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Food Subsidies and Trade in Egypt

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Introduction:

Egypt's wheat imports are among the highest worldwide. In 2011, for example, Egypt imported nearly 10 million MT of wheat, positioning itself as the world wide largest wheat importer (FAO Data, 2014).

Behind these imports: Egypt's socio- economic and political settings, limited agricultural land, a subsidized bread regime and a culture, where bread is a primary element to alimentation. This special context has triggered many International organizations, such as the World Bank, the IFPRI or the WFP, to conduct further research on Egypt and its wheat consumption. Results of these studies often establish policy suggestions for Egypt's subsidy regime to become more cost- efficient and less dependent on international markets.

In this paper, I would like to assess the impact of the food subsidy regime on trade. More specifically, I would like to evaluate the probability of a change in the current regime and its consequences on the amount of wheat imported. Therefore, the aim of this analysis shall allow for major visibility on the attractiveness of the Egyptian wheat market in the eyes of agricultural trading companies.

To this purpose in section one I will conduct a country analysis considering social, economic, political, agricultural, as well as trade aspects. This sub-section aims to position Egypt in its current environment and conclude on the probability of changes to the bread subsidy regime. The subsequent section two will describe the food subsidy regime and hence provide further support to forecast any potential changes. In section three and four potential changes in consumer and producer subsidies are simulated. These sections will provide estimates on the impact of a change in the food subsidy regime on trade. Two methods will be used:

(1) For consumer subsidies a simulation developed by Sumner (2005) will be applied, whereas (2) for subsidies linked to production a general simulation model developed by Francois and Hall (2002) will be used.

In section five, I will summarize the main results and draw the conclusion of this analysis.

Contents

Country profile

Social Aspects

Egypt's population grew from 44.9 to 89.6 million between 1980 and 2014 and is projected to reach 121.79 million by 2050. (United Nations, 2011). In order to nourish a growing population[1], food security becomes an important element, taking into account that Egypt constitutes more than 90% of desert. (FAO Data, 2014). Apart from food security, Egypt faces also other types of social challenges, such as reducing poverty. Measuring poverty by national standards for example, which takes into account country specific characteristics, the World Bank states a rising trend since 2000 (World Bank Data, 2014). Another concern may be the rising trend in unemployment, which has been observed since 2009. Unemployment grew from 9.4% (2009) to 11.9% (2012) (World Bank Data, 2014. Finally, it is also important to note that 54.1 million Egyptians (that is about two thirds of the population) live with less than 4 USD a day (World Bank Data, 2014). This makes food subsidies indispensable to the majority of Egyptians rendering them a vital and hence ethical and socially very sensitive issue.

Economic and Political Aspects

Egypt's GDP, estimated at 262 billion USD in 2012, is composed by around 50% of services, 14% of agriculture and the remaining part arises from industrial activities (CIA Data, 2014). Focusing on crucial sectors to the Egyptian economy, tourism accounts for about 5.4 % in 2010 (OECD, 2012), whereas transport, communication and the Suez canal represent about 10.3 % (OECD and African Development Bank, 2008). A further important parcel to the economy is the construction sector, which accounted for 4.1 % in 2006/7 (OECD and African Development Bank, 2008, p. 274).

GDP and Food Subsidies:

Egypt's expenditures on food subsidies measured as a share of GDP are among the highest, but remain comparable to other MENA countries, such as Jordan or Syria (Appendix C). Whereas the costs linked to the subsidy regime has declined in the late 19th century, during the 20th century it increased slightly reaching about 2% of GDP in 2009 (Akthar et al., 2010, p.2). In 2009 Egypt's GDP was estimated at 189 billion USD (World Bank Data, 2014). Therefore, 2% of the GDP are equivalent to 3.7 billion USD spent on food subsidies. It is argued that such rise is explained by "increased international commodity prices, mainly in

[1] *Egypt's annual population growth rate is estimated at 2.2% in 2014, compared to Morocco 1.43%, Tunisia 0.97% and 1.15% worldwide. (World Bank Data, 2014).*

wheat; exchange rate depreciation; increased numbers and/or quantities of subsidized food items; and coverage expansion of ration cards". (Akthar et al., 2010, p.2).

Egypt's Political Performance and its impact on the Economy:

Egypt went through political turmoil since the revolution of 2011, when the regime of President Hosni Mubarak was forced to withdraw after violent mass demonstration conducted by the Egyptian population. He was replaced by Mohammed Morsi, who became president with almost 52% of the votes (World Bank, 2014). In June 2013 however, once again demonstrations emerged, this time against President Morsi. These demonstrations were linked to social discontent concerning the economic and political path Egypt had taken. The situation escalated and a military coup led by Abdel Fattah al-Sisi ousted Mohammed Morsi and his regime. Elections took place in May 2014, with Abdel Fattah al- Sisi running for president, facing limited competition (The Economist, April 24th, 2014). Even though the military is said to bring back some order into Egypt's recent turmoil, the political environment remains very sensitive. Some observers even argue that the political situation in those countries, which went through the Arab Spring and are now back to dictators and military, is unstable in the medium/ long run. And so it is said that, even if Al-Sisi has won elections, he will have to mend the economy or his popularity will wane, just as the one of Mr Mubarak's did." (The Economist, April 19th, 2014). The political agitated climate has affected the Egyptian economy. For example in 2011 the number of tourists arrived dropped from around 14 million (2010) to 9.5 million and stabilized in 2012 at 11 million tourists (World Bank Data, 2014). GDP growth fell from an average of 7 % in 2005-6 to 2% in 2011-12. And even future economic growth is expected to remain low: In 2016 GDP is estimated to be at 3.3 %, estimation which was subject to significant downside risk (World Bank Data, 2014). Insurances, active in International Trade, such as "Ducroire" rate Egypt at 5/6, with 1 being the lowest and 7 the highest risk perception (Ducroire Insurance, 2014) (Appendix H). Gross public debt (domestic and external) rose to nearly 100% of GDP at the end of June 2013 (World Bank Data, 2014). Net inflows coming from foreign investors (FDI) reported in USD, fell from 6.4 billion USD in 2010 to -0.482 billion USD in 2011 and stabilized only at 2.7 billion USD one year later in 2012 (World Bank Data, 2014) (Appendix J) Such evolvement reflects a wide-spread perception of uncertainty concerning the development of the Egyptian economy. Moreover, with the FDI declining sharply, international reserves have been affected as well falling from 33.6 billion USD (2010) to 11.6 billion USD (2012) (World Bank Data, 2014), creating difficulties for the government to pay for imported goods, such as food. Therefore, wheat traders experienced delays in payments especially from private importers, who face even greater difficulties to obtain foreign currency allocations compared to government importing entities (i.e. GASC, General Authority of Supply Commodities). This

translated into shipments which did not enter the food supply chain in Egypt, as cargos were held at port warehouses until the payments were received (Financial Times, 2013). Recently (January, 2016), the Ministry of Agriculture has rejected several cargos implementing a zero-tolerance of ergot fungus in wheat shipments. This cancellation has been followed by weeks of concern about the requirements on the level of ergot, yet adding another factor of uncertainty in the business environment (Financial Times, 2016).

Nevertheless, despite the rather unfavourable environment, one should bear in mind that Egypt remains a large market for conducting many businesses: Its population is growing, GDP although declining is still positive and financial aid from Golf countries allow for certain comfort. In mid-2013 for example, Saudi Arabia, the UAE and Kuwait pledged an aid package of about USD 17 billion to support Egypt (World Bank, 2014). These foreign exchange (FX) allocations could partially be used to pay for food imports. To note that in times of FX shortage a country may prioritize food imports over other imports, due to their vital importance.

Agricultural Aspects

Being one of the oldest agricultural civilizations, Egypt's arable land is equal to 2.87 million ha. Its agricultural land was estimated at 3.54 million ha in 2011, which represents about 3.7% of Egypt's total area (World Bank Data, 2014). More than 90 % of this agricultural land lies within the Nile Basin and Delta. The available land for agriculture is highly dependent on irrigation, as the country has basically no effective rainfall. Notwithstanding, Egypt has an irrigation potential of 4.4 million ha, which is above the one currently used (El- Nahrawy, 2011). Challenges to the agricultural sector are apart from a growing population and limited agricultural land, desertification and human encroachment on agricultural land (Attia and Raslan, 2011).

Before 1986/7 the agricultural sector was to a very high extent controlled by the government. For example, in 1960 agricultural cooperatives were situated in each village to control the production and marketing process of major crops and to decide on crop rotation schedules. However, this system limited Egypt to fully develop its agricultural potential. Therefore, in the mid 1980's the government introduced agricultural market reforms aiming for greater agricultural efficiency and production (Gruhn et al., 2000, p.4-6). Initiated in 1986/7, liberalization of pricing and marketing of major crops took place. Mandatory crop rotations were replaced by farmer’s decision based rotations. Subsidies on agricultural inputs, such as pesticides and fertilizer, were eliminated. These reforms have impacted cropping patterns

(production of cereals, sugar crops, fruit and vegetables increased over time, whereas the one of fodder and oil crops, fibres and legumes decreased (FAO 2011)), but also applied technology changed, levels of agricultural incomes, and farmer's responses to market changes (El- Nahrawy, 2011, p. 9). Furthermore, the cropping area has increased more than 50% from 4'500'000 ha in 1980 to 6'940'000 ha in 2008/9 (FAO Data, 2014). Its average cropping intensity is set at 176 %, with old land having a higher cropping intensity (around 200%) (El- Nahrawy, 2011). Apart from above enumerated reforms and specific to the wheat sector, the reforms resulted in a modification of the price regime. Determining the procurement price at harvest period was replaced by a floor price that was announced before the planting season, offering greater visibility to farmers on the outstanding revenue. National wheat prices converged and even surpassed international levels, creating further production incentive to Egyptian farmers. (Gruhn et al., 2000, p.8). Moreover, the introduction of higher yielding wheat varieties, as well as an increase of the relative price of wheat to its competing crops (berseem, maize, rice) after the liberalization process (Gruhn et al., 2000, p.65) has led to an increased wheat crop area and output, increasing Egypt's wheat self- sufficiency ratio. (FAO Data, 2014). Production has increased more than the harvested area, implying higher yields. Yields have increased from 3.2 mt/ha in 1979 to 6.6 mt/ha in 2012. (FAO Data, 2014) (Appendix I).

Agricultural Trade

On a capita basis, Egypt's arable land per capita is very low, making Egypt a net food importer. Therefore, in terms of agriculture, Egypt faces a trade deficit, which grew from USD 2.4 billion (1985-1994) to over USD 3.32 billion (1995-2001) (Siam, 2003). The FAO classifies Egypt currently as a Low Income Food Deficit Country.

Agricultural Exports

In the past, agricultural exports were highly concentrated on cotton in terms of quantity and value. In 1990 cotton represented in terms of export value 55% of all major exported agricultural goods (FAO Data, 2014). This has changed during the 20th century when other agricultural goods have been increasingly exported, diversifying Egypt's export basket. Looking at exports from 2006 to 2011 for example one states that oranges, potatoes, grapes, sugar, onions and cheese products became of significant weight to Egypt's exports (Appendix F).

Agricultural Imports

Contrarily to the evolvement of Egypt's export basket, agricultural imports remained relatively similar between the last decades of the 19th century and the 20th century. Wheat, maize, soybeans, meat, raw sugar and palm or soybean oil have been and still are important components to Egypt's import profile (FAO Data, 2014).

Of remarkable weight are Egypt's wheat imports, which have increased over time, surpassing 10 million MT in 2010 (FAO Data, 2014). Wheat is imported via the private sector or via GASC (General Authority of Supply Commodities), a government entity responsible for the food subsidy regime. The amount of wheat imported by GASC with respect to the one imported by the private sector is relatively comparable. In 2012/13 for example GASC imported 4'809.95 thousand MT, whereas the private sector imported 3'320 thousand MT of wheat (USDA Data, 2014). Comparing the highest revenue gained by an exported good (oranges) to the highest expenses paid for an imported good (wheat), one can sketch a picture for Egypt's agricultural trade deficit: 2006- 2011 average wheat imports are valued at more than 2 billion USD, whereas orange exports barely reach 300 million USD for the same period. Therefore, Egypt depends on other sectors than the agricultural one to pay for its food imports..

Food Subsidies in the 20th Century

Whereas in the subsequent section I will focus on the current regime it is worthwhile pointing out that historically food subsidies have been of significant importance to the Egyptian population. Due to rising cost the GoE decided in 1977 to cut the amount of food subsidies. This announcement was followed by violent riots, manifesting clear discontent and the large mass of people which were directly affected by these changes. It is said that at that time already […] subsidized bread had become a powerful symbol of the broader social contract between the Egyptian government and the population. (Ahmed et al., 2001, p.5). The agitated atmosphere was smoothed with the government cancelling its announcement related to the subsidy reductions and the IMF, seeking for major stability, issuing a USD 140 million loan to Egypt (Adams, R. H., 2000, p. 8-9).

The current food subsidy regime consists mainly of baladi bread and flour, cooking oil and sugar. Whereas sugar and oil subsidies are explicitly designed to target poverty via ration card (red ration cards standing for lower subsidy and higher income, versus green ration card allowing higher subsidies and therefore only for lower incomes), subsidized bread and flour are available to all Egyptians. Notwithstanding, according to a study conducted in 1997, consumption of baladi bread declines with income. Consequently, bread subsidies, even though accessible to all Egyptians, may by nature self- target the most needed (Adams, R. H., 2000, p.16). Such characteristic suggests the presence of an inferior good.

From an organizational perspective GASC is the national agency (part of the Ministry of Supply and Home Trade) designated to carry out the food subsidy program in Egypt. They are responsible to handle purchases from the international market. The latter is conducted through consecutive tenders. Such tenders invite many grain trading companies to offer a fixed quantity at a competitive price. Going through the bread supply chain, two types of subsidies can be found in the current regime, one oriented towards production, the other one towards consumption:

Producer subsidies take place at the moment national production is purchased by the government. To encourage national wheat production, the government pays higher prices to wheat- farmers. For example the Ministry of Agriculture and Land Reclamation announced the wheat procurement price for the harvest season 2013/14 to be at 400 USD per MT, significantly above international wheat prices (USDA Report, 2014).

Consumer subsidies have recently changed in Egypt. Previously they took place between the mills and bakeries. Once the wheat is imported or purchased locally, stored and milled, the wheat flour is sold to the bakeries at a subsidized price. Thereupon the relatively cheap purchased wheat flour is used to produce baladi bread, which must then be sold at 5 Piaster per loaf. Despite wheat price volatility, the consumer price to purchase baladi bread (5 Piaster) remained unchanged since 1989 (Coelli, 2010). However the last two year have been a transition to a new system where each individual with a smart card is allowed to to purchase 150 loaves per month. The bakery registers each of these sales and gets paid back by the GoE the difference between the free market price and the subsidised price at which he has sold the bread. (Verdonk & Wally, 2016).

The System's Weakness

Rising cost to finance food subsidy regime have been observed during the 20th century with food subsidies reaching about 2 % of GDP (section 3.2). Comparing the cost- effectiveness of Egypt's previous untargeted bread subsidy regime to other programs in different countries, which similarly aim to transfer income to the most needed, Egypt has been less cost- effective, as targeted programs transfer income at a lower cost (Ahmed et al., 2001, p.57). A major underlying problem is leakage, a process in which benefits accrue to those, who favourably situated among the supply chain, are able to resell the subsidized good at a higher price (Ahmed et al., 2001, p. 57). Estimations on leakage vary depending on the year and conducted study. Ahmed et al. (2001) estimate that leakage within bread subsidies was at 11.8% in 1997, whereas Coelli (2010) documents that such phenomena has risen to 31% in 2008- 09. It is argued that the increment can be linked to an increasing gap between free

market price and the subsidized one (Coelli, 2010).To reduce leakage, fines and jail sentences are used to threaten those bakers, which don't produce the adequate amount or weight of loaves or which simply increase the moisture content (Ahmed et al., 2001, p. 15). A further burden settled along the supply chain is weak storage facility and limited competition. Losses along the supply chain are estimated at 25% (FAO, 2014). Better storage capacities are said to reduce significantly such losses. Furthermore, limited competition may contribute to inefficiency as for example in the milling process. Government mills are said to use 4.5 times the labour of private mills (Coelli, 2010, p.8). Locally interviewed people in Cairo claimed that even if the regime is said to be self-targeting the poor, in fact the most vulnerable people may be naturally excluded. Distribution is limited to morning hours and queues are not only long but also agitated as people elbow one's way through. Pregnant women or elder people, a vulnerable group in the society, might therefore automatically be excluded from the regime.

Government Reactions

The rising cost observed in recent years and the existing potential to increase cost-effectiveness, has called for initiatives from the Government of Egypt to ameliorate the system. For example, they have constructed distributive outlets to separated baladi bread production and distribution. This allows for major control on the real bread quantity sold, as the risk of leakage is higher, when baladi bread is produced and distributed by the same bakery. In fact, the bakery will no longer be in a position to falsify the number of bread sold and resale the subsidized wheat flour on the black market (Coelli, 2010, 27).

In addition more efficient bakeries in public-private partnership were built to address old-fashioned and inefficient bread producing practices. To establish major food security, defense force bakeries were implemented to better confront potential food crisis (Coelli, 2010). They have also introduced home delivery to ameliorate distribution especially in rural areas (Coelli, 2010, p. 38). Furthermore, competitive tenders to purchase flour at market prices from mills for further sale to the bakeries at a subsidized price were set up (Coelli, 2010, p.7). Opponents of the latter two initiatives (home delivery and flour tenders) may argue that in the case of home delivery, the system will become less self- targeting as the price will increase and such service may not be accessible for poor people. Competitive tenders are very effective in case of an independent flour supply chain. However, with flour mills being in most cases state owned (70% MoI and 30% privately) the competition is very weak and therefore prices might not be at their competitive level (Coelli, 2010).

But the government aims also to fight other inefficiencies along the chain, as for example the one of storage. Egypt aims to build 50 new silos for storage purposes (Coelli, 2010, p.5). Consequently, Egypt's wheat storage capacity is to grow from 1.5 MMT to 5 MMT by 2015. Expressed differently this will allow Egypt's storage potential to increase from 3 to 6 month and reduce losses, which are of significant weight (USDA Report, 2014). Finally, the GoE has achieved better targeting with the new smart card system. The current implemented pilot smart card system, which was operating as an experiment at the Port Said (USDA Report, 2014, p.7) turned out successful and is being expanded throughout the country. The new system has for example eliminated the previous evoked long and difficult waiting lines in front of the bakery. With the new system the GoE is able to control leakage with everything being registered via the smart card. However, it has been observed that some beneficiaries do not take a receipt from the bakery after purchasing the bread via the smart card, which then allows the bakery to falsify the amount of bread sold to the beneficiary and be in a position to proof more sales of subsidised bread to the GoE as he has falsely registered more sales under a given smart card. (Verdonk & Wally, 2016).

Demand

In this section, I would like to use estimates of demand elasticity to study the consequences of reduced baladi bread subsidies on national and international demand. In Egypt around 84 - 88% of the total wheat supply is used for food and seed, whereas only a small percentage (12- 15%) is used for feed (USDA Data, 2014). Wheat demand in Egypt has increased over time from 14.7 million MT in 2005/06 to 19.2 million MT in 2015/16.

The argumentation hereafter is based on a simulation model developed by Sumner (2005), which he uses in order to examine the impact of US subsidies on world prices. Using this analysis will allow to separate the impact on demand provoked by changes in the amount of subsidies and the one triggered by changes in the free market price. Price elasticity is defined as the impact of one percentage change in the price on demand:

$$n = \frac{dlnD}{dlnC}$$

Expressing Egypt's demand for baladi bread as D_E, its price elasticity as n_E and the consumer price as C_E, one may specify that:

$$d \ln D_E = n_E * dln\ C_E \qquad (1)$$

For subsidized goods the consumer price (C_E) depends on the level of subsidies (S_G), but eventually also on its free market price (P). The higher the input prices needed to produce the good, the greater the price (C_E) consumer of that good have to pay at least in the medium / long run and assuming subsidies are set at a fixed rate and do not interfere with such mechanism. On the other hand the higher the subsidies (S_G), the lower the price at which the Egyptian population can consume the subsidized good. Supposing equal profit margin taken under a free market and subsidy regime, such mechanism might be expressed as follow:

$$C_E = P - S_G \tag{2}$$

However, in Egypt, food subsidies (S_G) for baladi bread adjust in times of expensive inputs in order to maintain the consumer price C_E constant. This has two important consequences: First, the Egyptian population can purchase baladi bread at a fixed price, regardless of high or low input prices and second the cost of the subsidy regime can rise significantly in times of high input prices needed to produce the subsidized good. Combining equation (1) and (2) in log differential terms, one may write (Sumner, 2005):

$$dlnD_E\big(D_E(P,S)\big) = \frac{\partial lnD_{E(.)}}{\partial lnP} * \ dlnP + \frac{\partial lnD_{E(.)}}{\partial lnS_G} * dln\, S_G \tag{3}$$

Based on the rules for computing the total derivative, this expression equals:

$$d\ lnDE\big(C_E\ (P;\ S)\big) = \ n_E * \alpha * \ d\ ln\ P \ + \ n_E * \beta * \ d\ ln\ S_G$$

Assuming α to be positive and β negative, equation (2) and (3) recall two scenarios: If P rises, C_E rises and multiplied by negative demand elasticity (n_E) and a positive parameter α, demand will fall. Contrarily, S rises, $dln\, S_G$ is positive and multiplied by two negative factors (n_E and β), demand grows. Now, once again, one should recall that the first scenario, where P and consequently C_E rises, is purely illustrative as the current regime adjusts the amount of subsidies S_G with respect to free market price, in order to maintain the subsidized consumer price (C_E) constant.

The term $\frac{\delta lnD_E}{\delta lnP}$ is the price elasticity with respect to the free market price (P) and can be set equal to $n_E * \alpha$. Analogously $\frac{\delta lnD_E}{\delta lnS_G}$ an be red as the price elasticity with respect to the subsidy level (S_G) and is equal to $n_E * \beta$. To proof this, I will develop the assessment of α and β more specifically.

Finding α and β

Both parameters, α and β, represent weights assigned to S_G and P. The weight β, assigned to S_G, shall be the bigger, the higher the subsidies (S_G) with respect to the consumer price, C_E. It is important to point out that it is the relation between the amount of subsidies and the consumer price which needs to determine the weight assessed to S_G. Determining β:

$$n_E * \beta = \frac{\partial ln D_E\left(C_E(P, S_G)\right)}{\partial ln S_G}$$

$$n_E * \beta = \frac{dln D_E\left(D_E(P,S_G)\right)}{dln C_E} * \frac{\partial ln C_E}{\partial ln S_G} = n_E * \frac{\partial ln C_E}{\partial ln S_G}$$

With $\frac{\partial ln C_E}{dC_E} = \frac{1}{c}$ and $\frac{\partial ln S_G}{dS_G} = \frac{1}{S}$:

$$\beta = \frac{\left(\frac{1}{c} * dC_E\right)}{\frac{1}{S} * dS} = \frac{S_G}{C_E} * \frac{dC_E}{dS_G} = \frac{S_G}{C_E} * (-1)$$ [2]

Therefore, β is equal to $(-\frac{S_G}{C_E})$. If the subsidies reduce the free market price significantly, then a percentage change in S_G should impact consumer price as well significantly. In case the subsidies are very small and not of much importance to the consumer price, the weight β assigned to S_G, which is $-\frac{S_G}{C_E}$, will be smaller and hence the impact on demand limited. Similar α needs to capture the relationship between P and C_E. Using the same approach as for β, one finds that α = P * C_E. Differently said, one may argue that these parameters appear in equation (3), as we are using general price elasticity (n_E) to measure separately the impact on demand induced by a change in subsidies and the one provoked by a change in the free market price. In order to do so, a weight to reflect changes in S_G and P separately needs to be assigned to n_E.

Finding demand elasticity

In the case of Egypt, estimates of demand elasticity are provided by research of the IFPRI (International Food Policy Research Institute). Ahmed et al. (2001) estimate price demand elasticity by using the FCDS method (Food Characteristic Demand System). Using this approach they find that Egyptian households are generally responsive to changes in food prices. Meet, eggs, milk or beverages for example have unitary price elasticity, converting a 1% increase in prices into a 1% fall in demand. This is not the case of baladi bread. Contrarily to the previous enumerated goods, the results for baladi bread suggest the

[2] $\frac{dC_E}{dS_G} = -1$ *as* $C_E = P - S_G$ *the derivatice of* C_E *with respect to* S_G *is equal to* -1

presence of a rather inelastic demand. They estimate that a 1% increase in the price of baladi bread in 1997 implies that demand will fall by 0.33% (Ahmed et al., 2001, p.79). The explanation for this might be that baladi bread is a necessity rather than luxury. A good representing a need to the population to survive is characterized by its inelasticity. This a underlines the vital importance of the current system to support the most needed and the benefit they may obtain out of it. In addition to this baladi bread might be part of their food habits and therefore of cultural significance to the Egyptian diet. Consequently, it might be difficult to find a good substitute. Lack of an appropriate substitute favours inelastic demand. Moreover, and according to the estimates, demand for baladi bread in rural areas of Egypt are more responsive to price changes compared to urban areas (Ahmed et al., 2001, p.79). The latter might emphasize the scarce income of rural households or the presence of an even cheaper good for nutritional purposes in rural areas.

The estimate of demand elasticity is comparable to the one published on the website of the USDA. Using the Florida PI Model, Seale et. al. finds that the Egyptian price elasticity for Bread and Cereals in 1996 is equal to -0,3324% (USDA Commodity and Food Elasticity, 2014). His findings support the price elasticity estimated by Ahmed et al. (2001) in 1997.

Two Simulations

1997 - Simulation

Data from the Egypt Integrated Household Survey (EIHS) 1997 and the Ministry of Trade and Supply, that were used for estimations in Ahmed et al. (2001, Appendix A and B), will be applied to obtain a numeric estimation for α, β, S_G and P.

The amount of subsidies, S_G

By subtracting the cost of purchasing, milling the wheat from the revenue gained by selling (a) bran, a by-product of the milling procedure, and (b) the wheat flour itself at a subsidized price, one obtains the cost of the subsidies to the government. In 1997 the amount paid by the government for bread subsidies is estimated at 2.3 billion LE. Assuming an 82% flour extraction ratio, out of the 4.1 million MT of wheat used to produce subsidized baladi bread, 3.4 million MT of flour is obtained. It is said that out of 100 grams of flour, 1 loaf is baked (see IFRP 2001, Appendix B). Therefore, out of 3.4 million MT of flour 34.1 billion loaves can be produced. To obtain the subsidy amount in a LE per loaf basis the total subsidized amount can be divided by the number of loaves normally to be baked with 3.4 million of flour. The result is equal to 6.76 Piaster per loaf, which corresponds to S_G.

Subsidised Production Cost and the Consumer Price, C_E

The production cost of one loaf using *subsidized* flour are estimated at 4.6 Piaster. ((Ahmed et al. (2001, Appendix B)). One loaf is sold at 5 Piaster, which corresponds in our above analysis to (C_E), the consumer price.

The free market price, P

With the consumer price (C_E) and the amount of subsidies (S_G) given, one can estimate the free market price, using equation (2), which will set the free market price at 11.76 Piaster. Using the above results, one finds that in 1997, the rate of subsidy, defined as ($\frac{S}{P}$), is equal to 57%. This ratio as well as above figures are very similar to the one found by a study conducted by Adams, R. H. (2000, p.16). He reports that the free market, non- subsidized price (P) was 12.1 Piaster in 1996/7, only slightly higher than the one obtained above (11.76 Piaster). The subsidy ratio calculated by the World Bank scores 59%, supporting above results as well.

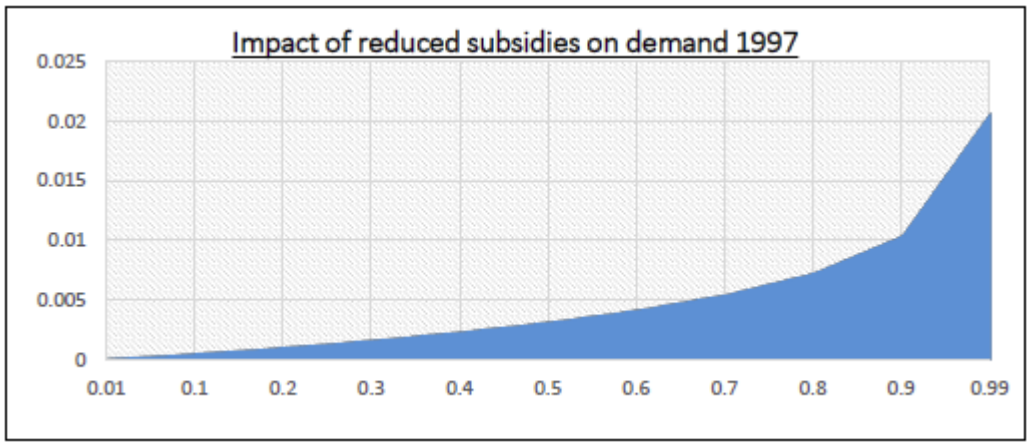
Parameters (α and β) assigned to unspecific elasticity

Having found values for the main variables, one can deduce β, defined as $-\frac{S}{C_E}$, to be at -1.35 and α, $\frac{P}{C_E}$, at 2.35. Combining these estimates with the ones for demand elasticity, one can use equation (3) to estimate the impact on demand.

Simulating a 99% cut in subsidies	Demand Elasticity	Demand drop %
Egypt	-0.0033	2.05%
Rural	-0.0044	2.74%
Urban	-0.0027	1.68%

One finds that a 99% cut in the amount of subsidy implies a 2.03% fall in demand, with rural areas responding more to such price change compared to urban areas. As the LN of 0 cannot be taken, a 100% cut could not be simulated.[3] Notwithstanding, a cut of 99% approaches the scenario, in which the government does not provide basically any bread subsidies.

[3] To note that $dlnS_G = \ln\left(\frac{S_1}{S_0}\right) = \ln\frac{S_0 - \delta * S_0}{S_0}$. If δ equals 100%, $S_0 - 1 * S_O = 0$. However, one cannot take the ln of 0.



2011 - Simulation

With the aim of producing more recent estimates one could change the input variables. One may suspect that β, defined as the subsidy amount over the consumer price, has increased in absolute terms. The reason behind could be that the cost of producing baladi bread has increased over time, due to higher input prices, such as for example higher wheat prices (Appendix B). Therefore, the estimates using equation (3) should give greater weight to any change in the amount of subsidies provided by the government. Consequently, a cut of a 99% in the subsidized amount in 2011 should impact demand more significantly than in 1997. Average free market baladi bread is sold nowadays at 15 Piaster, price which can be used for variable P, the free market price. With the subsidized consumer price unchanged at 5 Piaster, the cost supported by the government can be approximated at 10 Piaster per loaf. Using these estimates, combined with unchanged demand elasticity, one obtains that a 99 % cut would imply a fall in demand by 2.99%.

Simulating a 99% cut in subsidies	Demand Elasticity	Demand Drop
Egypt	-0.0033	3.039%

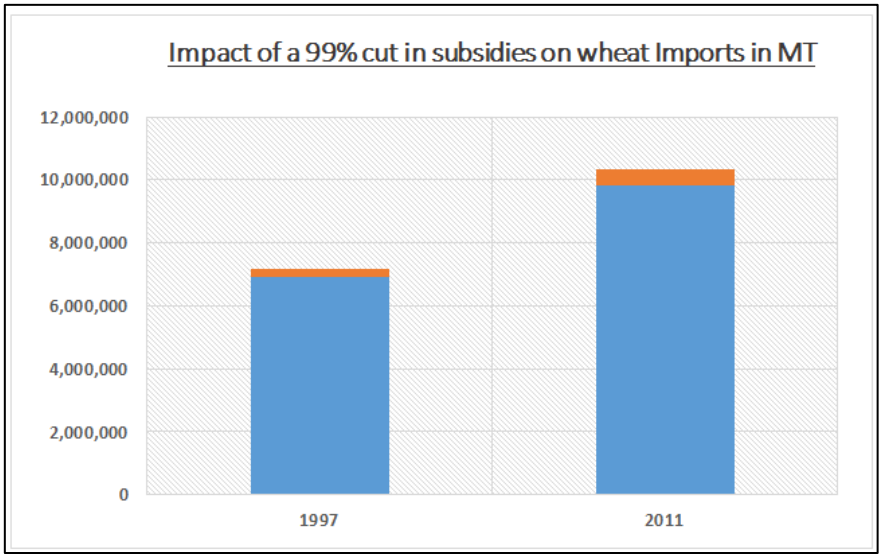
Linking Demand and Trade

In order determine the impact of a cut in subsidies on trade, one may picture two different scenarios: (a) A situation in which the subsidy cut is not accompanied by any changes in the economic incentive given to farmers to produce wheat. Therefore, local wheat production remains the same. (b) The opposite, a cut of subsidies is accompanied with reduced economic support from the government concerning national wheat production, resulting in less incentive to produce wheat and consequently diminishing local wheat supply.

In the interest of analysing the impact of subsidies on wheat imports purely from a demand perspective, scenario (a) is chosen for further discussion. Using the results from the 1997

simulation to approximate the impact on wheat imports, which in 1997 stood at 6.9 million MT (FAO Data, 2014), one obtains that a 99 % cut in the baladi bread subsidies would result in 259'161 MT less of wheat imported. In 2011 imports were equal to 9.8 million MT (FAO Data, 2014). Using a decline of 2.99%, a 99% cut in subsidies implies 545'066 MT less wheat imported in 2011.

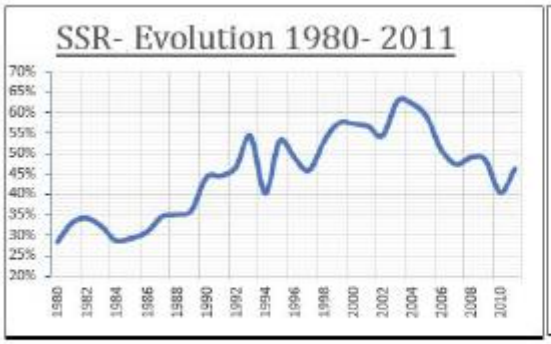
The above simulations imply 4% and 6% less wheat imported in 1997 and 2011 respectively. Therefore, I conclude that the consequences of a cut in subsidies on trade are limited. This points out the importance of baladi bread in the Egyptian food diet, regardless of existing food subsidies.



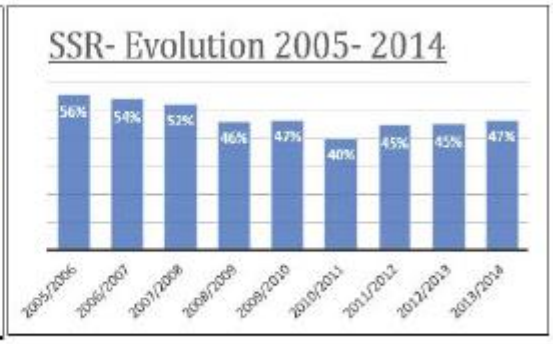
Supply

The Egyptian Wheat Self- Sufficiency Ratio (SSR)

The evolution of the self- sufficiency ratio for major agricultural products within the period 1990-1999 are resumed in Appendix D. Wheat achieved the highest increase in its self-sufficiency ratio and went from an average of 42.8% in the first period (1990- 1994) to 50.4% in the second period (1995- 1999) (Siam, 2003). The leading performance of the wheat sector did not come by itself. Reaching the self-sufficiency ratio is one of the often cited goals by the Government of Egypt (GoE). Within this context, the GoE has taken measures that have successfully resulted in raising the self-sufficiency ratio of wheat from 28% in the early 1980s to 63% in 2003. (FAO Data, 2014) (USDA Data, 2014)



(FAO Data, 2014)



(USDA Data, 2014)

However, improving further the SSR entails challenges. From 2005 to 2014 the Egyptian wheat SSR declined from 56% to 47%. National production needs to keep up with a growing population, limited agricultural resources and a supply chain incorporating leakage and waste.

Feasibility

From a technical point of view, Croppenstedt (2005) approaches the question of how much more output could be obtained given the inputs and the current technology in Egypt. He argues that the reforms in the late 19th century, as well as the introduction of higher- yielding wheat varieties have led to increased wheat crop areas and output, supporting the above mentioned leading performance of the wheat sector in terms of growth. Nevertheless, in spite of the positive development, distortions remain, namely those linked to limited access of small farmers to improved varieties and inputs, as well as old- fashioned farm practices.

His findings highlight that land, apart from water, is the scarcest input. With most farmers cultivating only on very small land areas, marginal returns to land are very high. Additionally, increased availability of fertilizers and support on improved irrigation techniques could translate in significant higher returns. In this sense he estimates via a Cobb- Douglas frontier production function that on average Egyptian wheat farmers are 81% efficient, which implies a potential for higher output maintaining the inputs constant.

With respect to agricultural land being a very scarce resource, one may envisage two horizons: a national and an international one. Focusing on a national frame of references, the FAO estimates that Egypt has 1.75 million HA land ideally suitable for wheat cultivation, plus additional 900,999 HA of medium quality soil for wheat cultivation. (Beillard et al., 2013). From June 2013 to May 2014 Egypt planted a total area of 1, 4 million HA (FAO Data, 2014). Considering only the 1.75 million HA of suitable and high quality land to maintain a yield of 6.3 mt/ha observed in 2013/2014 (USDA Data, 2014), Egypt could produce on top of its

current production additional 2.2 million MT of wheat a year. To note that such output would of course imply less production of other agricultural goods. From an international perspective, land acquisition, especially seen in Arab and Asian countries, might be an option to tackle the problem of scarce arable land in the home country. Two Arab countries, namely Saudi- Arabia and UAE (both net importers of cereals), hold together more than 2.8 million hectares in third- party countries (World Bank, 2009). Egypt attempted to acquire land in Sudan and Uganda. Nevertheless, such strategy entails significant risk factors, such as production and most importantly country risk. Any political tension not only between the countries but also within a country itself may imply a considerable threat to the investment. Furthermore, such strategy is not flexible in the short-term, as the invested capital in the third- party country is timely blocked and cannot be easily used to acquire food from other suppliers, in case of bad weather in the host country (World Bank, 2009). Further improvements to the SSR could come from ameliorating the supply chain, as for example the storage capacity and reduce related losses. In the same line dissolving problems of inefficiency within the food subsidy regime, such as leakage, would lead to a more efficient allocation. Fragmented ownership resulting in weak small farmers union and traditional irrigation systems, which are inefficient in using water, offer opportunities to achieve further efficiency (Hag Elamin and Tanyeru, 2011, p. 32). In February 2014, the Daily News Egypt publishes an article stating that also financially there is scope for amelioration. A new strategy for marketing wheat domestically developed by the Ministry of Agriculture and Land Reclamation implying greater pre- financial support from the PBDAC (Principal Bank for Development and Agricultural Creidt) will provide greater support to the farmer's condition and ability to market their crop (Farid, 2014). In another study, the FAO emphasizes the importance of investment in the agricultural sector to address inefficiencies and take advantage of Egypt's full agricultural potential. Such investment is said to be below the sufficient level, which would allow Egypt to develop its capacity fully (Hag Elamin and Tanyeru, 2011, p. 32).

Summarizing, the SSR has considerably ameliorated within the last 50 years. Further increase is challenging, as the SSR needs to keep pace with a growing demand, situation which is not alleviated considering the limited agricultural land suitable for wheat cultivation. Reaching complete independency has not been evoked by any of above studies. Growing demand, limited agricultural land, desertification and the high risk to acquire land in third-party countries might be barriers to reach the wheat SSR completely. Nevertheless, despite the fact that reaching the SSR completely might have its limitation, opportunities to achieve greater efficiency and therefore a higher SSR seem to exist. There is scope for technical, organizational (food subsidy regime), structural (fragmented ownership) and financial (pre-

financing) amelioration. Accompanied by greater investment allocated to the agricultural sector, one may conclude that potentially Egypt could achieve greater wheat production. Notwithstanding, such development requires a political rather stable environment, for foreign investment to happen and most importantly for the government to take the necessary steps to address the above enumerated inefficiencies.

Simulating Production Incentive – GSIM

Government incentives aim to change plantation decisions of farmers, which would have been normally taken under free market conditions. With the government announcing higher procurement prices compared to international ones, additional revenue is given to the Egyptian farmers. Such surplus provides a production incentive and can be expressed in monetary terms. However, the argument goes beyond monetary terms, as further motives exist. For example further incentive might be given if the government revenue is considered to be a very stable one compared to the one obtained by planting crops with no government support and exposed to international price volatility. (Sumner, 2005). Moreover and specific to Egypt, planting wheat might be considered a social- political correct decision to take, taking into consideration the relevance of bread in religion. (Khalil, 2014) But to what extent does such incentive results in higher national production? A Global Simulation Model (GSIM) will be used to approximate the national and international impact of higher prices on production.

The Model

The model, developed by Francois and Hall (2003) as an improvement of SMART, focuses on a limited set of data providing a transparent policy analysis. The GSIM clears global markets taking into account a new set of policies. The new policies, defined as an experiment, imply a new market clearing price vector, which then is used to back solve for changes in trade quantities and welfare. Under GSIM, imports are imperfect substitutes for each other. More specifically goods imported from different countries although similar are not equal to the eyes of the importer as they originate from different countries. (Armington Assumption). Although wheat is a commodity, it can be seen as an imperfect substitute as its different qualities makes it suitable or not for the consumption in certain countries. Furthermore the presence of imperfect substitutes impacting trade patterns might be even more reasonable in a low freight prices environment.

The following model is based on the explanation of Jammes and Olarreaga (2005) (Appendix E). Import Demand and Export Supply are defined (see Appendix E) and used to calculate new price equilibrium.

Data:

The main inputs needed are wheat trade values as well as import demand, export supply and substitution elasticity.

Trade Matrix

In order to establish a bilateral trade value matrix specific to wheat, Egypt and its 12 main wheat partners in 2011 are identified. The matrix is created based on these 13 specific countries plus an additional one (RoW), capturing wheat trade with the Rest of the World (RoW). Including RoW will allow global market clearing. The bilateral trade value between these countries was extracted from the UN Comtrade (2014) Database. The diagonal of the trade value matrix is to include "trade with itself", that is domestic supply for domestic utilization. Such variable was obtained by substracting exports from total national production, quantity which was valued at the average wheat price in 2011 (FAO Data, 2014).

Import Demand Elasticity:

Data on Import Demand Elasticity was obtained from an estimation conducted by Kee, Nicitaz and Olarreaga in 2008. For the variable RoW, as well as for any country for which no data was given, as for example Australia, Argentina etc. the average of all disposed data was used.

Export Supply Elasticity:

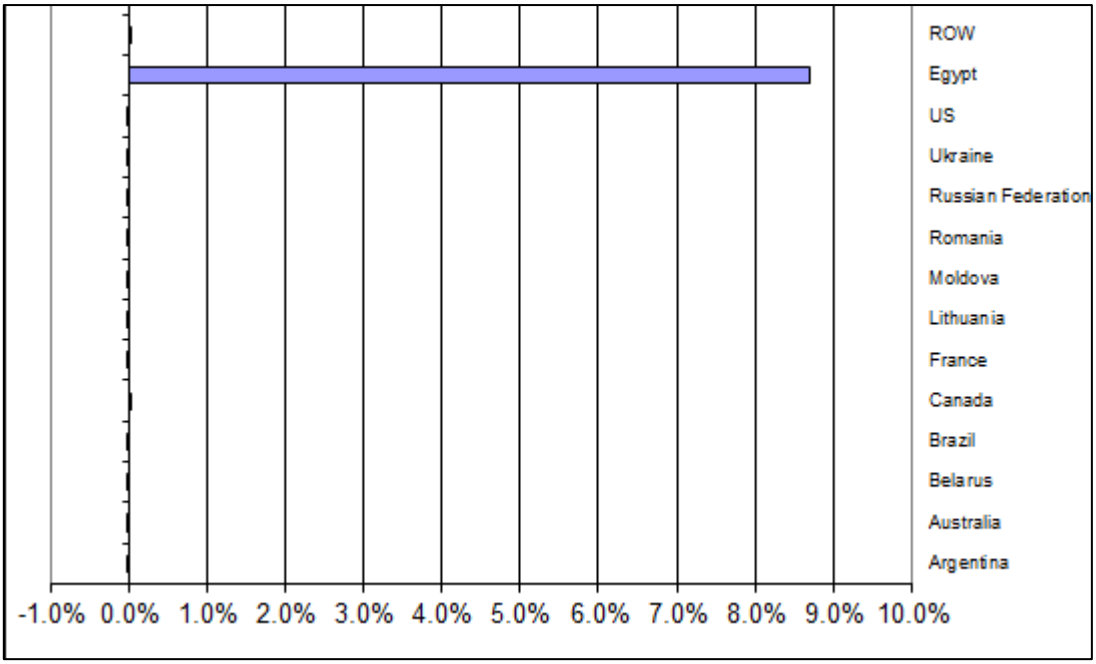
Export supply elasticity captures by how much exports would increase if the price of wheat increases by 1 %. The inputs used are given by Professor Olarreaga and subject to an ongoing project.

Substitution Elasticity:

Broda and Weinstein calculate using 10-digit HTS data substitution elasticity for the U.S. from 1990- 2001 to be at 2.6%. Such result has been used as well for all other countries due to lack of data.

Results

The result obtained indicates that paying Egypt farmer's 10 % more as to what was paid in 2011 does not affect production worldwide. In other words, Egypt's wheat partners will produce the same amount of wheat. However, Egypt's production itself would increase by about 8.5%.



Competing Crops

Despite Egypt's ambition to reach the SSR in wheat, it might be interesting to analyze whether from an economic point of view it is favorable to support national wheat production versus producing other more valuable agricultural goods, which than can be exported and contribute to greater revenue. Such issue is often referred in literature as self- sufficiency versus self- reliance.

Mohamed Khalil, Chairman Bunge Egypt, working with GASC for many years has been interviewed on the topic of food subsidies. In his opinion from a pure economic point of view Egypt is better off planting crops with high exportable value and use the cash for wheat imports.

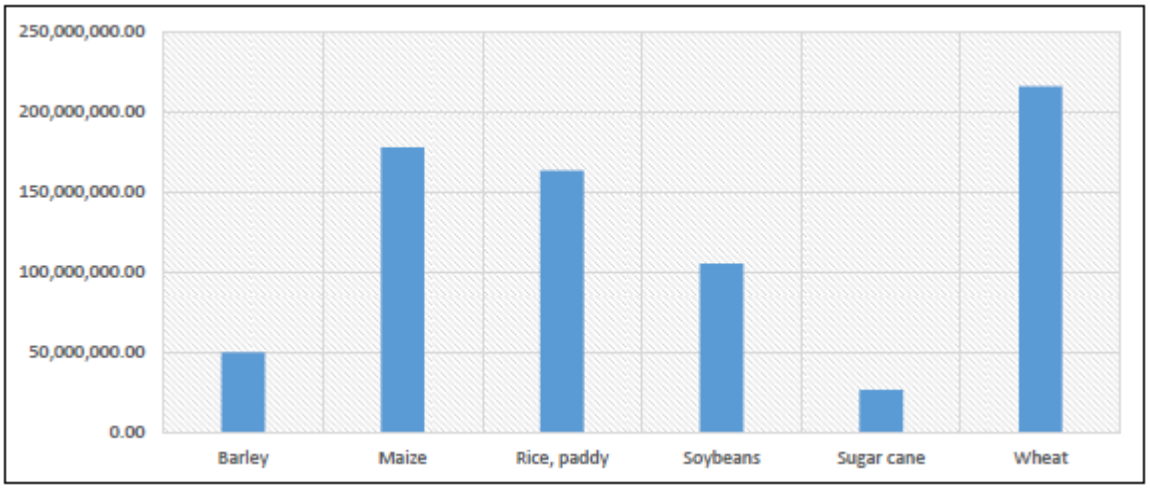
Conclusion

The economic, political and social analysis has shown that there is limited space for a drastic change within the Egyptian food subsidy regime. Poverty, a population touched by a deteriorating economy and most importantly the wide- spread economic, political and social dissatisfaction at the source of the violent demonstrations seen in the last three years support this conclusion. Rather than reducing food subsidies, the Government of Egypt is focusing on ameliorating the system to achieve greater cost- effectiveness, given the difficulties they are facing as well in the economy. The GoE may prioritize political stability and hence re- comfort the economy, which has been affected by the political turmoil since 2011. Food subsidies became of great importance to the Egyptian population during the 19th century. They are perceived as an essential service the GoE must provide. The Riots in

1977 and the resulting prudence of any government touching up on food subsidies accentuate the important role of food subsidies to maintain social peace. Consequently, the analysis provides further support to above mentioned conclusion of limited space to any potential reduction. Furthermore, assuming that changes in the amount of food subsidies are to happen, the impact on trade is limited. The results of simulating a 99% cut in subsidies implied 550'000 MT less imported wheat in 2011, which corresponds to only around 6% of the total wheat imported in that year. Thus, even if food subsidies are reduced significantly, the impact on wheat imports is limited. From an agricultural perspective, Egypt has grown significantly the last two decades. Efforts of the GoE to achieve greater national agricultural production and hence reliance has translated into more agricultural land and higher yields. Yet, the environment remains challenging due to a growing population, limited agricultural land, nearly no effective rainfall, fragmented land ownership, desertification and insufficient agricultural investment. Notwithstanding some studies and articles state that further potential for greater efficiency and production exist. Such amelioration might come from different sources. Among these, greater technical support to the farmers, better land organization, more financial aid and agricultural investment. Ameliorating the SSR might be, therefore, possible. From a numeric frame of reference the 1.75 million HA of suitable land for wheat plantation could result in additional 2.2 million MT of wheat produced locally, fortifying the SSR. However, this will be of course at the cost of other agricultural crops. Likewise the result of the GSIM has shown that greater output induced by production subsidies is possible. A 10% increase in production subsidies could raise national wheat production by about 8%. Consequently, from an agricultural perspective, I would like to conclude that there is still scope for further national wheat production in Egypt. Yet, to approach the question whether such potential may reduce imports, a growing population hence demand and the opportunity cost of planting wheat and not another commercial crop needs to be considered. The stagnant, slightly decreasing wheat SSR in the 20th century may underline the difficulty to scale down wheat imports. As per the analysis I deduct that reduced food subsidy are not likely to occur and even if they do, their impact on trade is limited. Changes within the food subsidy regime may target a more cost- effective, efficient and targeted supply chain, rather than a reduction. From a production point of view, potential for greater wheat production exists. Notwithstanding, given the size of the yearly imports, the growing demand as well as the questionable economic profitability of national wheat production, I conclude that the additional national wheat production is not likely to replace significantly wheat imports. Therefore, Egypt may certainly remain an interesting market in terms of wheat demand for agricultural trading companies.

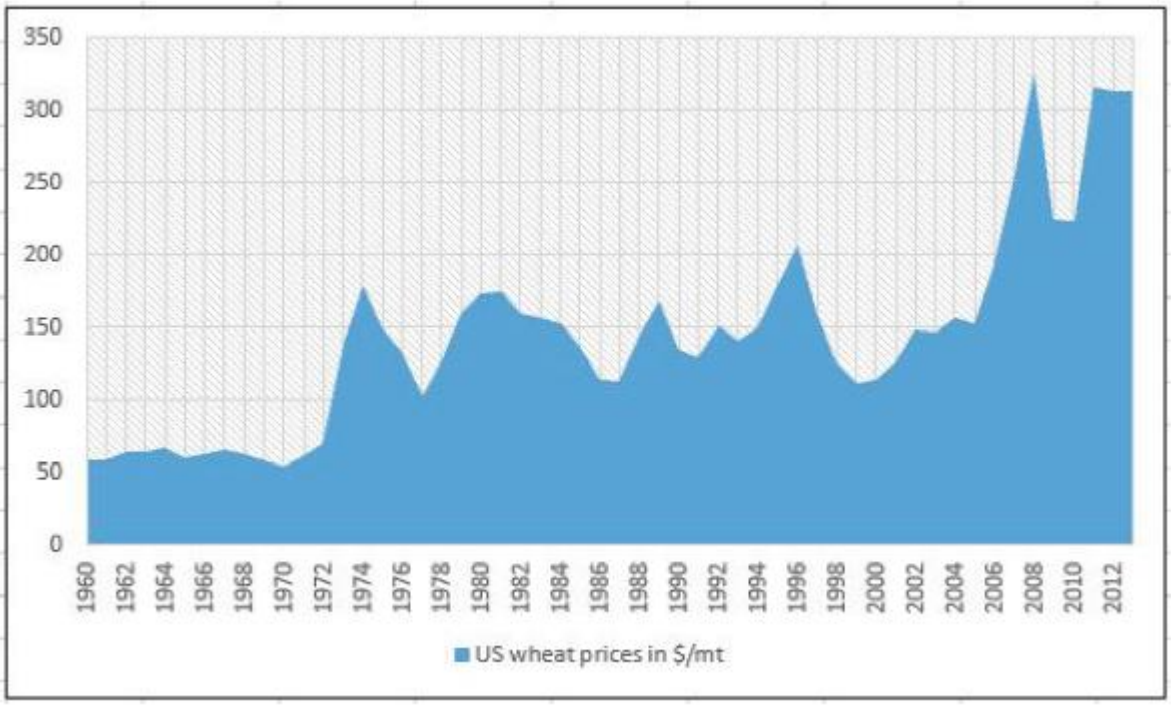
Appendix

A - Area Harvested (ha) per Commodity



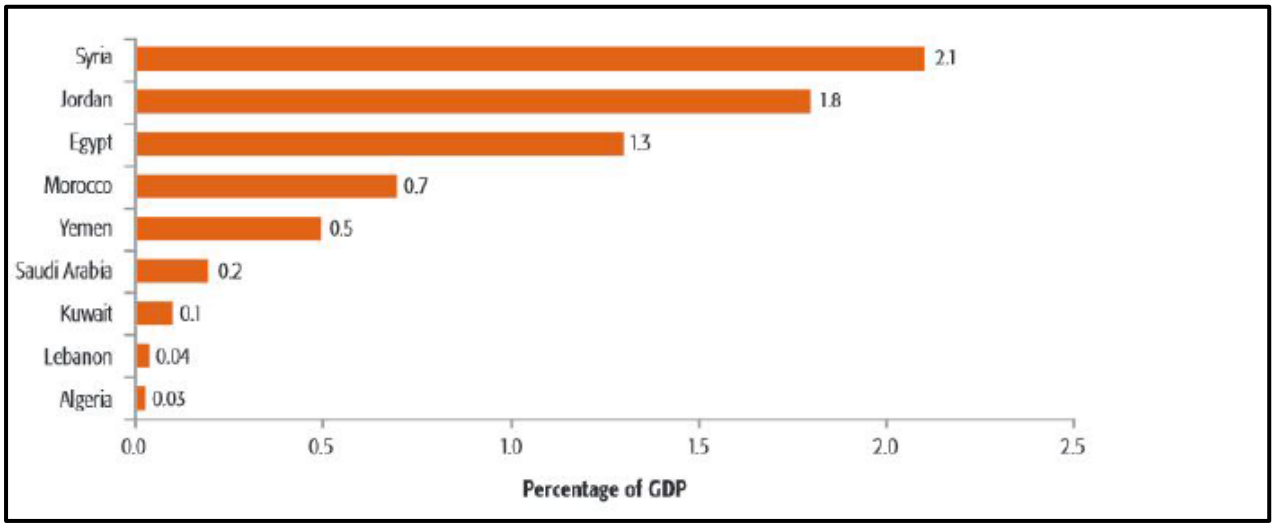
(FAO Data, 2014)

B - Historical Wheat Prices



(World Bank Data, 2014)

C - Cost of Food Subsidies in other MENA Countries



(World Bank, 2009, p.12)

D - Evolution of the SSR in % for major agriculture goods Egypt

Year	Wheat	Maize	Rice	Sugar	Edible oil	Meat
Av. 1990-94	42.8	74.9	110.7	63	13.2	86
Av. 1995-99	50.4	72.8	113.7	61.8	12.4	88

(Siam, 2003)

E – GSIM: Explanation

Import demand:

$$\in_{m,p,x} = \phi_{m,p,x} (\epsilon_{m,p} + \delta_{m,p})$$

with $\phi_{m,p,x}$ equals the expenditure share of product p exported by x in the total imports of product p by country m; $\in_{m,p}$is a composite import demand function for product p in country m and $\delta_{m,p}$= elasticity of substitution in country m for p exported from different countries.

Export supply:

$$\left(X_{p,q}\right) = g(P^{*}_{p,x})$$

Where P^{*} is equal to the international price for product p exported from country x. (Jammes and Olarreaga (2005)).

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For further development, the following variables need to be explained:

- $E_{m,p}$ is a matrix, where the diagonal equals to the import demand function over the export supply elasticity. The elements of the diagonal are equal to the cross price elasticity over the export supply elasticity. For each country $E_{m,p}$ is calculated. Furthermore, E_P entails the sum of all matrixes $E_{m,p}$ and due to the given data is exogenous.

$$E_P = \sum_m E_{m,p}$$

- B_p is a vector which entails the sum of the multiplication of these matrixes to a policy vector ($T_{m,p}$). Such vector $\left(T_{m,p}\right)$ contains tariffs and/ or production subsidies specifications:

$$B_P = \sum_m (E_{m,p}\ T_{m,p})$$

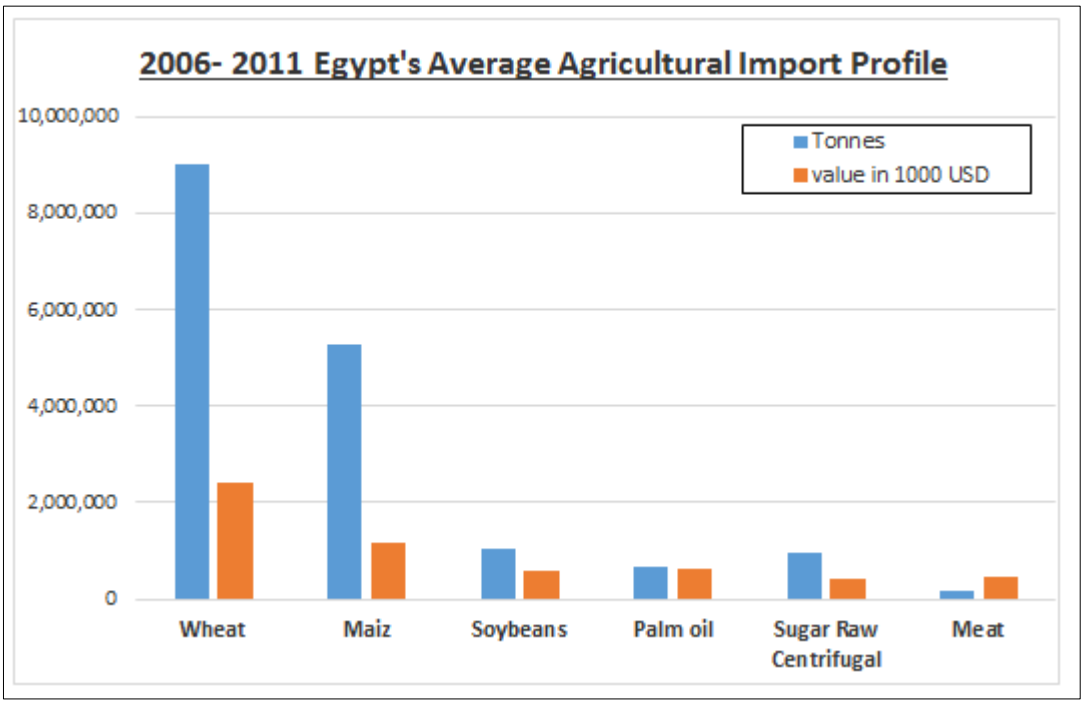
Consequently, vector B_p will automatically capture the policy simulation defined in $\left(T_{m,p}\right)$. The equilibrium is defined as:

$$P^{*}_{p} = (I - E_P)^{-1} B_P$$

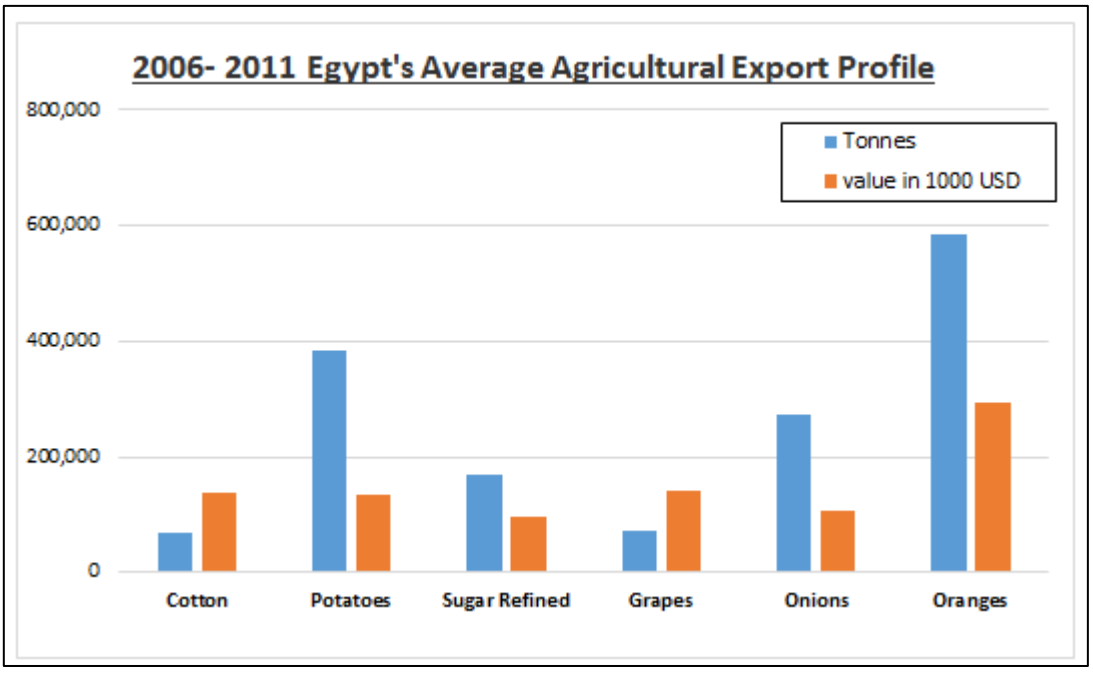
$$(I - E_P) P^{*}_{P} = B_P$$

With vector B_P changing according to the policy experiment it forces P^{*}_{p}, the price vector, to adjust in order to maintain an equilibrium given that $\left(I - E_p\right)$ is exogene. Once this new price vector is determined, the import demand as well as export supply functions are used to solve for the consequences on exported and imported quantities as well as domestic production. (Jammes and Olarreaga, 2005).

F – Agricultural Import and Export Profile

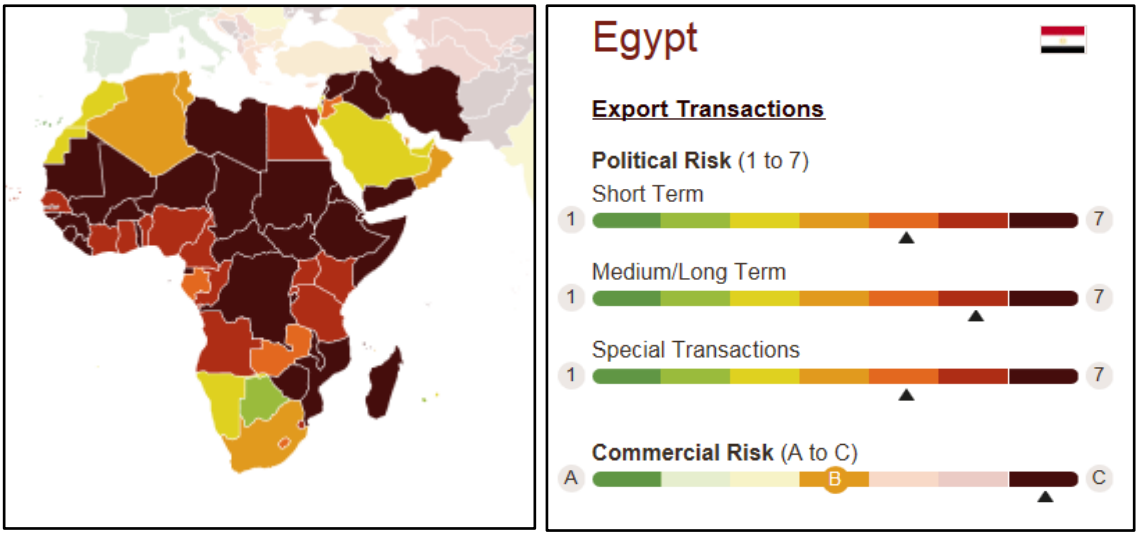


(Fao Data 2014)



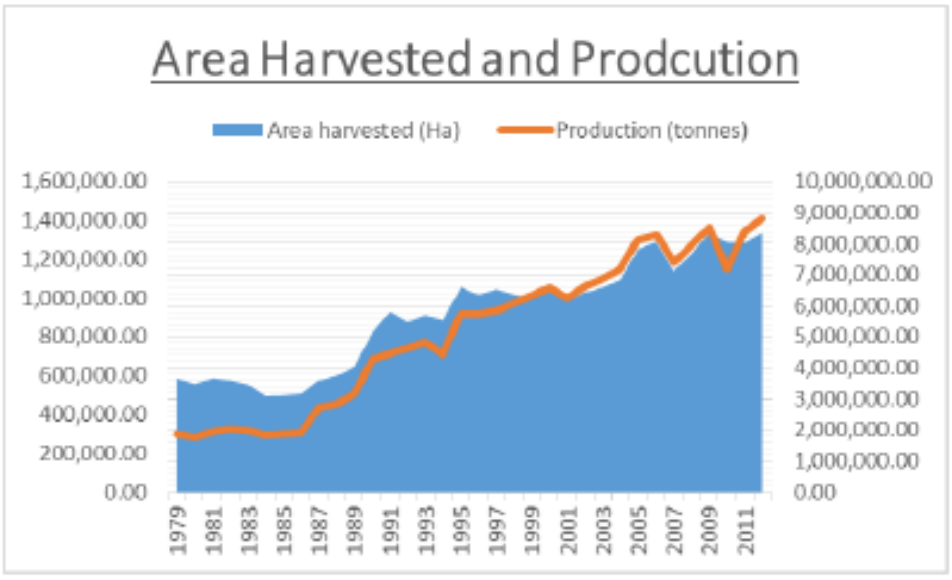
(Fao Data 2014)

H – Ducroire – Risk Assessment of Egypt



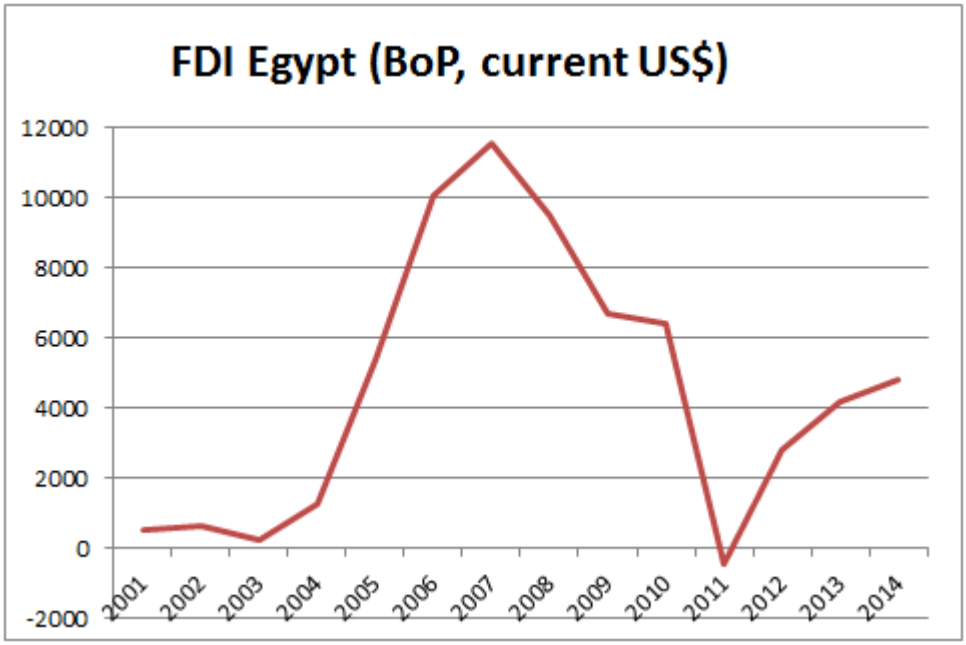
(Ducroire Insurance)

I – Area Harvested and Production



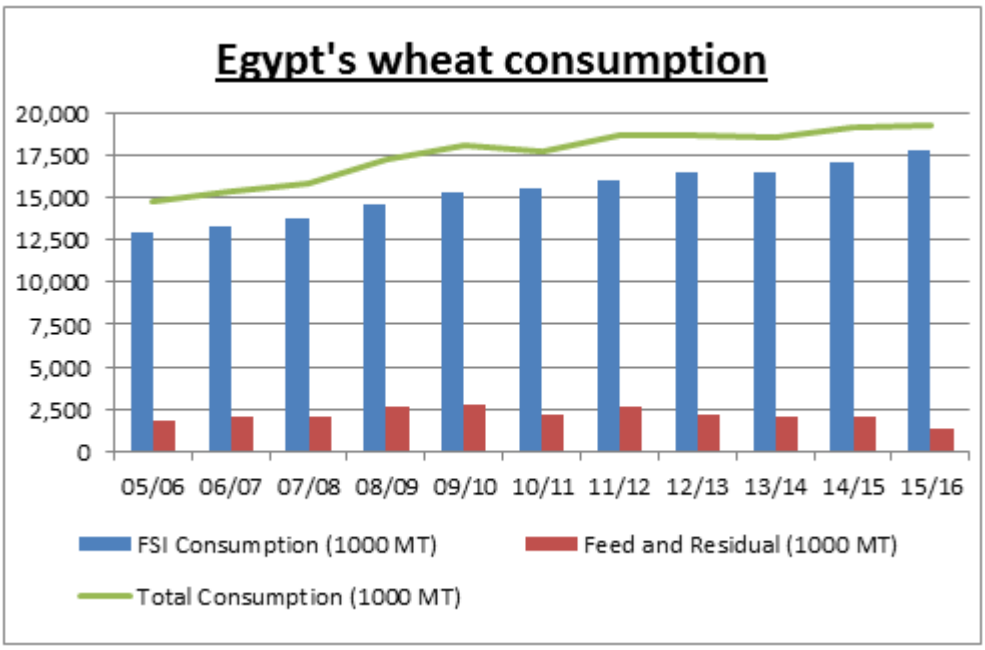
(FAO Data, 2014)

J – Foreign Direct Investment of Egypt



(World Bank Data, 2015)

K – Egypt's wheat consumption



(USDA, 2014)

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