1\}}$$

Where ε(p1,p2)is the elasticity of a price change from p1to p2.

This equation can be reduced to:

$$\in(P_2, P_1) = \frac{[d(P_2) - d(P_1)]P_1}{[P_2 - P_1] \, d(P_1)}$$

Since downward sloping price-response curve, $\varepsilon\,(P_1, P_2) \geq 0$.

Finally, The price elasticity at a single price, P1, ("point elasticity at P1") can be computed as

the limit of the above price elasticity equation as P2 approaches P1:

$$\in(P_1) = - \, d' \, (P_1) \, P_1 \, / \, d(P_1)$$

In example, the point of elasticity is equal to –1 times the slope of the demand curve

times the price divided by the demand. The point elasticity is useful as a local estimate of the

change in demand resulting from a small change in price. Is important to note that, unlike the

slope, the price elasticity is independent of the units in which the price and demand is

measured. In practice, some of these concepts don't fit with reality, but they are a good

approach to explain and implement measures and policies. In this sense, the term price

elasticity is often used as a synonym for price sensitivity.

"High price elasticity" items have very price sensitive demand, while "low price

elasticity" items have much less price sensitive demand. Often, a good with price elasticity

greater than 1 is described as elastic, while one with elasticity less than 1 is described as

inelastic. Elasticity is dependent on whether we measure the total market response if all

suppliers of a product change their prices or the price-response elasticity for an individual

supplier within the market.

If all suppliers raise prices, the only alternative for customers is to purchase a substitute

product or to go without, *that's the importance to take international consented measure to guarantee the global production stable, regarding the food security and keeping the subsidies targeting the producers.* If a single supplier raises prices, customers can go to its competitor. Furthermore, as well as other aspects of price response, elasticity is dependent on the time period under consideration. There may be great difference in price elasticity in the short run and in the long run:

For most products, short-run elasticity is lower than long-run elasticity since buyers have more flexibility to adjust to higher prices in the long run. On the other hand, for many durable goods, such as cars and washing machines, the long-run price elasticity is lower than the short-run elasticity. The reason is that customers initially respond to a price rise by postponing the purchase of a new item.

However, they will still purchase at some time in the future, so the long-run effect of the price change is less than the short-run effect. In the case of agricultural commodities, particularly wheat has low price elasticity as a respond to market price changes (people will by wheat all the time even if prices go up) but for an individual seller, the price elasticity would be expected to be high due to competitiveness. In reality, the price-response function is not simply given.

Demand is the result of each potential customer observing the prices and deciding whether or not to buy a specific product, despite other intrinsic factors that affect the whole system and other extrinsic factors that distorts the commodities markets price.

The price-response function specifies how many more of those potential customers would buy if the price is lowered and how many current buyers would not buy if price is raised. In this sense, the price-response function is based on assumptions about customer behavior. The most important part of models of customer behavior is based on willingness to pay (w.t.p). The willingness-to-pay approach assumes that each potential customer has a maximum willingness to pay (also called "reservation price") for a given product. Usually,

this so called reservation prices are stated in the free trade agreements or inner commercial contracts between nations.

A customer will purchase if and only if the price is less than his/her maximum w.t.p., that's why is so important to mention here, that to take this concepts to practice, in terms of subsidies, is necessary to eliminate all trade barriers and promote the free trade between nations no matter what inner measure can take place inside the borderlines.

To explain in algebraic ways, the number of customers whose maximum willingness to pay (w.t.p.) is at least P is denoted $d(P)$. Here, $d(P)$ is the number of customers who are willing to pay the price P or more for the product (according to the thesis proposal, this can be the amount of money a producer has to receive in terms to promote production and maintain the supply tie with the food security, the amount of money that government needs to subsidize, is the difference between the real market price (defined by the "invisible hand" of Adam Smith) and the optimized prices obtained by the proper Pricing and Revenue Optimization analysis.

Defining the function $w(x)$ as the w.t.p. distribution across the population, then for any values $0 \leq p1 < p2$: $\int_{P_1}^{P_2} w(x) \ dx$ is the fraction of the population that has w.t.p. between P1and P2. Is important to note that $0 \leq w(x) \leq 1$ for all nonnegative values of x. So, the willingness to pay distribution let $D = d(0)$, i.e. the number of customers willing to pay zero or more – i.e. willing to buy the product at all, be the maximum demand achievable. Then we can derive $d(P)$ from the w.t.p distribution: $d(P) = D \int_{P}^{\infty} w(x) \ dx$.

Is important to remark that the price-response function is partitioned into two separate components: the total demand D and the w.t.p. distribution $w(x)$.

5.1.1. The current RM systems dilemma

Marginal revenue transformation: Lately, several researches present a marginal revenue transformation that transforms any price structure (with any set of constrains) into an

independent demand model. This allows all the traditional RM methods (that was invented assuming independent demand) to be used unchanged. The standard availability control methods can be used unchanged provided that the efficient frontier is nested (or approximately nested).
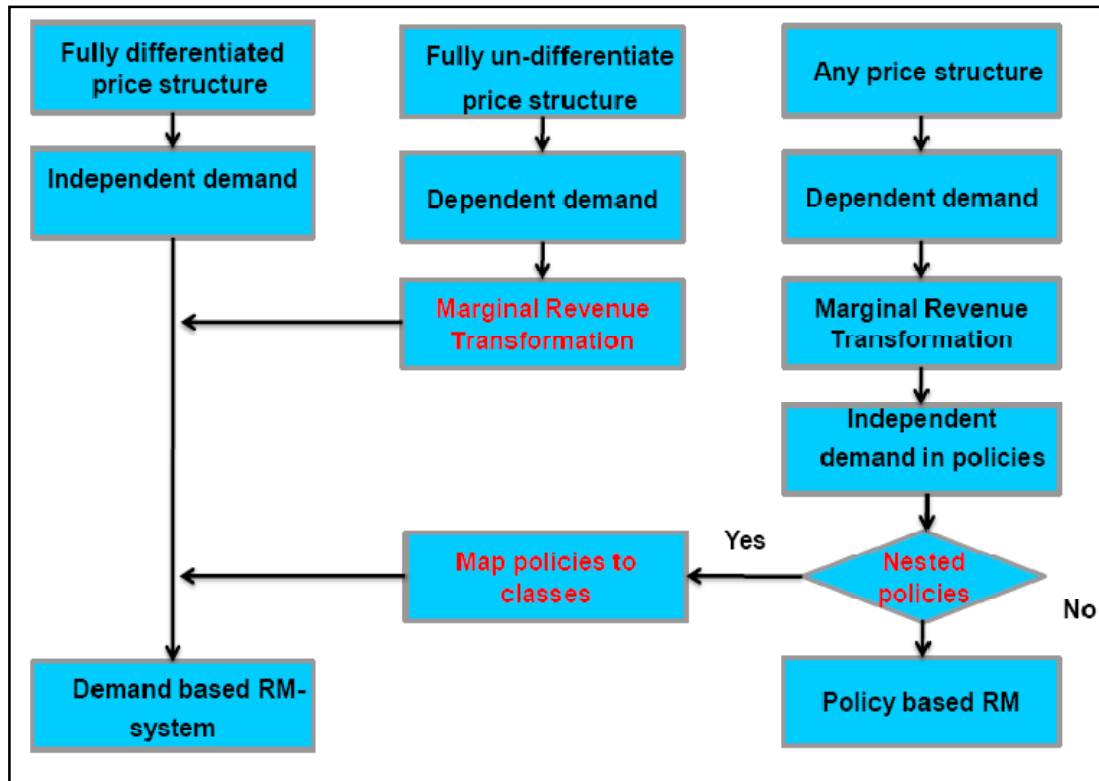
Figure 11

Under   eral discrete choice mod   ıal revenue transformation allows traditional RM systems (that assumed demand independence) to be used continuously. Some authors (Phillips, R., 2005) mentioned that the marginal transformation is valid for: static optimization, dynamic optimization and network optimization.[o]

5.2. Discrete Optimization

Some authors stated that discrete optimization has a more realistic way to apply the revenue management concepts in terms of pricing and revenue optimizations than continuous

systems, because the most of the entities of interest (demand, supply, prices, agreements and so on), are discrete rather than continuous. Nevertheless, this represents a huge challenge in terms of knowledge to analyze and understand the concepts, discrete optimization is more computationally difficult and the interpretation of data requires a lot of expertise if the main target is the agricultural commodity markets.

Quoting Phillip, R. (2005, 326 pp.): "*In continuous optimization we are navigating a smooth surface, looking for the highest point. If the continuous function is differentiable (as we have assumed), either we are at maximum or the local derivatives give us a clear direction to move. In contrast, discrete optimization is like hopping from island to island in an archipelago, looking for the island with the highest peak. When we are on a particular island there may be no indicator to tell us which island to jump to next.*"[o] In this sense, the above state can explains the nature of global commerce, particularly in the whole mosaic of agricultural goods and related commodities.

The continuous approach is not exact, but is enough. In other words, most of the pricing and revenue optimization problems, and using the RM principles as a guide to correct policy decision, specifically in terms of agricultural subsidies can be a simple (but not ordinary) nearest feasible integer solution that usually can provide a good output to the strategy and actions to take. In the case of discrete approach, can be more accurate but requires complicated formulas and a lot of expertise, that usually and ironically can distorted the researcher mind to take crucial decisions clearly. In summary, depending on the expertise, time and available resources can represent a titanic task.

Chapter 6:   RESULTS

6.1. Period of analysis (1993-2007)

The data available for the analysis and later on forecasting come from the FAOSTAT database (Agriculture Statistics) of Food and Agriculture Organization of the United Nations –FAO- and OECD Review of Agricultural policies for the Chapter of China. Yet though the importance of agriculture in China's economy has declined, it is still an important sector, accounting for almost 15% of GDP and above 40% of employment[d]. Is important here to remark that inside the cereal sector there was also an significant reorganization as land sown to rice and wheat tended to decline, while land sown to maize increased, maybe regarding the bio-fuels increasing offer.

Nevertheless, wheat is a primary agricultural commodity inside China & generally world's economy. Is well known, that increased food production was accomplished by increasing agricultural land, but the area of cultivated land has been declining and output rising due to higher productivity regarding the greater use of fertilizer, pesticide and mechanical inputs and investment. The safeguard of the environment and the aptitude to develop agricultural productivity are integrally linked, and where markets are not able to take environmental externalities into account, there is a need for effective policies, from the economic perspective, at macro and micro level, a lot of this related issues can be mend through the implementation of well targeted subsidies.

The main agricultural policy measures employed by the government cover producer support measures, general services and consumer support measures. In turn, producer support measures cover both domestic and trade policy measures; these can be through input subsidies (water, fertilizer, seeds in a very low cost) or on the other hand, can be as the form of direct payments in terms of money related with quantities produced or total value of production. *In line with its WTO accession commitments, China is not allowed to apply export subsidies. The*

distortions on grain markets are still relatively high, mostly due to state trading, which continues to drive a wedge between domestic and world prices.
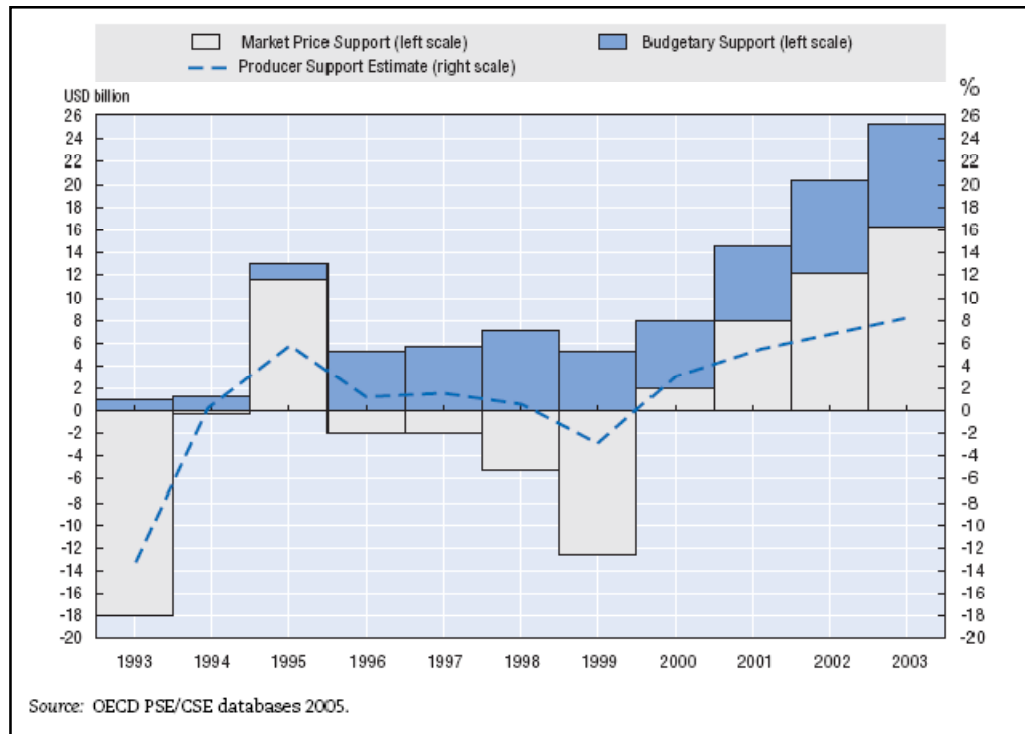
Figure 12
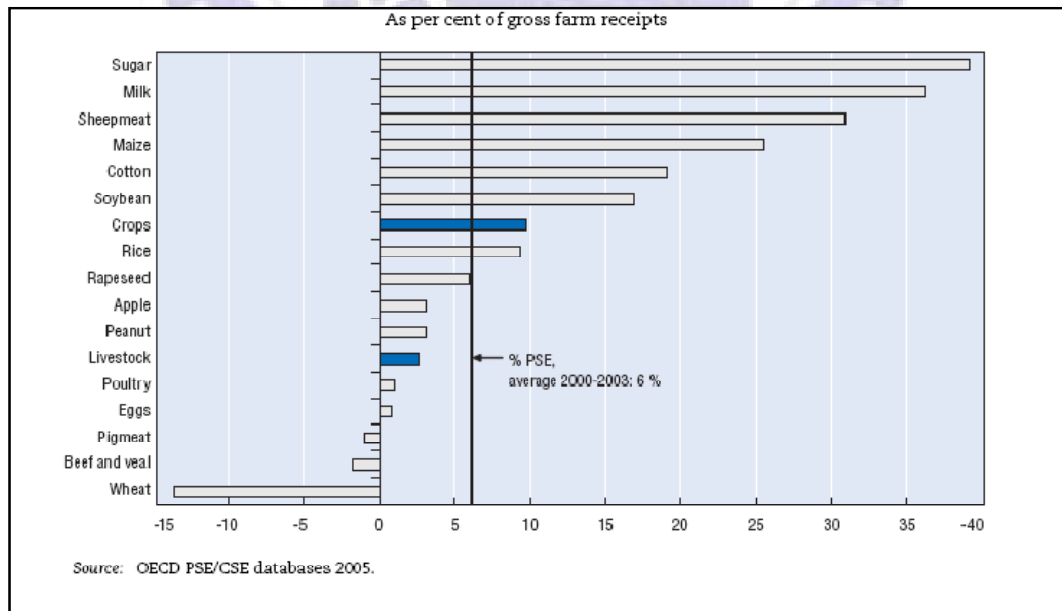
Figure 13: China's Producer Support Estimate by commodity, 2000-2003 average

Note: Estimates for vegetables 1990-1992.

Sources: China Statistical Yearbook, NBSC (2004); China Rural Statistical Yearbook, NBSC, various editions.

Figure 14:

Sources: China Statistical Yearbook, NBSC (2004); OECD China PSE/CSE databases.
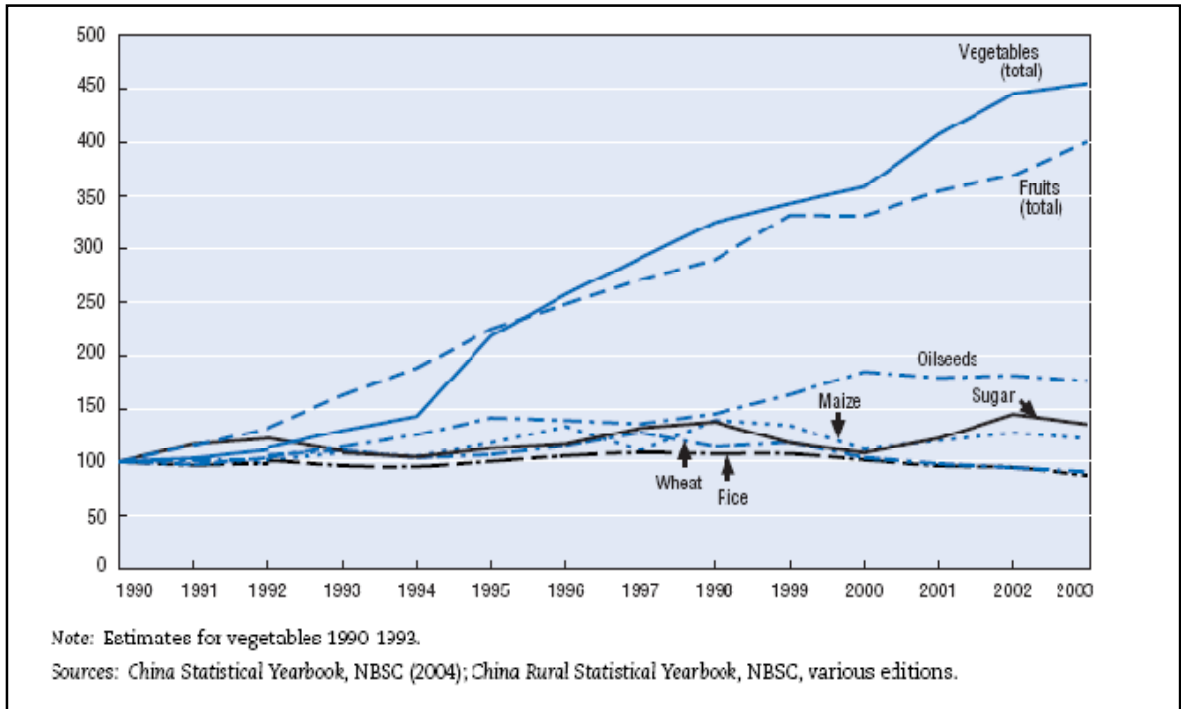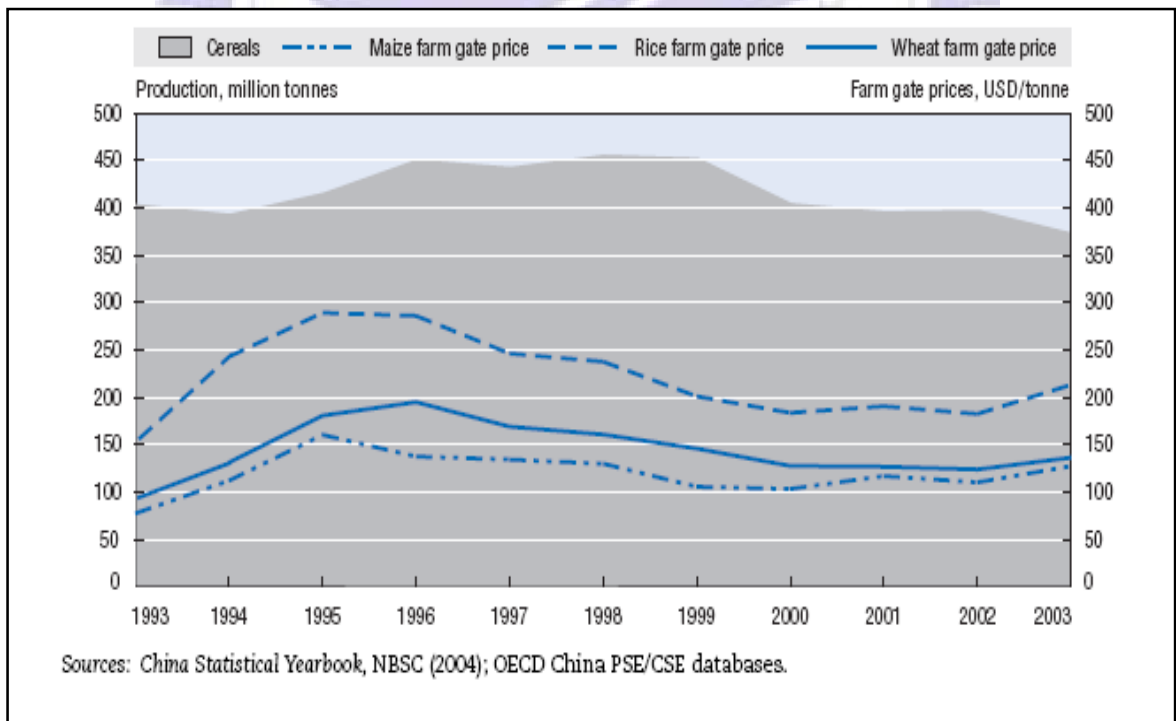
Figure 15: Total cereal production and nominal farm gate prices, 1993 – 2003
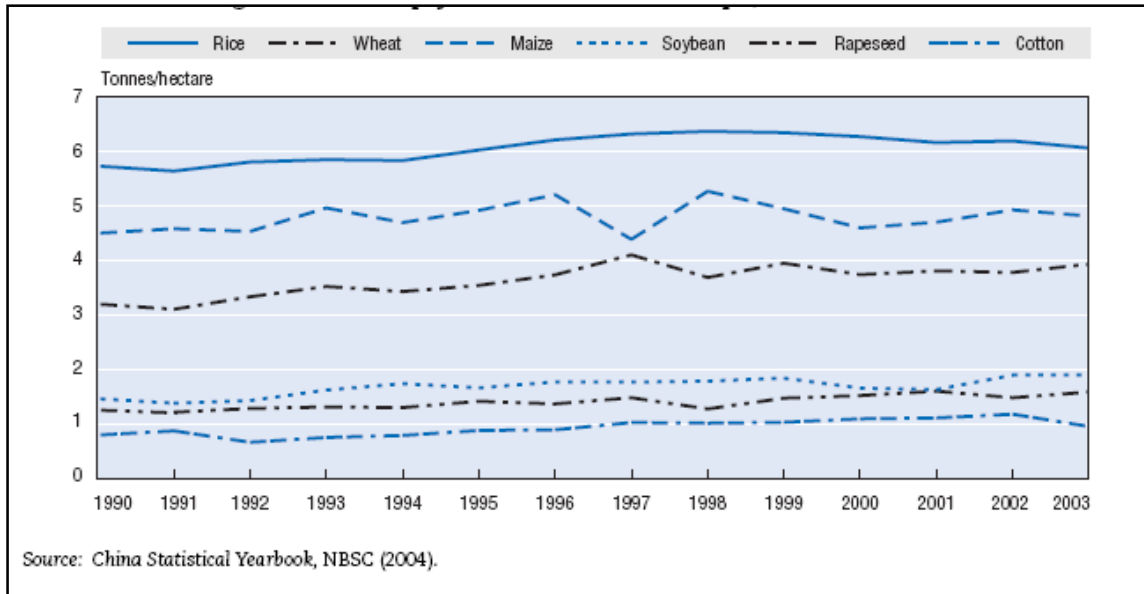
| Rice | Wheat | Maize | Soybean | Rapeseed | Cotton |

Tonnes/hectare

Source: China Statistical Yearbook, NBSC (2004).

Figure 16:

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with the oveny.

6.2. Increasing

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general poplevel as a
priority.

The negotiations for WTO accession get inside the system external pressures to accomplish policies and institutional reforms regarding the Agreement on Agriculture. In order to be well ready for the bigger competition after the opening of its domestic markets, the government placed a strong importance on developing the efficiency rate of agricultural production.

Alongside with education programmes intending to approach at improving farmers' take-up of technology, actions to assist raise the competitiveness of Chinese products in both

the domestic and international markets were put into practice. *These measures were implemented in response to the impact of cheaper imports on domestic prices.*

Table 1: China's wheat trade data generated, 1993 – 2007.

Year	Production (Int. 1000)	Production (MT)	Consumption (MT)	Import Quantity (MT)	Export Quantity (MT)	Trade Balance (MT)
2007	15,348,160	109,298,296	105,633,866	1,940,001	1,934,469	3,669,962
2006	15,400,880	108,466,271	104,254,259	1,926,238	1,912,133	4,226,117
2005	13,889,270	97,445,196	105,143,982	5,407,000	1,106,000	(3,397,786)
2004	13,204,060	91,952,238	105,224,849	8,913,000	1,559,000	(5,918,611)
2003	11,930,640	86,488,264	108,087,305	2,220,000	2,911,000	(22,290,041)
2002	12,461,280	90,290,262	109,844,131	2,312,000	1,328,000	(18,569,869)
2001	13,035,750	93,873,234	112,035,916	2,281,000	1,032,000	(16,913,682)
2000	14,137,420	99,636,127	112,957,909	2,615,000	488,000	(11,194,782)
1999	16,655,560	113,880,088	113,679,686	2,062,000	393,000	1,869,402
1998	16,140,200	109,726,066	113,896,196	3,094,000	547,000	(1,623,130)
1997	18,263,710	123,290,085	113,960,844	3,474,000	957,000	11,846,241
1996	16,326,300	110,569,193	113,433,186	9,798,000	1,045,000	5,889,007
1995	15,035,140	102,211,429	113,818,329	13,211,000	621,000	983,100
1994	14,646,730	99,301,440	112,354,733	8,825,000	601,000	(4,829,293)
1993	15,737,580	106,394,921	112,345,914	7,781,000	605,000	(1,225,007)
AGGREGATE	222,212,680	1,542,823,110	1,656,671,105	75,859,239	17,039,602	(57,478,372)
AVERAGE	14,814,179	102,854,874	110,444,740	5,057,283	1,135,973	(3,831,891)

Source: FAO

6.3. The optimal approach for subsidization

The major Chinese policy actions employed by the national government, discussed in before, cover producer support measures, general services and consumer support measures. In turn, producer support measures cover both domestic and trade policy measures.

Regarding the food price subsidies, since 1992, China has paid subsidies to urban consumers to offset the price increases of food products.[c] Although some of the subsidies are still paid, there has been a significant decline in the level of budgetary expenditure on them.
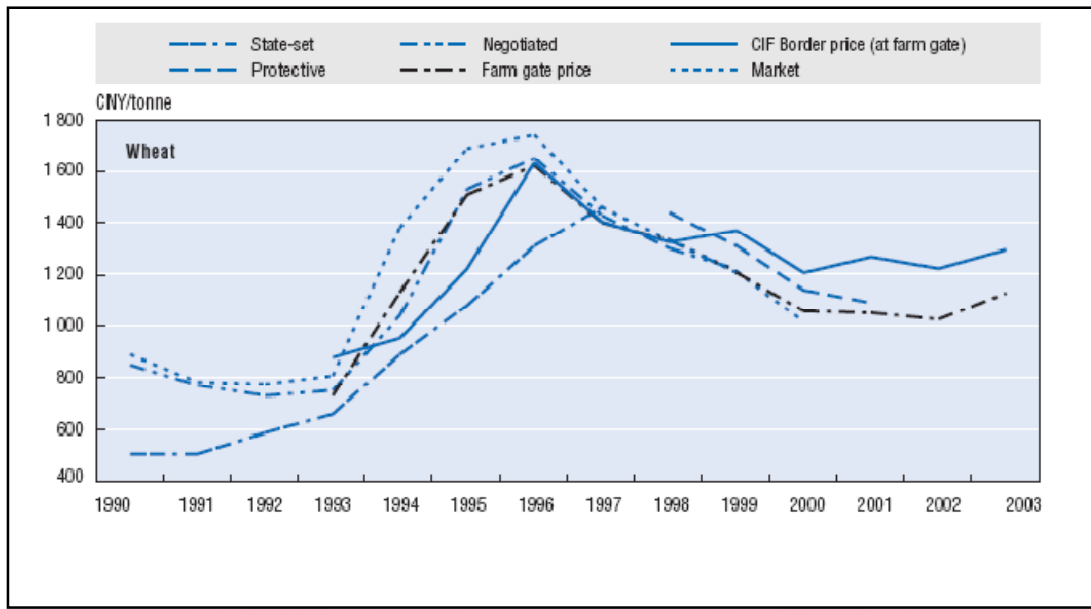
State-set — · — · Negotiated — · · — CIF Border price (at farm gate) Protective — — Farm gate price — · · — Market · · · · ·

CNY/tonne

Wheat

Figure 17:

Protec   uaranteed to

purchase all   ective prices

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with the im   lertake state

procurement   ing grains at

a profit. It i   ers or even

rejected pur   ng behavior

not in accor   teed prices.

Second, bud   n producing

regions resulted in the policy being under-funded; payment for state purchased grains could

not always be made in cash or in a timely manner.

Conversely, for wheat, domestic prices were lower than the international indicator price,

suggesting that domestic and trade policies prevented farmers from receiving as good a return

on their wheat crop as was possible on world markets. Benefits from this subsidy may accrue

indirectly to the majority of farmers through reduced costs faced by farm service providers,

such as harvesting companies.

In the beginning of this period, government applied a subsidy that was designed to ameliorate the impact of the food price increases, rather than calculated to fully offset the additional food costs faced by individual urban consumers. Following the initiation of the subsidy, each subsequent food price rise entailed an associated subsidy level increase. The subsidized food prices could be expected to increase the quantity of food demanded, thus increasing prices further, and potentially contributing to an inflationary spiral.

Table 2: China's crop variables and prices for wheat, 1993-2007

Year	Harvested Area (Ha)	Yield (Hg/Ha)	Seed (Tones)	Producer Price (USD/tonne)	World Prices (USD/tonne)
2007	23,721,075	46,076	4,100,004	258.40	340.02
2006	23,613,067	45,934	4,130,004	220.02	204.34
2005	22,792,462	42,753	4,600,004	165.10	168.21
2004	21,626,074	42,519	4,800,003	165.55	151.22
2003	21,997,075	39,318	4,500,004	186.63	149.36
2002	23,908,072	37,765	4,400,004	127.58	138.37
2001	24,664,068	38,060	4,800,004	126.86	119.54
2000	26,653,326	37,382	5,000,004	118.26	105.39
1999	28,855,019	39,466	5,100,002	144.48	113.08
1998	29,775,167	36,851	5,050,001	162.58	136.19
1997	30,057,020	41,018	5,200,001	169.49	179.15
1996	29,611,057	37,340	5,100,001	189.80	201.81
1995	28,861,315	35,414	5,120,003	173.03	145.97
1994	28,981,966	34,263	4,900,078	126.00	132.27
1993	30,236,410	35,187	5,100,081	123.92	134.75
AGGREGATE	395,353,173	589,346	71,900,198	2457.7	2419.67
AVERAGE	26,356,878	39,290	4,793,347	163.85	161.31

Source: FAO

As for other transition or developing economies, the results have to be interpreted carefully bearing in mind recognized limitations with respect to policy and commodity coverage, and data availability. In addition, the macroeconomic and institutional framework within which agricultural policy measures have been applied may have an impact on the

results. Thus, *the market price support(MPS) element may capture the effects not only of agricultural policies as such, but also macroeconomic policies (in particular through the exchange rate) and of imperfect price transmission from the border to the farm gate level.* Nonetheless, other aspects such as a long-lasting inefficient downstream sector, a large share of agricultural production consumed on farms, not strong price transmission compared to grown-up market economies, and data collection systems covering behind the changes in the economy, may distort the measured level of support.
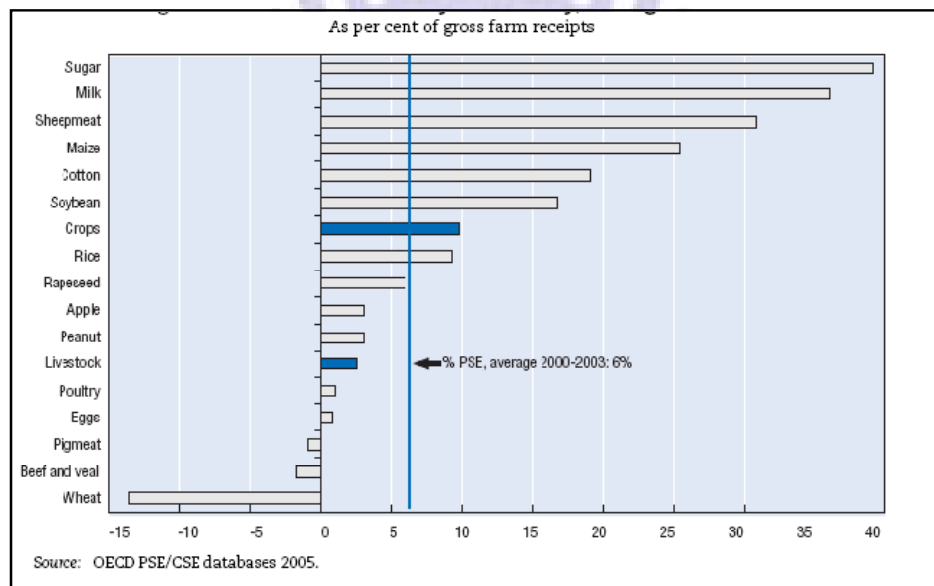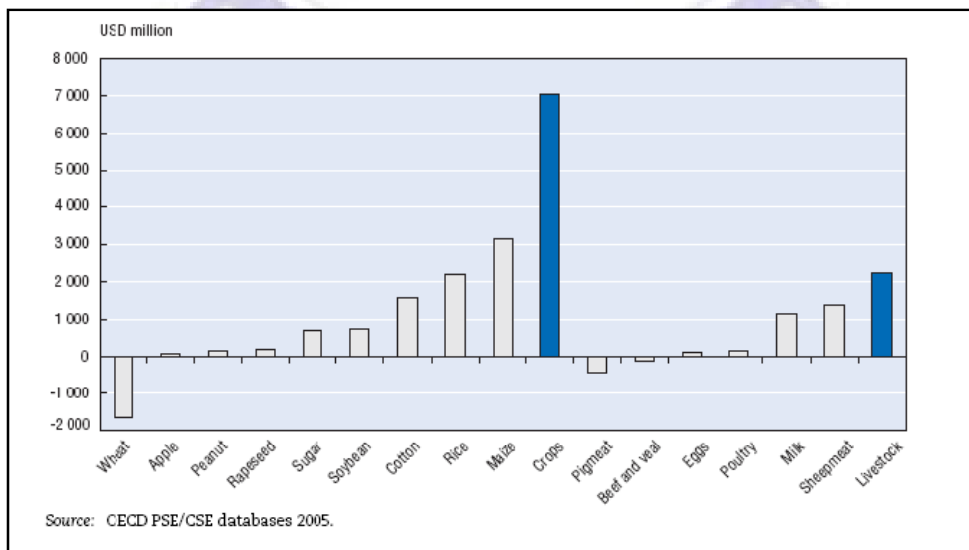

Figure 18

Figure 19: Distribution of producer support by commodity, 2000 – 2003 average

6.4. Data Analysis

Before enter in the analysis itself, is important to remark that in this sense, the whole thesis proposal is a conceptual model, which involve political, economical and econometric measures. In this sense there are some basic assumptions that make the model feasible and logic to work. These are as follow:

✓ The market prices are set under the supply and demand economic model of price determination in a market. Logically, China's wheat market is a competitive market, and price will function to equalize the quantity demanded by consumers, and the quantity supplied by producers, resulting in an economic equilibrium (partial or general) of price and quantity.

✓ Eventually, there are no trade barriers for commerce. Despite the fact that is something relatively uncompleted now, the tendency in following years and according to WTO regulations for the future will be minimized to 0.

✓ The conceptual model itself, work under classic economic principles, but it's relevance relies in how a pure business concept itself (in this case revenue management) can be applied in governmental policies decision in order to increase its economic welfare and promote low costumer prices and guarantee food security in benefit of general population.

From all data presented, and in order to find the optimal price under the basic pricing approach, the data output was to find the price response curve in term of the willingness to pay (w.t.p.) and under the assumption that all potential demand (D) will be targeted between the maximum price (world price or producer price) and the minimum possible (world price or producer price) depending on the year's tendency analyzed to apply a subsidize, but theoretically between the maximum price in the market (world or domestic) and 0.

Table 3: Price Gap, consumption, sensitivity and elasticity, 1993-2007

Year	Price Gap (USD/tonne)	Consumption Change (MT)	Price Sensitivity (tonne/USD)	Price Elasticity	World prices or Producer Price (USD/tonne)
2007	81.62	1,379,607	16,902,806	0.00411	340.02
2006	(15.68)	(889,723)	56,742,538	0.10266	220.02
2005	3.11	(80,867)	(26,002,251)	0.00487	168.21
2004	(14.33)	(2,862,456)	199,752,687	0.00073	165.55
2003	(37.27)	(1,756,826)	47,137,805	0.00848	186.63
2002	10.79	(2,191,785)	(203,131,140)	0.01845	138.37
2001	(7.32)	(921,993)	125,955,328	0.00610	126.86
2000	(12.87)	(721,777)	56,082,129	0.00102	118.26
1999	(31.40)	(216,510)	6,895,223	0.00142	144.48
1998	(26.39)	(64,648)	2,449,716	0.01071	162.58
1997	9.66	527,658	54,622,981	0.00680	179.15
1996	12.01	(385,143)	(32,068,526)	0.00136	201.81
1995	(27.06)	1,463,596	(54,087,066)	0.02571	173.03
1994	6.27	8,819	1,406,539	0.00853	132.27
1993	10.83				134.75
AGGREGATE	(38)				
AVERAGE	(3)				

Source: FAO

In this sense, it's important to remark the tendency of wheat which compared with other crops tends to be very volatile, but never the less, in terms of the relative production amount, demand and change regarding the change in prices, relatively inelastic.

How can this be interpreted? Well, demand is so big and usually cannot be fulfilled with domestic production, but on the other hand, each farmer's production (no matter how big is) cannot influence in the prices established by the market, that means, wheat as a commodity is offered according the market price, cause it's demand is almost equal to the entire market.

Buyers are totally indifferent among the offerings of different sellers, and among them there is a perfect knowledge about all prices being offered, and they will buy the product only from the lowest price seller.

The seller as mentioned before is relative small to the total size of the market. In this scenario, has no pricing decision –his price is set by the operation of the larger market. Quoting a popular text inside pricing and revenue optimization (Phillips, R., 2005, 39 pp.) "*In a competitive market, each firm only has to worry about how much output it wants to produce. Whatever it produces can only be sold at one price: the going market price.*"[o]

Under this assumptions is possible to elaborate the so called curves and find the optimal price with an incremental cost (marginal cost) set by the cost of produce one unit (in this case tone) in that year:

Table 4: China's price response curves, incremental cost & margin for wheat, 1993-2007

Year	D (tonnes)	Slope	Price Response Curve d(P)	Incremental Cost (USD/tonne)	Margin (USD/tonne)
2007	105,633,866,000	310,669,566	105633866000 - 310669566P	140.42	199.60
2006	104,254,259,000	473,839,919	104254259000 - 473839919P	141.99	78.03
2005	105,143,982,000	625,075,691	105143982000 - 625075691P	142.53	25.68
2004	105,224,849,000	635,607,665	105224849000 - 635607665P	143.60	21.95
2003	108,087,305,000	579,152,896	108087305000 - 579152896P	137.95	48.68
2002	109,844,131,000	793,843,543	109844131000 - 793843543P	138.01	0.36
2001	112,035,916,000	883,146,114	112035916000 - 883146114P	138.87	-12.01
2000	112,957,909,000	955,165,813	112957909000 - 955165813P	141.89	-23.63
1999	113,679,686,000	786,819,532	113679686000 - 786819532P	146.26	-1.78
1998	113,896,196,000	700,554,779	113896196000 - 700554779P	147.10	15.48
1997	113,960,844,000	636,119,699	113960844000 - 636119699P	148.14	31.01
1996	113,433,186,000	562,079,114	113433186000 - 562079114P	147.66	54.15
1995	113,818,329,000	657,795,348	113818329000 - 657795348P	147.10	25.93
1994	112,354,733,000	849,434,740	112354733000 - 849434740P	147.50	-15.23
1993	112,345,914,000	833,735,911	112345914000 - 833735911P	147.92	-13.17

Source: FAO

Finally, all the data processed and after make the mathematical procedures to find the intended variable, is possible to find the optimal price sustained in the price response curve and willingness to pay for each year, which in the case is less then both prices (world and

producer price) the subsidy is not necessary to apply cause high market prices "pull" the enough the world or producer price to exceed the optimal. In this sense, the amount of subsidy encountered (which theoretically is negative) can be applied from producer as investment in their own infrastructure or research to boost production in their crop's techniques.

Table 5: Optimal price, price gap with the market price and subsidy to apply

Year	P* (USD/tonne)	Price gap (USD/tonne)	Producer price	World price	Subsidy (USD)	Change in Trade Balance
2007	240.22	(18.18)	258.40	340.02	(1,986,796,383.44)	-0.15
2006	181.00	(23.34)	220.02	204.34	(2,531,183,343.43)	1.80
2005	155.37	(9.73)	165.10	168.21	(947,938,650.02)	-0.74
2004	154.57	3.35	165.55	151.22	308,359,070.09	-2.77
2003	162.29	12.93	186.63	149.36	1,118,085,244.12	0.17
2002	138.19	10.61	127.58	138.37	958,140,150.51	0.09
2001	132.86	13.32	126.86	119.54	1,250,647,840.26	0.34
2000	130.08	24.69	118.26	105.39	2,459,542,764.98	1.17
1999	145.37	32.29	144.48	113.08	3,676,917,206.08	1.87
1998	154.84	18.65	162.58	136.19	2,046,138,976.60	8.30
1997	163.64	(5.85)	169.49	179.15	(720,872,142.78)	0.50
1996	174.73	(15.07)	189.80	201.81	(1,665,898,411.74)	0.83
1995	160.06	14.09	173.03	145.97	1,440,589,488.81	5.91
1994	139.88	13.88	126.00	132.27	1,378,684,294.40	0.75
1993	141.33	17.41	123.92	134.75	1,852,689,192.06	-45.92

Source: FAO

So according to the results presented, inside the conceptual model, the continuing process of global integration carries with it implications for farmers and the related supplying and processing industries in many parts of the world, and impacts the world economy. An assessment of agricultural and trade policy impacts is bound to be complex and is often supported by quantitative policy analyses. The development of global models is now well established and has become an integrated part of world economies and world economic reviews.

Partial models consider the agricultural system to be a closed system without linkages to the rest of the economy. Exogenous variables are used to capture the effects of the rest of the domestic and world economy. Supply and demand relationships are represented by means of behavioral equations, which are used to estimate the parameters of the independent variables.

This single conceptual model implies that demand and supply interrelationships among agricultural products are captured. These partial equilibrium models are commonly applied to detailed trade policy analysis for a specific product. According to neo-classic theory, the producer is assumed to be a maximizer of profit or net returns, which are subject to some technical and institutional constraints. In this regard, economic theory suggests that the supply of products to the next highest level of the market channel depends on the expected profits accruing to the decision maker.

The government's production plan as the producer's technical constraints define the physical relationship between factor inputs and the maximum output level for the given technology, per unit of time. This can be closely related to government agricultural policies, international agreements, and so on. The constraints can be the food security, which is the major concern inside the productions policy, government's budget for subsidization (in the case is applied), social welfare which is related to the capacity to integrate the final price for consumer and the incremental cost of production in farm, etcetera. To illustrate this physical relationship between output and factor inputs, consider a farm that uses land, labor, and other inputs (fertilizer and capital), in the production of the concerned commodity (for this study, wheat).

The profit maximization or cost minimization approach can now be used to derive the output supply response from the profit function by means of the first order conditions or in other words in terms of the willingness to pay. The subsidization function that includes the optimal price perceived by the farmers multiplied by the production amount for that specific

year must satisfy the following conditions, firstly, the supply and demand functions have to be linearly homogenous, secondly, it must be increasing in fixed quantities and output prices and decreasing in input prices, and thirdly, it has to be twice differentiable and must satisfy the condition of convexity in prices, both in domestic and world markets.

When the marginal product of a factor input is multiplied by the price, the value of the marginal product is calculated, which is the rate of increase of the producer's revenue from additional employment of an input. In this sense, the objective function of profit maximization implies that the expected value of marginal product is equal to input costs, i.e. a farmer who maximizes profit will produce where the expected value of marginal product is equal to input cost or in this case the incremental cost. However, the first order condition is not sufficient for profit maximization and the second order condition needs to be integrated. The basic Price and Revenue Optimization approach allows us to obtain the subsidization amount originated in the commodity supply and factor demand equations with partial differentiation scenario of the indirect profit function. *The indirect profit function is defined as the maximum profit associated with the given product and factor prices.* On the other hand, the "law of demand" states that the higher the prices, the less of a given good will be purchased.

This implies that the demand curve is downward sloping. For the ultimate buyer of food, demand could relate retail prices to amounts that will actually be consumed within a given time frame, not the same for the farmer's price related to the input cost. However, the final consumer is not the only actor on the demand side. It's possible to distinguish between two main categories of domestic demand, namely, demand for direct use and inventory demand. The demand for direct use consists of primary as well as derived demand. Primary demand can be signified as the demand at a retail level where the individual consumer can make decisions based on price and preference, and this is the case for the wheat commodity because it's a product that can be included in a perfect competitive market.

Expectations are determined by the expected utilization of the commodity (in our case wheat), product availability, and future changes in other market factors such as market prices and agricultural policies, there is where the revenue management concept can be implemented. Although demand for direct use and inventory demand could be regarded as isolated from international markets, this is not the case since nations participate in an international market and also face export or import demand, as well other factors that can be constraint the model. Nevertheless, there are some assumptions that had been already mentioned in previous chapter and under that one the model can be applied and be feasible.
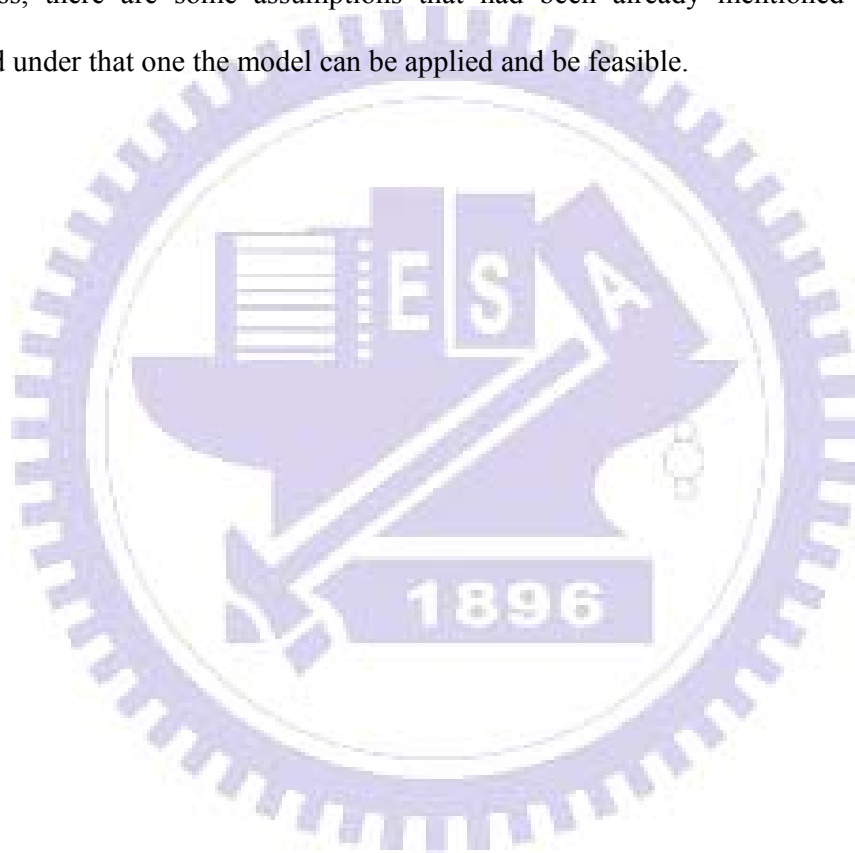
Chapter 7: CONCLUSIONS & FUTURE RESEARCH

7.1. Main Conclusions

The mix of measures used to support farmers is dominated by market price support, a category known to be amongst the least efficient and most trade distorting means of providing agricultural assistance, but nevertheless, according with this thesis proposal, can be one of the most important tools to use in the future to regulate the WTO agricultural policies if applied in a correct manner. Optimizing farm support would therefore improve the efficiency of domestic resource allocation leading to net income gains nationally.

Historically, China and other's economies were still applying a large number of distortive policies such as grain quotas, government fixed prices for selected crops and state trading. But domestic prices, including those set by the government, were usually fixed at levels close to world prices are necessary. So, budgetary support for producers has been low for small economies and high for strong economies. As a result, the level of support, as measured by the percentage PSE, although fluctuating was generally very fluctuant and in some cases the support gap comparing the proportional amount of money applies is very big.

Multilateral subsidization in agriculture would improve access to overseas markets and raise world market prices for agricultural commodities. It, therefore, would generate income gains for China's farmers and generally as soon as all the countries agree to apply the same policy to all farmers till the amount of offer and demand get in equilibrium according to "the invisible hand". At the same time, higher world market prices lead to higher costs for consumers of some agricultural goods, though some domestic consumer prices would fall with the assumed reduction in China's own agricultural liberalization of commerce and increase of support. Because net trade constitutes only a small fraction of China's agricultural output, the gain in farm incomes would be just about the same as the consumer loss due to higher prices, and China's overall welfare would not be much affected.

The level of support in the 2000s increased, but remained far below the other big world economies average, especially in the first world. The increase in support may mean that, within the context of largely liberalized domestic commodity markets, producer prices started to adjust to reflect market conditions as well as border protection, in particular for imported commodities. Therefore, even as border protection declined, tariffs and other border measures will start to have a stronger impact even if they reduce considerably.

7.2. Specific conclusions

While China's producer support is low, the level of support varies significantly across commodities, which is an indication of distortive policies, but then again, according to this thesis proposal, necessary policies in terms of feasibility and finds the point of accordance within WTO and OECD countries regarding the trade regulations. The distortions on wheat markets are still high, mostly due to state trading which continues to drive a wedge between domestic and world prices.

The mix of measures used to support China's farmers is dominated by market price support and input subsidies, categories known to be amongst the least efficient and most trade distorting ways of providing agricultural assistance. In particular, low transfer efficiency means that only a small part of support is effectively received by producers, that why a well implemented level of support applied directly to this group will have a very high impact on the whole chain and will regulate the process, with the respective social benefits.

Total support to China's agricultural sector places a relatively high cost on the Chinese economy. This is partly due to the economic importance of agriculture in a relatively poor economy, and partly due to large budgetary expenditures on general services. The share of producer support (the PSE) in the total support to the agricultural sector (the TSE) started to increase in the last few years, but the share of general services in the total is still very high, mostly due to large investments in agricultural infrastructure. The high share of general services can be viewed as a positive feature of China's policy as such support is provided

through measures characterized by relatively low production-distortions. However, the share may be overestimated as the available budgetary data are very aggregated, which does not allow a clear distinction to be made between payments supporting producers and those improving the performance of the agricultural sector as a whole.

All market prices develop more strongly in the first years of the projection when import rise, compared to the later years when import dependency declines. With domestic cereal prices being increasingly determined by international grain price developments, implications for world markets become more and more important when discussing Chinese market and policy changes.

For a number of commodities, the effects of a partial multilateral subsidization would therefore be rather small. The effects of these policies individually are generally more pronounced in crop markets. A partial subsidization in all countries would generally result in higher world and domestic prices for most agricultural products and would therefore not only benefit Chinese producers, but at the same time negatively affect food consumers. This potential negative effect would be largely eliminated in a multilateral subsidization scenario where prices for the main food commodities would be either reduced (for this case, wheat).

Unilateral Chinese liberalization on the other hand will have minor effects on world prices but lead to larger declines in domestic prices. All policies remain in place in the scenarios, only their levels differ. Complete subsidization would be expected to have a more substantial impact. In addition, the results are conditional on the underlying baseline. A different baseline may lead to different results. Furthermore, the results will be dependent upon the commodities they intend to represent in the model which does not include all agriculture. Although the commodities represented are among the most protected, a fuller set of commodities would give a more complete picture of the effects of liberalization and subsidization.

It should be noted that within WTO, large shares of the agreed grain quotas of imports

remain under control of the government. As in the past these entities have been found to be rather restrictive with respect to grain imports, it remains unclear whether, in case of grain shortages on the Chinese markets, this policies become filled as assumed in the baseline projections. Another uncertainty is related to the impact on international prices, particularly strong for wheat–due to the large change in every country imports and due to the smaller world offer market for this commodity from the farmers' perspective.

Chapter 8:   RECOMMENDATIONS

8.1. Future Research

Policy decisions should be based on adequate and accurate information. Reliable statistics are therefore necessary to assess the results of reforms undertaken so far and to formulate proper policy responses. To date, user orientation of statistics is only beginning and data collection methods are not sufficiently transparent. Moreover, the accuracy of data, particularly on budgetary support for agriculture, agricultural commodities' prices, overall farmland area, farm structures is far from adequate. But, in this moment can be the best approach to start and make crucial decisions in the world trade and establish well consented WTO regulations in benefit of the world's production and not a particular group of countries.

Simulated impacts of multilateral and multi-sectoral policy reform results open to report in here can be obtained in analysis undertaken as part of a comprehensive description of the model, the data and the policy simulation experiments performed under the GTAPEM model used to estimate reform impacts and is a modified version of the GTAP global general equilibrium model widely used in applied agricultural and trade policy analysis. *This also can be covered under the discrete optimizations models.*

8.2. The possible approach and applied theory

The potential implications for China of combined global and domestic agricultural policy reforms have been the subject of many analyses in recent years. In some analyses, including this thesis, the net welfare effects are slightly negative; in others slightly positive. To understand this outcome, it is useful to recall that the total welfare effect adds the impacts across both consumers and producers but always under the perspective of subsidies as a feasible and significant measure to smooth the world's commerce. The higher world market prices for agricultural goods that would come with global agricultural policy reform bestow economic benefits on most of China's farmers (e.g. those producing exportable agricultural

commodities), but also higher costs of agricultural imports on some consumers. Because agricultural trade constitutes only a relatively small share of total agricultural output in China (domestic agricultural production largely equals domestic consumption), these two effects offset each other leaving small net impacts on China's overall economy from agricultural trade reforms. *There is no doubt; however, that global agricultural policy reform is in the interest of China's and world's agreements on agriculture.*

Chapter 9:   REFERENCES

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Chapter 10: APPENDICES

10.1.   FAOSTAT

"The FAO indices of agricultural production show the relative level of the aggregate volume of agricultural production for each year in comparison with the base period 1999-2001. They are based on the sum of price-weighted quantities of different agricultural commodities produced after deductions of quantities used as seed and feed weighted in a similar manner. The resulting aggregate represents, therefore, disposable production for any use except as seed and feed.

All the indices at the country, regional and world levels are calculated by the Laspeyres formula. Production quantities of each commodity are weighted by 1999-2001 average international commodity prices and summed for each year. To obtain the index, the aggregate for a given year is divided by the average aggregate for the base period 1999-2001.

Since the FAO indices are based on the concept of agriculture as a single enterprise, amounts of seed and feed are subtracted from the production data to avoid double counting them, once in the production data and once with the crops or livestock produced from them. Deductions for seed (in the case of eggs, for hatching) and for livestock and poultry feed apply to both domestically produced and imported commodities. They cover only primary agricultural products destined to animal feed (e.g. maize, potatoes, milk, etc.). Processed and semi-processed feed items such as bran, oilcakes, meals and molasses have been completely excluded from the calculations at all stages.

It should be noted that when calculating indices of agricultural, food and nonfood production, all intermediate primary inputs of agricultural origin are deducted. However, for indices of any other commodity group, only inputs originating from within the same group are deducted; thus, only seed is removed from the group "crops" and from all crop subgroups, such as cereals, oil crops, etc.; and both feed and seed originating from within the livestock

sector (e.g. milk feed, hatching eggs) are removed from the group "livestock products". For the main two livestock subgroups, namely, meat and milk, only feed originating from the respective subgroup is removed.

The "international commodity prices" are used in order to avoid the use of exchange rates for obtaining continental and world aggregates, and also to improve and facilitate international comparative analysis of productivity at the national level. These "international prices", expressed in so-called "international dollars", are derived using a Geary-Khamis formula for the agricultural sector. This method assigns a single "price" to each commodity. For example, one metric ton of wheat has the same price regardless of the country where it was produced. The currency unit in which the prices are expressed has no influence on the indices published.

The commodities covered in the computation of indices of agricultural production are all crops and livestock products originating in each country. Practically all products are covered, with the main exception of fodder crops. The category of food production includes commodities that are considered edible and that contain nutrients. Accordingly, coffee and tea are excluded along with inedible commodities because, although edible, they have practically no nutritive value.

The indices are calculated from production data presented on a calendar year basis.

The FAO indices may differ from those produced by the countries themselves because of differences in concepts of production, coverage, weights, time reference of data and methods of calculation."