

**DIRECT PAYMENT SUBSIDIES AND THE
IMPACT ON FARM LAND PRICES: A
CROSS-COUNTRY COMPARATIVE
EVALUATION**

by

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ABSTRACT

Agriculture subsidization policies have a long history and have been criticized, reformed and heavily discussed multiple times over the last centuries. However, most countries in the world use farm subsidies as a policy instrument and spend billions every year. Especially highly developed and wealthy countries seem to have a tendency to subsidize production agriculture and the agricultural industry.

The objective of this thesis is to improve understanding of the impact direct payments or subsidies may have on farm land values via farmers paying higher dollars for ground they rent and capitalization of those higher rents. Analysis is done by comparing the allocation of subsidy dollars from the Common Agricultural Policy on two wheat farms in Germany and Czech Republic, which are member countries of the European Union, to wheat farms in the United States and Australia, countries with relatively lower subsidy levels. Data for the farms include their cost structures, total revenues, and total direct payments. Comparisons of their relative land values and rental rates paid will provide evidence to test the hypothesis that direct subsidies are likely to increase land values.

Based on the economic costs of production for the farms in Germany and Czech Republic, the value of land is not necessarily the residual claimant for the direct payments paid out through Europe's Common Agricultural Policy. Possible explanations for this include restrictions on farmland use and farmland ownership structures held over in former communist countries where farms were owned by the state. These factors are likely to affect potential farmland owners' perceptions of property rights and their willingness to pay a full market value for land.

TABLE OF CONTENTS

List of Figures.....	iv
List of Tables	v
Acknowledgments.....	vi
Chapter I Introduction.....	1
1.1 Agriculture in the European Union.....	1
1.1.1 Farm sizes.....	2
1.1.2 Distribution of agriculture payments in the EU	4
1.1.3 Exports, Imports, trade balance	5
1.1.4 Agriculture and employment	7
1.1.5 Influence on GDP.....	9
1.2 History of the Common Agricultural Policy	10
Chapter II subsidization models across countries	15
2.1 Subsidization models.....	15
2.2 Subsidization in Australia	17
2.3 Subsidization in selected OECD countries.....	18
2.4 Farm-Level Costs of Production.....	19
Chapter III Discussion of subsidy impacts	21
3.1 Subsidization – direct payments on a per farm basis	21
3.1.1 Evaluation of cost structure on per hectare basis	22
3.1.2 Evaluation of cost structure on a per ton basis.....	27
3.2 The impact of subsidies on land rents and land prices	34
Chapter IV Summary.....	37
References.....	39
Appendix A.....	42

LIST OF FIGURES

Figure 1.1 Percentage shares of UAA by farm size per country.....	3
Figure 1.2 Payments distribution of CAP by FEADER and FEAGA 2010	5
Figure 1.3 EU 27 Agricultural trade balance with principal customer countries	7
Figure 1.4 Employment in agriculture by country in the EU 27	8
Figure 1.5 Percentage share of agriculture on GDP by country	10
Figure 1.6 Historical Development of the CAP	13
Figure 1.7 Shift of payment distribution of CAP spending 1980-2009	14
Figure 2.1 Agriculture subsidization including direct payments in selected OECD countries.....	19
Figure 3.1 Wheat yields in t/hectare.....	22
Figure 3.2 Crop establishment costs (\$/hectare).....	23
Figure 3.3 Operating costs (\$/hectare)	24
Figure 3.4 Key cost elements (\$/hectare)	25
Figure 3.5 Total cost and gross revenue, including decoupled payments (\$/hectare)..	26
Figure 3.6 Crop establishment costs (\$/ton)	28
Figure 3.7 Operating costs (\$/ton)	29
Figure 3.8 Key cost elements (\$/ton).....	31
Figure 3.9 Total cost and gross revenue, including decoupled payments (\$/ton)	33

LIST OF TABLES

Table 1.1 Farm size distribution within the EU 27.....	2
Table 1.2 Objectives of Agenda 2000	12
Table 2.1 Congressional budget summary farm program payments U.S. 2012.....	16
Table 2.2 Old structure PSE through tariffs (US \$ billion and percent) 2001.....	17

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CHAPTER I INTRODUCTION

The objective of this research is to analyze the impacts of the European Common Agricultural Policy on farmers' returns and costs of production in the European Union (EU), as compared to costs of production in two non-EU countries. Further analysis includes discussion of how the policy impacts owners of farmland and rural communities.

Four wheat farms are selected and used for the analysis. They represent the countries of Germany, Czech Republic, United States and Australia. The comparison of production costs and the returns to farming across both EU and non-EU countries will provide insights into some of the effects of the Common Agricultural Policy (CAP) on land values, labor and machinery use, and other farm management decisions. This analysis will provide greater understanding about the profitability of the farming operations in each country and what impact subsidies have on farmland values.

1.1 Agriculture in the European Union

The European Union currently consists of 28 member states that provide home for 502.5 million people¹. Being one of the largest world economies, Europe not only benefits from its uniqueness of knowledge from their engineers it also states its importance due to its beneficial location and climatic influences. The EU stretches over areas of subtropical climate zones in the south, alpine and maritime climate zones in central Europe, moderate and continental zones in the middle and eastern part to polar in the north parts. As a result, a wide range of diversified production occurs in agriculture.

¹ Source: European Commission, Eurostat, available at: http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/3-28072011-AP/EN/3-28072011-AP-EN.PDF, accessed February 2013

The Common Agricultural Policy (CAP) is probably one of the most complicated pieces of EU policy in existence, given the differences in farming practices and rural economies across EU member countries. The goals of the CAP are to give incentives to modernize Europe’s agricultural industry, raise farm productivity, maintain rural areas and introduce sustainable farming practices.

1.1.1 Farm sizes

Europe has approximately 14 million farmers farming a total of 170 million hectares. A little less than 10 million farmers generate their income from less than five hectares (70.4%), while the overall average farm size for the rest of Europe is 12 hectares². For comparison, the United States average farm size is 170 hectares and only approximately 2.2 million farmers produce food for 300 million Americans on approximately 371.1 million hectares³. Table 1.1 shows the farm size distribution in greater detail. It illustrates that large farms make up a small percentage of the total number of farms.

Table 1.1 Farm size distribution within the EU 27

% of Farms	Size in ha
70.4%	0.01-5
11.4%	5-10
7.2%	10-20
5.9%	20-50
5.1%	>50

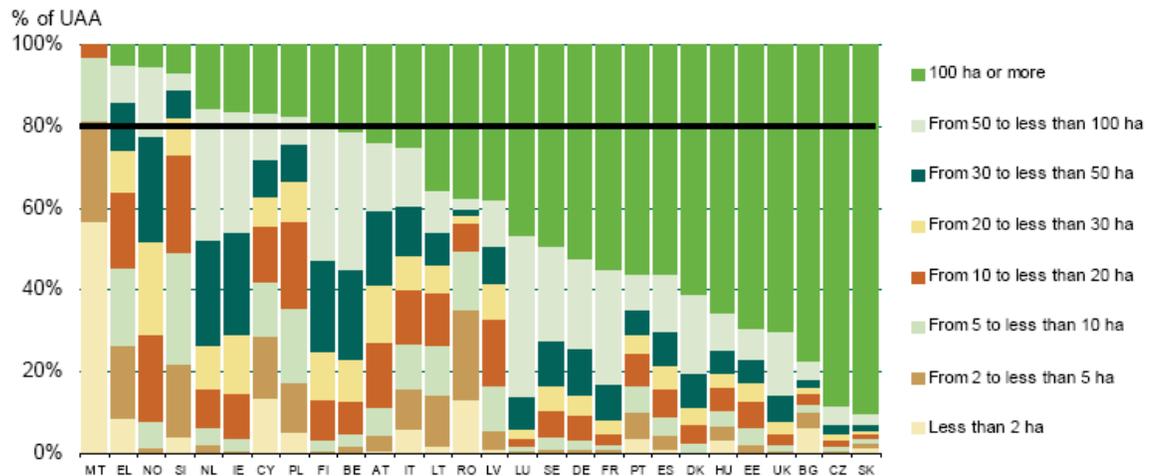
Source: adapted from European Commission, “EU agriculture - Statistical and economic information – 2011”, available at: http://ec.europa.eu/agriculture/statistics/agricultural/2011/pdf/c5-5-354_en.pdf, accessed January 2013

² Source: European Commission, Eurostat, Pocketbooks, “Agriculture, fishery and forestry statistics Main results - 2010-111” available at: http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-FK-12-001/EN/KS-FK-12-001-EN.PDF, accessed February 2013

³ USDA, Farms, Land in Farms, and Livestock operations, 2011 Summary, February 2012, available at: <http://usda01.library.cornell.edu/usda/current/FarmLandIn/FarmLandIn-02-17-2012.pdf>, accessed February 2013

A closer look at the farm size distribution, reveals that 1% of all farms occupy about 20% of the total utilized agricultural area (UAA) within the EU. In Bulgaria 0.04% of all farms cover 20% of the total UAA, while the farm sizes range from 6 ha to 3128 ha. In Germany, the UK, and France, the economic leading countries of the EU less than 1% of all farms cover 20% of the UAA. Looking at the EU 27 overall, 3% of all holdings have more than a 100 ha and farm more than 50% of the total area. 47% of all farms have less than 2 ha but only represent 2% of the total farmed area.⁴

Figure 1.1 Percentage shares of UAA by farm size per country



Source: European Commission, Eurostat, available at: [http://epp.eurostat.ec.europa.eu/statistics_explained/images/c/c7/Distribution of UAA by UAA size of the farm%2C_2007.PNG](http://epp.eurostat.ec.europa.eu/statistics_explained/images/c/c7/Distribution_of_UAA_by_UAA_size_of_the_farm%2C_2007.PNG), accessed February 2013

Farm size distribution is mainly influenced by the history of a country. The newcomer states in the EU are former Soviet Union states and have greater farm sizes due to the existence of government-owned farms that, while now are mostly privatized, remain relatively large in size.

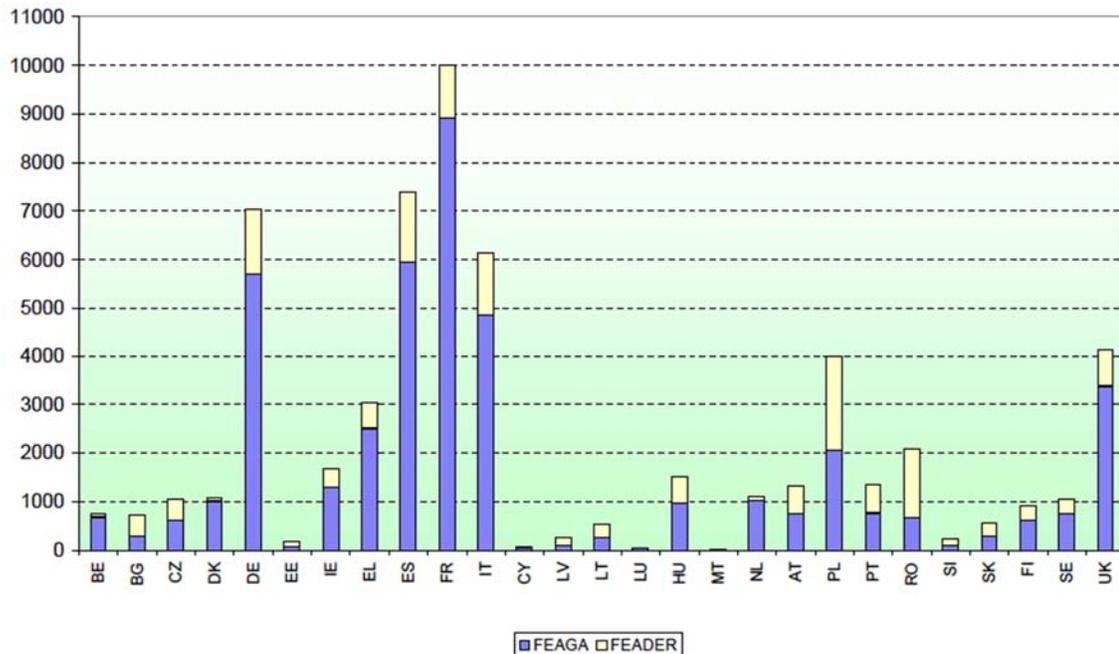
⁴ European Commission, Eurostat, Pocketbooks, “Agriculture, fishery and forestry statistics Main results – 2010-11”, Available at: http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-FK-12-001/EN/KS-FK-12-001-EN.PDF, accessed February 2013

1.1.2 Distribution of agriculture payments in the EU

The distribution of the CAP payments across EU member countries is not consistent. A lot of financial differences exist between the member states. As an example, well developed countries like Germany and France subsidize countries with struggling economies but are also the biggest recipients of agricultural subsidies. The CAP consists of two major funds, the European Agricultural Guarantee Fund (EAGF-FEAGA) and the European Agricultural Fund for Rural Development (EAFRD FEADER). The CAP is a political initiated tool that helps to transition farmers from an environment with lots of subsidization to the reformed environment with a stronger focus of CAP spending on rural development.

Figure 1.2 shows the separation of the payments by the rural fund (FEADER) and direct farm payments (FEAGA) and depicts the huge differences in values. There appears to be no consistency in the value of payments. Poor countries like Latvia or Estonia receive very little money, while highly developed countries like Germany, France, the UK, Italy and Spain receive over 50% from the spending budget. Poland receives 4,000 million euros half rural and half direct payments.

Figure 1.2 Payments distribution of CAP by FEADER and FEAGA 2010



Source: European Commission, Eurostat, available at: http://ec.europa.eu/agriculture/statistics/agricultural/2011/pdf/c4-1-34_en.pdf, accessed February 2013

1.1.3 Exports, Imports, trade balance

Europe is one of the largest exporters and importers of foodstuff products. In agriculture trade, Europe exported a total value of 86.841 million Euros and imported agricultural goods worth 83.584 million Euros in 2010.⁵ Europe mainly imports luxury foods and citrus products that cannot be produced in the EU, or cannot be produced in sufficient volume to serve the demand.

The main exported products are beverages, spirits and vinegar, with a cumulative value of 18,643 million Euros. Other important exported products are eggs and meat products. From a world-wide perspective, the EU 28 is the largest producer of food and

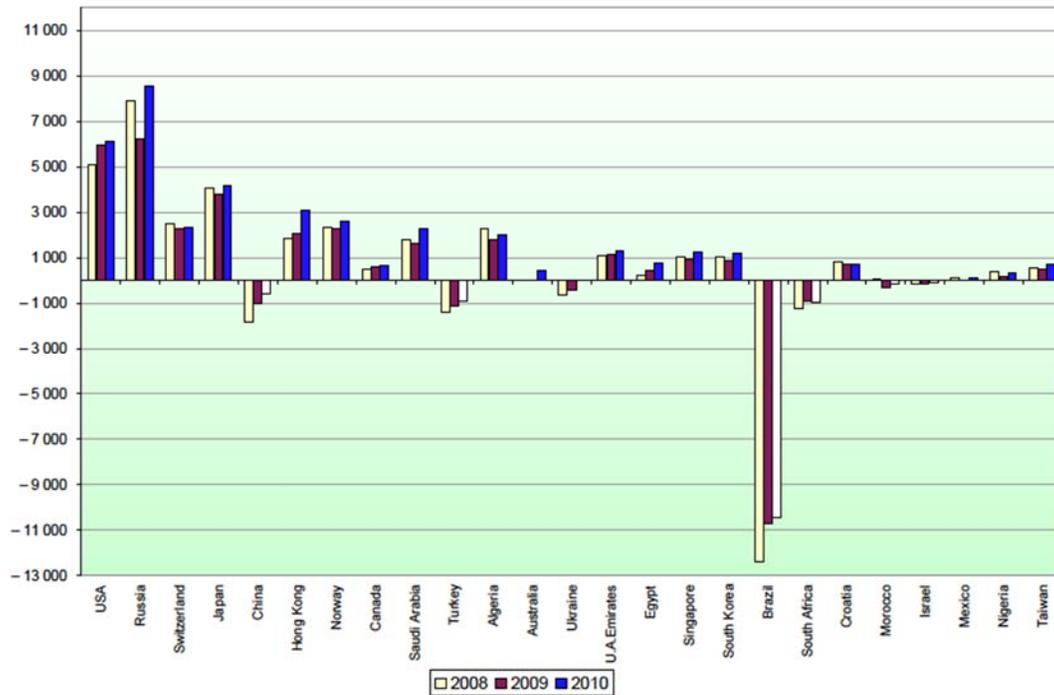
⁵Source: European Commission, EU agriculture Statistical and economic information 2011, Publication “trade”, available at: http://ec.europa.eu/agriculture/statistics/agricultural/2011/pdf/c7-1-37_en.pdf, accessed January 2013

beverages. The production is estimated with a value of 675 billion Euros⁶ which compares to other important agriculture exporting countries like the United States with an exporting value of 84,132 million Euros.

Figure 1.3 illustrates the trading balance of Europe with its main customer countries. EU 27 maintains a positive balance with the United States and Russia. It would be expected to also have a positive balance with China, but surprisingly this balance is slightly negative. Japan is positive due to its limited agricultural area and its high population, making it an important importer for agricultural products with the EU. The negative trading balance with Brazil is caused by the high demand for natural protein, mainly used in meat production. Sources of plant based protein include soybeans, lentils, lupines, beans as well as peanuts. In animal nutrition soybeans are most commonly used due to their cultivation on large scale and high protein content. In the EU several wealthy countries consume meat due to higher income. As a result many farmers feed animals and refine cereals but a negative protein balance forces natural protein to be imported to fulfill the high demand. Soybeans have high protein content and are well suited for Brazil's climate. Europe's climate is not suited to grow soybeans therefore it is more economical to import them from Brazil.

⁶ Source: Europedia, available at: http://europedia.moussis.eu/books/Book_2/6/21/index.tkl?all=1&pos=297, accessed January 2013

Figure 1.3 EU 27 Agricultural trade balance with principal customer countries

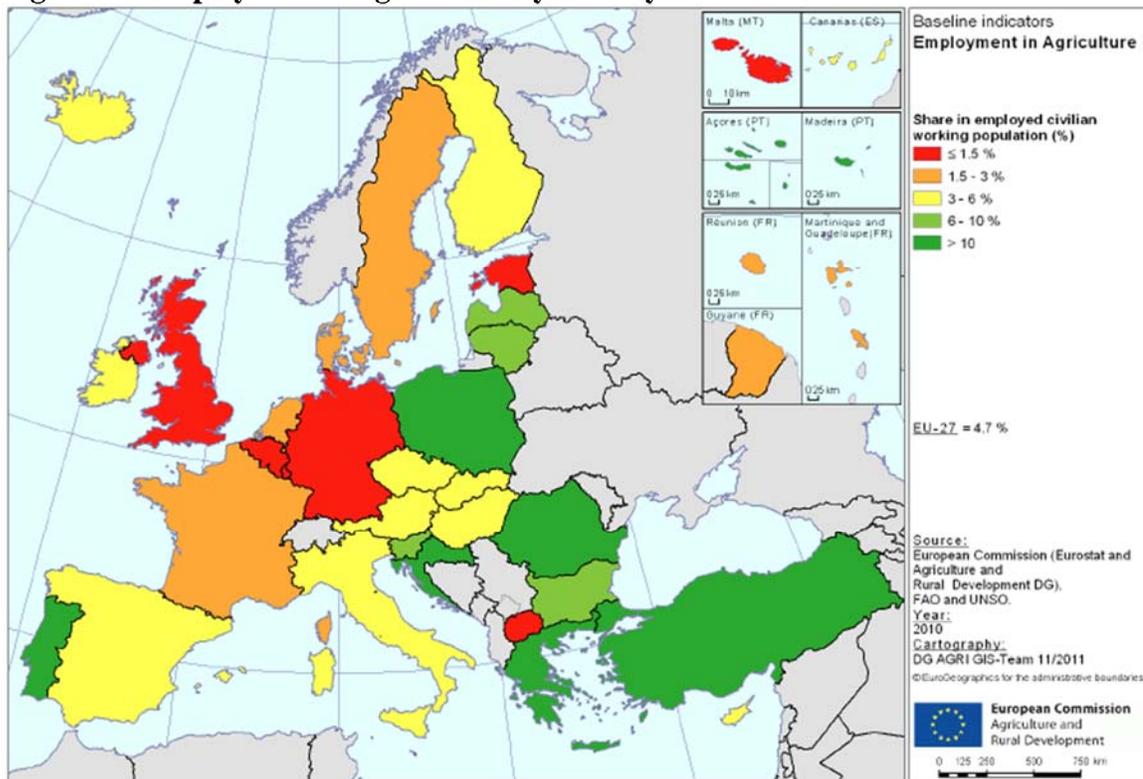


Source: European Commission, Eurostat, available at: http://ec.europa.eu/agriculture/statistics/agricultural/2011/pdf/c7-1-37_en.pdf, accessed March 2013

1.1.4 Agriculture and employment

Farming in Europe serves multiple purposes. The main function is to produce food for society, while the secondary role is to maintain the rural countryside and the rural way of living. Agriculture production provides 4.7% of all jobs in the EU. However, there is much diversification between the 28 member states with regard to the importance of agriculture employment.

Figure 1.4 Employment in agriculture by country in the EU 27



Source: European Commission, Eurostat, available at: http://ec.europa.eu/agriculture/statistics/agricultural/2011/pdf/b0-1-2_en.pdf, accessed March 2013

As shown in Figure 1.4, in countries with a strong economy and industry, production agriculture employment is low. This occurs in the traditional metal and petro- or chemical- producing countries of Germany and the United Kingdom. Agriculture production plays a minor role in employment. However, downstream markets serving the production agriculture industry play a very important role in employment. For example, Germany has 4 million people employed in the non-farm agriculture industry, which is 10% of total employment. In other words, every 10th job is in the Agribusiness industry⁷. In

⁷Source: Bundesministerium für Ernährung und Landwirtschaft, available at: <http://www.bmelv.de/cae/servlet/contentblob/430138/publicationFile/26477/DieDeutscheLandwirtschaft.pdf>, accessed January 2013

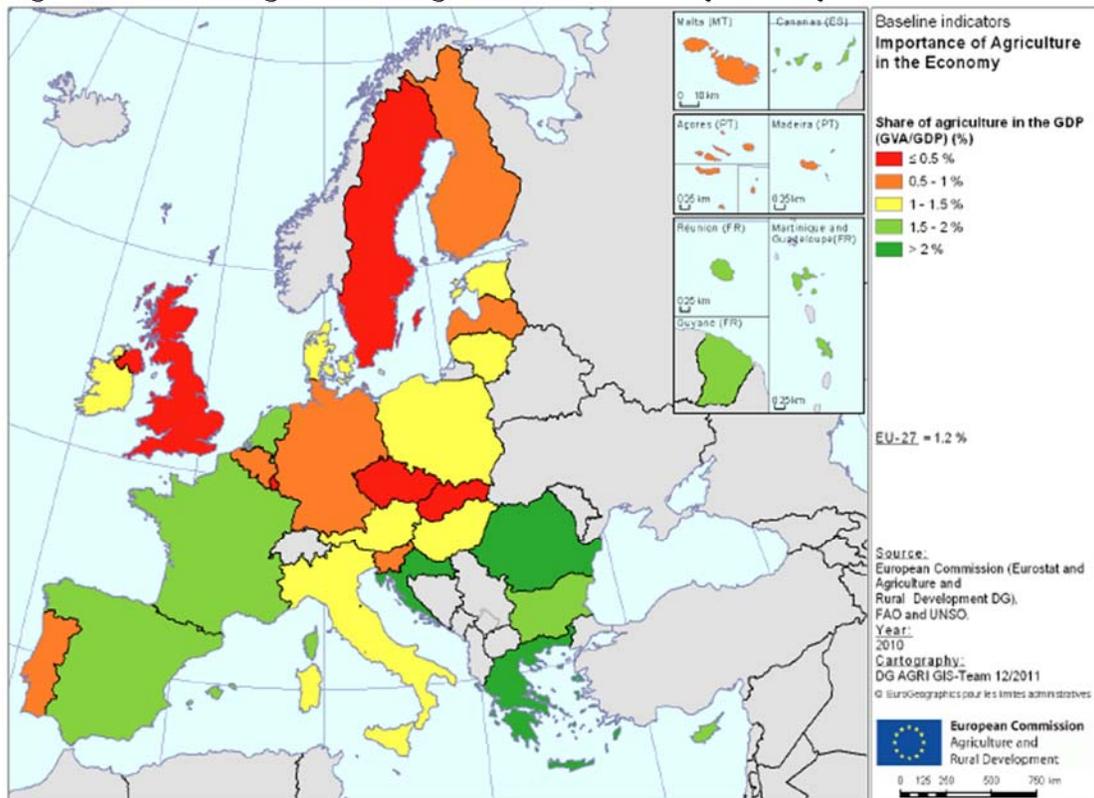
other countries, like Poland, Bulgaria and Romania, agriculture production remains a key employer. The large production agriculture employment in these countries comes with serious structural problems as many of them are former socialist countries and transitions from state-owned farms to private farms has occurred with varying degrees of success.. These countries are provided a greater budget to modernize and increase the productivity of their agriculture industry and farms.

1.1.5 Influence on GDP

The impact of production agriculture on the GDP by country is shown in Figure 1.5. In most countries the influence of production agriculture on the GDP is very small and its importance in the founder states of the European Union like Germany, the Netherlands and Italy is very low. French agriculture has traditionally had a higher percentage, since the maritime influenced climate allows growing cereals that naturally yield higher, than in other parts of Europe. In addition to that, France and Spain are the largest wine producing countries in the world and the share of exported beverages in these countries is fairly high⁸. Therefore, the relative impact of production agriculture on GDP is higher.

⁸ Source: The Wine Institute, available at: http://www.wineinstitute.org/files/2010_World_Wine_Production_by_Country.pdf, accessed April 2013

Figure 1.5 Percentage share of agriculture on GDP by country



Source: European Commission, Eurostat, available at: http://ec.europa.eu/agriculture/statistics/agricultural/2011/pdf/b0-1-2_en.pdf, accessed February 2013

1.2 History of the Common Agricultural Policy

In the beginning of CAP, the focus was on improving the availability of food supplies at reasonable prices to EU consumers; ensure fair living standards to the agriculture communities, and stabilization of the markets. To reach this goal, the CAP was introduced in 1962 and used tools like border protection, support for exported goods and a system that kept support prices artificially high for farmers.

With the beginning of the 1970s, the focus moved to speeding up structural adjustments in the farming sector of the European Union including modernizing farms, providing training for farmers and encouraging older farmers to retire early to allow a younger workforce to take over. The 1970s was the age of introduction of penalty

payments for overproduction in the milk market. Incentives were given for farming in less favorable areas with the goal to increase production.

By the 1980s, the original policy goals appeared to be accomplished with greater self-sufficiency in food production by the EU. Surpluses of many farm commodities were stored or disposed by the EU or exported with large subsidies to be able to compete with the world market. Taxpayers and consumers began criticizing this approach. Furthermore it was not in the personal interest of all farmers, especially the ones who were operating at an economically profitable scale. Public concern increased regarding sustainability of agriculture and the impacts of overproduction on the environment, as well the high costs of subsidization to the taxpayer.

The first big reform was followed by many others focused on shifting the entire system from product support to a producer support system through increases in farm income. Focusing on keeping the diversification of agricultural production alive while protecting the environment, this reform improved the competitiveness of agriculture in the EU as well stabilized the commodity markets and overall controls of the budget spent. The so called “MacSharry reform” in 1992 also introduced direct payments and decreased the amount spent for price support on cereals and beef. It is also important to mention that programs like retirement of land, afforestation and programs focusing on increasing sustainability and diversification were now allowed to be funded. The impact on the land prices in Germany was low even though land availability declined in Western Germany. This was due to new land becoming available in Eastern Germany at the same time, due to the Reunification.

The most significant and long lasting reform was done in 2000. The Agenda 2000 formulated new goals focusing explicitly on economic, environmental and social objectives including a paragraph about the European Model of Agriculture, focused on preserving the existing diversity in farming including particular problem regions. The Agenda included objectives listed in table 1.2.

Table 1.2 Objectives of Agenda 2000

- more market orientation and increased competitiveness,
- food safety and quality,
- stabilization of agricultural incomes,
- integration of environmental concerns into agricultural policy,
- developing the vitality of rural areas,
- simplification, and
- strengthened decentralization

Source: European Commission, Eurostat, available at: http://ec.europa.eu/agriculture/cap-history/agenda-2000/index_en.htm, accessed February 2013

With the introduction of a second policy objective (known as a “pillar”) of rural development, new rural initiatives were stimulated and farmers improved their strategy of marketing products and diversifying or reorganizing their businesses. Farmers started to locally sell their products under their own brand names and tourism was stimulated in areas close to cities.

Just three years after the introduction of Agenda 2000 as shown also in Figure 1.6, due to pressure from the European society and a fast progressing economy, the CAP got adjusted once more. The main changes included decoupling of payments through income support for farmers, the introduction of cross-compliance, a structural reformation of the fruit and vegetables policy, sugar and wine markets and most important a new policy for rural development for the financial period 2007-2013. Once more the reform motivated the strengthening of the competitiveness of the farm sector and rural development, while

focusing on sustainability. One of the key elements that enabled their competitiveness is the strengthening of local produced products under a brand that clearly defines the origin. Tradition and quality lay a major role and allow those producers to charge a higher price that a specific group of consumers is willing to pay in order to offset themselves from others.

Figure 1.6 Historical Development of the CAP



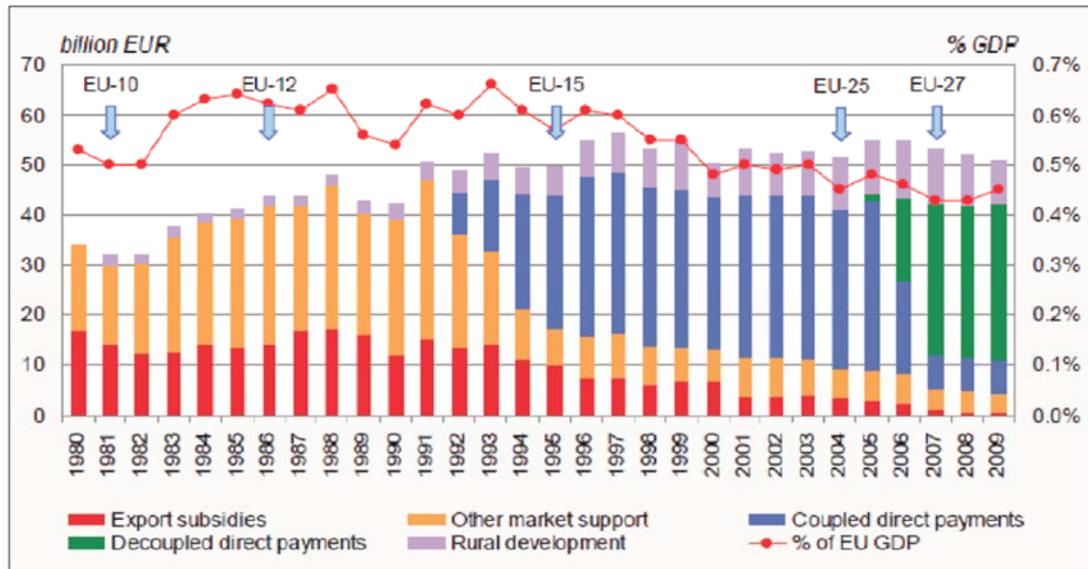
Source: European Commission, Agricultural and Rural Development, History of the CAP, available at: http://ec.europa.eu/agriculture/cap-history/index_en.htm, accessed January 2013

The CAP today is now set on two major pillars. The first pillar focuses on direct payments, which is the direct income support for farmers. This pillar also includes marketing measures that allow continuously improving and adjusting the policy. It also takes account for specific support in a scenario when markets are troubled by external effects such as natural events like flood or drought. The second pillar of the CAP covers a various scope of programs for rural development and support. The framework allows co-financing programs in the individual member states focusing on important tasks to keep the rural areas attractive and livable for Europe’s citizens. One of the major expectations and

benefits is that rural areas remain populated, the jobs stay in those areas and farmers still have enough qualified employees to support their operations.

Figure 1.7 represents and underlines the historic development of the CAP and show how the payments shifted from former export subsidies and market support payments to the two pillar system with the focus decoupled direct payments and support for rural development. By 2011 all of the coupled direct payments were completely removed.

Figure 1.7 Shift of payment distribution of CAP spending 1980-2009



Source: Open Europe, Christopher Howard, Anna Kullmann, Pawel Swidlicki, “More for less: Making the EU’s farm policy work for growth and the environment”, February 2012, available at: http://www.openeurope.org.uk/Content/Documents/Pdfs/CAP_2012.pdf, accessed February 2013

CHAPTER II SUBSIDIZATION MODELS ACROSS COUNTRIES

2.1 Subsidization models

World-wide there are various models used for subsidizing farming focusing on the same goal: increase agriculture productivity and secure food production. Furthermore in the paper "Subsidies as an instrument in agriculture finance: a review" by Meyer (2013), the following guidelines for subsidization in agriculture are understood to be important. First, subsidization of an institution that does not undermine competition is preferred to reduce market distortions. Second, subsidies have to provide incentives to create public goods that benefit the entire financial sector. This is especially important in developing countries with nonfunctional financing institutions. Third, analyzing studies can help to identify the subsidies with the best payoff that provide the most economic sense. Lastly it's important to provide grants to dedicated organizations so recipients understand clearly that money is approved and that it is provided through a loan.⁹

In the United States, farm subsidies include direct payments, marketing loans, countercyclical payments, conservation subsidies, yield and revenue protection insurance, disaster aid payments, and export subsidies are often used. In addition, funding for agricultural research and statistics is also subsidized by the government. The United States uses different forms of subsidization that directly affect the income of a farmer. Table 2.1 shows the break-down of spending for each intervention in the 2012 fiscal year.

⁹ Source: The World Bank, "Subsidies as an instrument in agriculture finance: a review", Richard L. Meyer, available at: http://siteresources.worldbank.org/INTARD/Resources/Subsidies_as_Instrument_AgFin.pdf, accessed January 2013

Table 2.1 Congressional budget summary farm program payments U.S. 2012

Type	Million US-Dollars
Direct Payments	3,921
Marketing Loans	6
Countercyclical payments	11
Conservation programs	4,692
Crop Insurance	8,801
Disaster aid	693
Export subsidies	0
Agricultural Research Service (ARS)	1,100

Source: Adapted from Congressional budget office, available at: http://www.cbo.gov/sites/default/files/cbofiles/attachments/43893_USDAfarmPrograms.pdf, Agricultural Research Service (ARS), available at: <http://www.ars.usda.gov/aboutus/aboutus.htm>, accessed February 2013

Looking at the distribution of the payments by the individual sector the majority of spending is used for crop insurance, conservation programs and direct payments. This distribution is similar to the European situation, except that Europe does not subsidize its crop insurance programs. Crop insurance is only available in Europe for a few crops and certain damages caused by hail or freeze. The new U.S. Farm Bill is expected to introduce a new budget for rural development similar to the European idea. The focus areas are similar to European Common Agricultural Policy as there are: Rural development, secure food safety and food supply, conservation programs and sustainable agriculture.

A study focusing on subsidization in OECD and non-OECD countries shows that the old structure of producer support was more focused on market price support instruments, mainly through tariffs. In 2001, 86% agricultural of subsidization was through import market protection and another 8% through export subsidization. The impact on economic welfare is enormous because prices that the farmers receive for their products are kept artificially high. Therefore a free market structure is hindered. Table 2.2 shows the volume of billion dollars spent in the regions surveyed and the policy instruments applied.

The table indicates, that overall the OECD countries have a higher tendency to apply support measures in agriculture than non-OECD countries.

Table 2.2 Old structure PSE through tariffs (US \$ billion and percent) 2001

	OECD	Non-OECD	All-countries	
Direct domestic support	7	.5	8	6%
Market price support	80	41	121	94%
Import tariffs	70	41	111	86%
Export subsidies	10	.1	10	8%
All support measures	87	42	129	100%

Source: Adapted from: World Bank, Project “The Relative Importance of Global Agricultural Subsidies and Market Access”, November 2005, by Kym Anderson, Will Martin and Ernesto Valenzuela, available at: <http://siteresources.worldbank.org/INTRANETTRADE/Resources/RelativeImportanceOfGlobalAgriSubsidies&MarketAccess.pdf>, accessed February 2013

2.2 Subsidization in Australia

Australia is one of the countries in the world among for example New Zealand that only use very little subsidies or direct payments. In Australia the subsidies based on 2012 data only make up for 3.2% of a farmers income as shown in Figure 2.1. Australia started to reduce the subsidies in the 1980’s and more significantly in 1990. Almost all subsidies were removed then completely by today. This changed the former dominated production present in Australia and exports from wheat, beef and wool to cotton, wine and rice.¹⁰ Almost no farms went out of business during that time, as the farms were able to adjust their production and use their factors more efficiently. The gross revenue without subsidies and including subsidies therefore is almost no different for farms in Australia. This will also be visible in the data from agri benchmark on a farm basis. By removing the farm subsidies Australia followed the idea of having a free market present that will regulate itself.

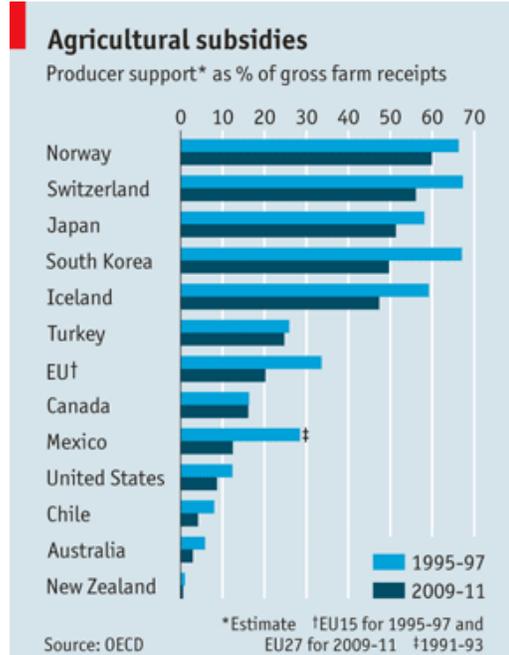
¹⁰ Source: Brian Phillips, Capitalism Magazine, available at: <http://capitalismmagazine.com/2012/06/end-farm-subsidies/>, accessed April 2014

2.3 Subsidization in selected OECD countries

Subsidization in OECD countries varies greatly. Countries with natural existing production disadvantages have a tendency to subsidize more. As shown in figure 2.3, subsidization in Norway and Switzerland accounts for more than 50% of a farmer's income. Those financially strong countries transfer income generated in other areas into the farming sector to secure national food production and Switzerland maintains the unique landscape that is enjoyed by many visitors. Large countries like the U.S. or Australia use little subsidization as the farms have a greater potential to produce cost efficiently due to the given land structure. New Zealand specialize their production that best fit their given resources and can produce more than they actually consume. With the money generated from the exports they import the goods that are not produced in country due to natural disadvantages. Europe follows a little different approach and rather focuses on secure food production other than depend on imports.

Subsidies in all OECD countries, except Australia and New Zealand account for at least 10% of farm's gross income using them as a tool to secure food production, maintaining their unique landscape and to address the goal of sustainable agriculture.

Figure 2.1 Agriculture subsidization including direct payments in selected OECD countries



Source: The economist, September 22nd 2012 issue, available at: <http://www.economist.com/node/21563323>, accessed February 2013

2.4 Farm-Level Costs of Production

The focus of this thesis is on government-provided subsidization to farmers for food production. The subsidies that are evaluated are direct payments on per ton and per hectare basis. The decision to use direct payments is based on the idea of the Common Agricultural Policy that mainly uses direct payments to support farmers with additional income. The underlying data are observed and provided by the agri benchmark network, a German based institution focusing on the economics of farming world-wide. Wheat farms and the data are collected by agri benchmark. The selection includes a farm from eastern Germany, a farm from Czech Republic, one from Australia and a farm in North Dakota in the United States. The planted crop on these farms is wheat. The farming practice is the customary used practice to plant and establish the crop including all factors such as

fertilizer, pesticides, labor etc. Data and charts are from the years 2009-2011. The labeling on the chart is including the Continent or Area of the location of the farms such as “EU” for Europe. The vertical labeling gives information about the country of the farm these are the first two letters. The following number gives information about the size of the farm in hectares and last two letters tell us about the county or state that the farm is located in a country.

The charts are labeled as follows:

SH AU4000WB = Southern Hemisphere, Australia, 4000 ha, State in Western Australia

EU CZ4000JC = European Union, Czech Republic, 4000 ha, State in Czech Republic

EU DE1300MB = European Union, Germany, 1300 ha, State Mecklenburg-Vorpommern

NA US900ND = North America, United States, 900 ha, State North Dakota

It is important to note that the question of how (or if) subsidies have an impact on land rents and the land market is narrowly based on direct payments only. There are more incentives and other subsidies as well as certain rules and regulations that may also impact farm land markets. Examples for other “subsidies” would be loans that help farmers finance a new building project, grants for complying with fertilizer use on grass land and arable land, and slurry bonuses, heath bonuses, as well a bonus for only using renewable crops in biogas or methane digesters.

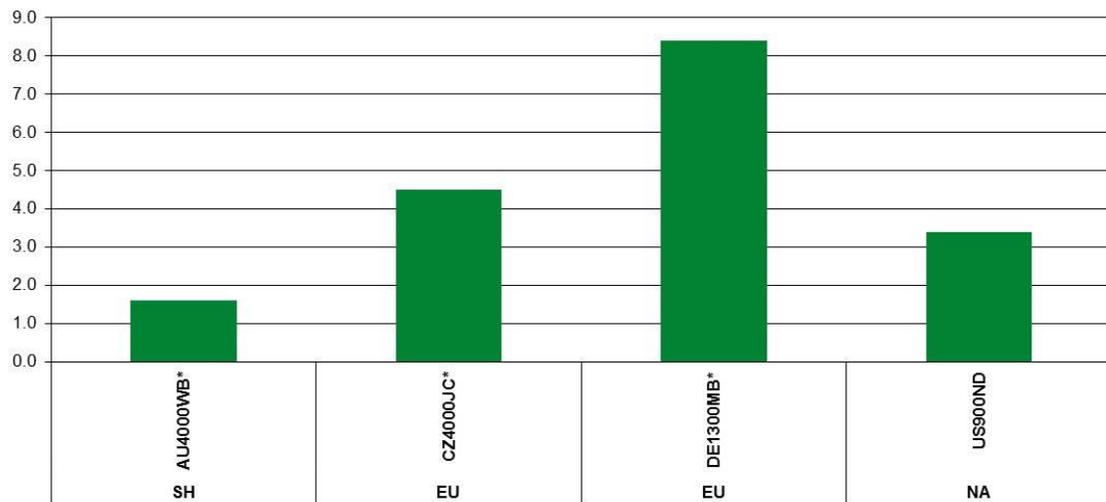
CHAPTER III DISCUSSION OF SUBSIDY IMPACTS

The following section focuses on the impact of the direct payment on production costs, especially the cost of farmland as measured by rental rates and land values. Four wheat farms two from EU member countries and two from non-member countries were selected and compared using their production costs. Section focuses on how the amount of direct payments and if they affect the land rents and land markets in any way.

3.1 Subsidization – direct payments on a per farm basis

To better understand any differences in the impact of subsidies across the four farms considered in this thesis, the production cost structure of four selected wheat operations is compared. The farms show a huge variation in yield as can be seen in Figure 3.1. The highest average wheat yields are in Germany with over 8 t/ha, followed by the farm in Czech Republic with over 4.5 t/ha. The farm in the U.S. harvested slightly over 3 t/ha, which is still higher than the farm in Australia which only harvested a little over 1.5 t/ha on average over the three years 2009-2011. Note that the Australian farm was impacted by a drought during the observed period. Therefore, comparing the data with the other farms might be meaningless, but for transparency the data are still included. For additional information it needs to be mentioned that the rainfall amounts and climatic conditions also vary due to the location of the farms and will have an impact on the cost structure.

Figure 3.1 Wheat yields in t/hectare

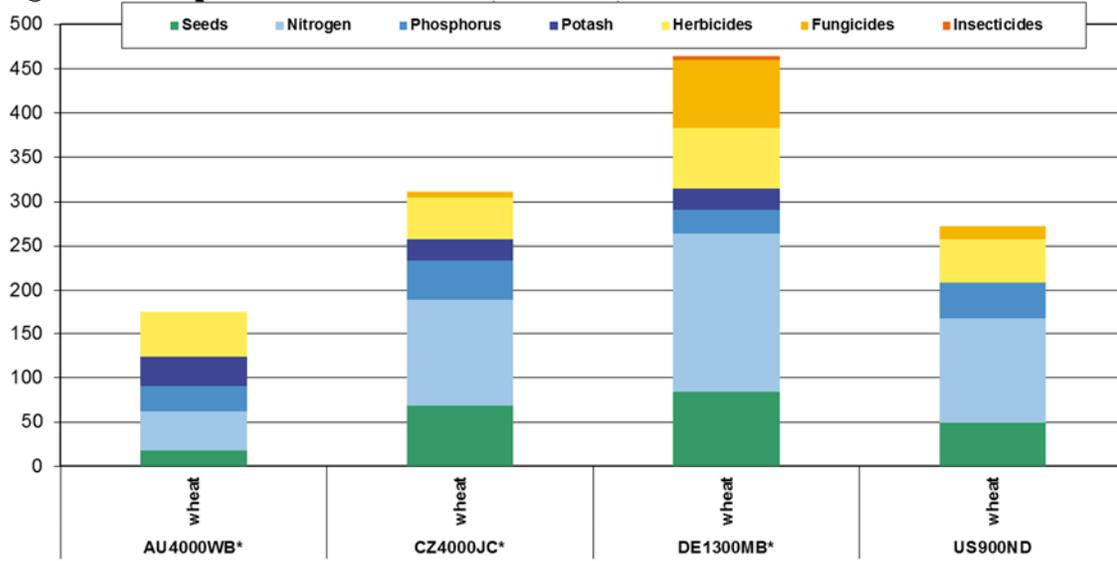


Source: agri benchmark data 2009-2011, Thünen Institut Braunschweig

3.1.1 Evaluation of cost structure on per hectare basis

As mentioned previously, different climatic conditions and soil type will impact the cost structure of each individual farm for the wheat crop establishment. In Figure 3.2 it can be seen that the crop establishment cost vary from little over \$450 on the farm in Germany as the highest to slightly over \$150 in Australia. The establishment costs seem to be closely correlated to the yield. The highest costs for crop establishment are also resulting in the highest yield and vice versa. Germany overall is using the highest inputs in fertilizer, seed and pesticides but also produces the highest yields. Slight variances can be found in the usage of types of fertilizer and pesticides, which for example potash is not used in the U.S. farm but is used in all others. On the other hand, insecticides are only used on the German farm. The crop establishment costs are directly correlated to climate, soil health and yield. A high yield, depending on the farming practice, causes higher reestablishment costs for the next crop; consequently cost for nutrient application might be increased.

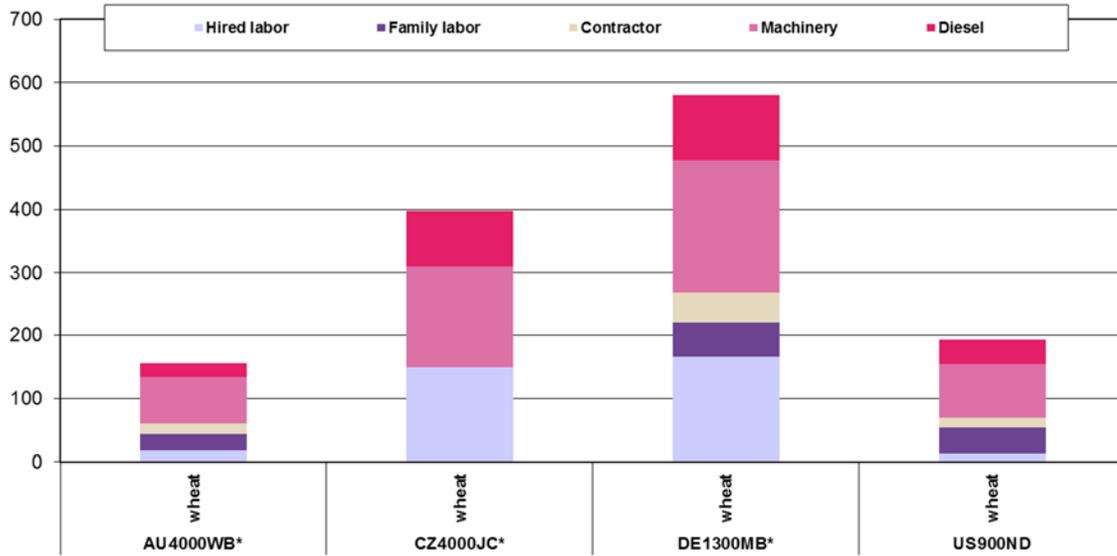
Figure 3.2 Crop establishment costs (\$/hectare)



Source: agri benchmark data 2009-2011, Thünen Institut Braunschweig

The operation costs per hectare follow a similar pattern as than the crop establishment costs. Again the highest operation costs are on the German farm, while the second lowest costs are represented by the farm in North Dakota. Looking at Figure 3.3 the biggest bulk of cost is for machinery and diesel expenses. On the German farm it is interesting, that about half of the total operating cost is for labor, while on all other farms this input only represents about 1/3 of the total operating expenses. The Czech farm does not use a contractor, but completely depends on hired labor. The Czech operation, therefore, must have all the machines they need on their own and might be slightly over mechanized, as a result. This would be an inefficiency of the operation caused by subsidization. If we look at both EU farms the machinery costs are higher as compared to the US farm. A potential explanation could be that they do more field work to achieve those higher yields and need more equipment for transporting and harvesting more grain.

Figure 3.3 Operating costs (\$/hectare)



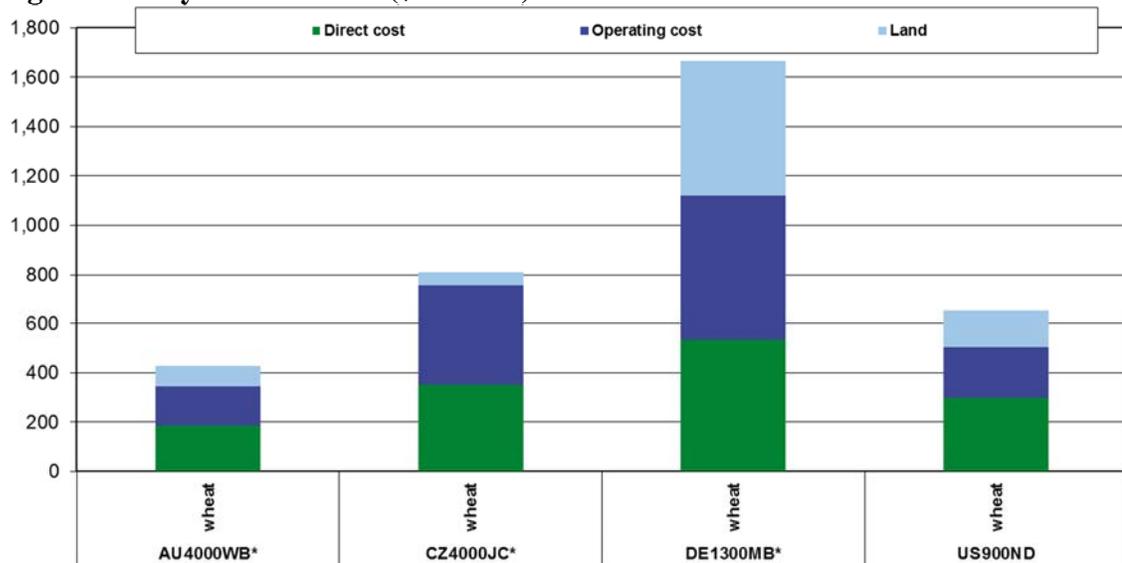
Source: agri benchmark data 2009-2011, Thünen Institut Braunschweig

Figure 3.4 illustrates the key cost elements for the production of wheat on each farm on a per hectare basis. The highest costs, with over \$1600 per hectare, exist in Germany. The shares for land, operating and direct cost each make up approximately a third. The lowest land costs are found at the Czech farm with just \$50 per hectare. The farm in North Dakota has the second highest land costs. For further understanding, the land cost are defined the following: “Land cost equals the sum of land rents actually paid per hectare times the share of rented land in total arable land plus the average opportunity cost for family owned land times the share of owned land in total arable land.”¹¹ This definition accounts for land costs that are both in cash form (rents) and the value of owned land that could be sold or rented out rather than farmed by the existing farm operation.

¹¹ Source: Dr. Yelto Zimmer, agri benchmark, Cash Crop Report 2011 understanding agriculture worldwide, page 4

The direct costs on the Czech farm and the farm in the U.S. are similar and come in at about \$350. Direct costs include expenditures for seed, fertilizer, crop protection, insurance and irrigation. They only include the raw material and do not include costs for application. Operating costs contain labor (opportunity cost farmer-provided labor plus wages paid to employees), machinery (including financing, depreciation and repairs) diesel, and costs for a contractor.

Figure 3.4 Key cost elements (\$/hectare)

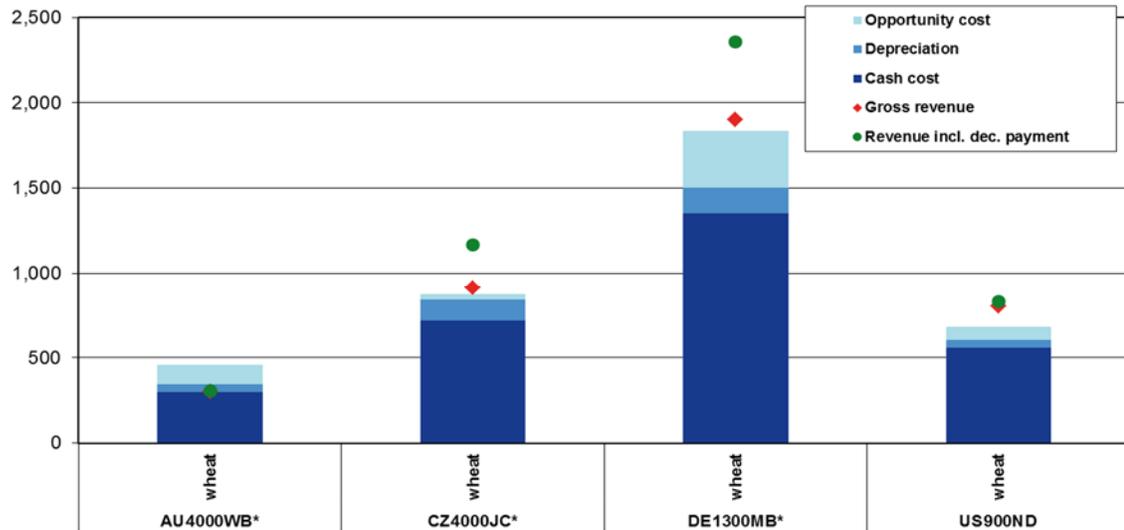


Source: agri benchmark data 2009-2011, Thünen Institut Braunschweig

Figure 3.5 summarizes all costs associated with the production of wheat, including depreciation, and shows the revenue with and excluding decoupled direct payments. All farms, with the exception of the farm in Australia, had a positive net return for the 2009-2011 period. Since the United States has very low direct payments, the revenue excluding these payments is almost the same as the revenue including the payments. Looking at the Australian farm it turns out that the income for the three-year period was negative and the

farm acquired a loss with producing wheat because of the drought. There is no insurance indemnity to support revenue in Australia. Both European farms generated a slightly positive net return, without direct payments. Including the direct payments the German farm generates the highest revenue followed by the Czech farm.

Figure 3.5 Total cost and gross revenue, including decoupled payments (\$/hectare)



Source: agri benchmark data 2009-2011, Thünen Institut Braunschweig

The net returns and yields exhibit the same pattern across farms, on a per hectare basis, indicating that the wheat yields have a great impact on the revenue of a farm. The greatest revenue without direct payments is generated on the American farm. A possible explanation could be found in economies of scale due to average field size being larger in the U.S. than in the EU. For all farms, the cash costs represent the greatest share of the total costs.

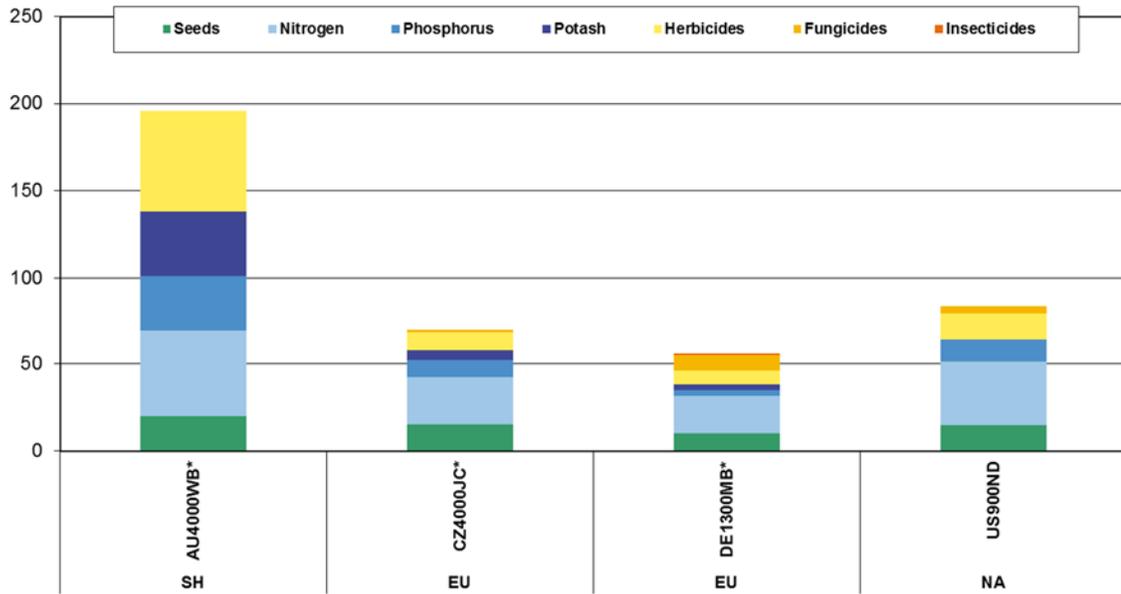
The direct payments help the European farms on a hectare basis to generate the largest revenue on a per hectare basis. Considering that the direct payments artificially

increase the revenue generated, but the EU farms already generate revenue to be profitable, it seems fair to argue, that the subsidies are not necessary for the farms to be economically competitive with other countries. The yield per hectare on the German farm is twice the yield of the North Dakota farm, while the cost per hectare is not twice as high. Just looking at the \$ per hectare values it is not possible to say if the subsidies granted for the EU farms cause inefficiencies in their cost structure.

3.1.2 Evaluation of cost structure on a per ton basis

The evaluation of the production of wheat on each individual farm on a per ton basis helps to further understand the different cost structures of the farms, while controlling for the yields. The following charts are based on \$/ton versus the formerly discussed charts that were on a \$/hectare basis. Keep in mind, when looking at the data, that the Australian farm was impacted by a drought. Thus the data expressed in \$/ton need to be interpreted with caution and likely are not representative for purposes of comparison with the other farms.

Figure 3.6 Crop establishment costs (\$/ton)



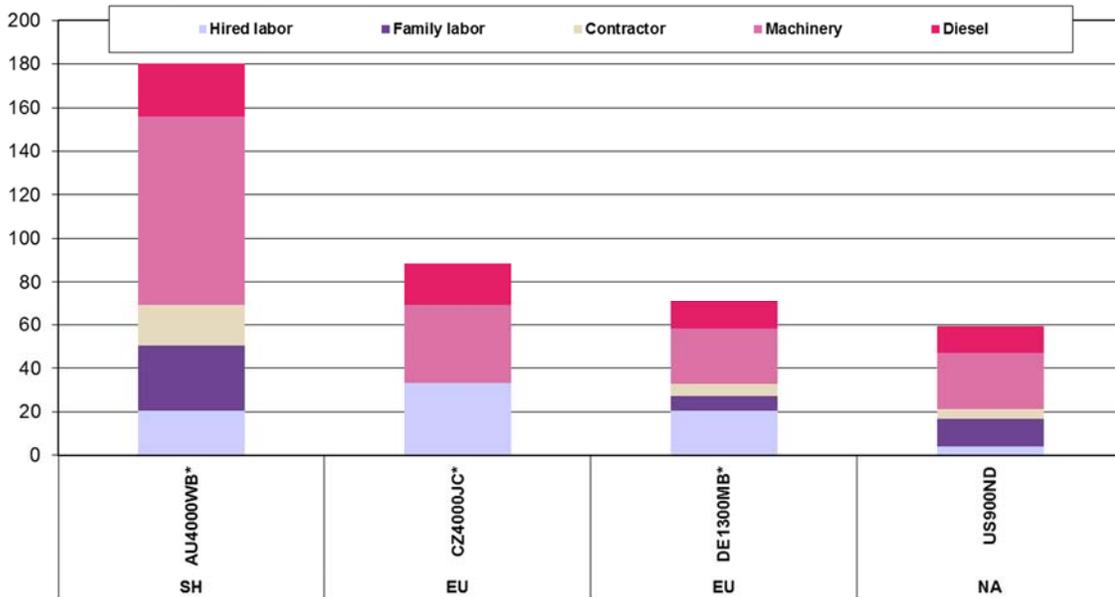
Source: agri benchmark data 2009-2011, Thünen Institut Braunschweig

Figure 3.6 shows the crop establishment costs for each of the four selected farms for the years 2009-2011. The farm with second lowest yield, the farm in the U.S., also has the second highest establishment costs per ton yield produced. A potential explanation could be found in the agronomics of the soil that might cause higher inputs in order to produce the relative yield targeted. On the other hand, the German farm with the highest yield and the highest inputs per hectare has the lowest input costs when considered on a per ton basis. The crop establishment costs for the U.S and Czech farms are higher than on the German farm.

A different picture shapes up if the operating costs are figured on a per ton basis. The farm in North Dakota has the lowest operating costs with \$60/ton overall. The European farms have higher operating costs. The farm in Germany shows \$70/ton and the Czech farm \$90/ton. The differences are associated by the expenses for hired labor or

contractors and the cost for machinery. The U.S. and German farms show similar machinery costs while the costs for the Czech farm are quite a bit higher in comparison.

Figure 3.7 Operating costs (\$/ton)



Source: agri benchmark data 2009-2011, Thünen Institut Braunschweig

The key cost elements on a per ton basis in figure 3.8 show quite a few differences. While the land cost per ton is the lowest for the Czech operation, they are the highest on the North Dakota farm of the three compared. The second highest land costs can be found on the German farm. Overall the lowest key costs are present on the Czech farm with \$180 per ton. The key costs on the German and U.S. farms are almost the same at \$200. The German farm has higher land costs compared to the North Dakota farm, but the direct costs on the North Dakota farm are higher and make up the majority of the key costs on their farm. The three key cost elements each make up a third of the costs on the German farm, which is the only farm that shows that kind of structure. Of the two European farms, the Czech farm shows the highest operating costs that also account for the biggest share of

their costs. Further chart 3.8 also shows the relative effectiveness of the farms on a \$/ton basis. Given the fact that the EU farms have twice the yield of the U.S. farm the operating costs are expected to be different than on the North Dakota farm which is reflected by the graphs.

An interesting aspect of the two EU farms is that the German farm has the second highest operating costs and generates the highest yield. By comparison, the Czech farm has higher operating costs than the German farm but does not generate a higher yield. This might be additional evidence that the Czech farm is not using its factors of production, especially machinery and labor, as efficiently as it could and are using direct payments to offset a potential loss.

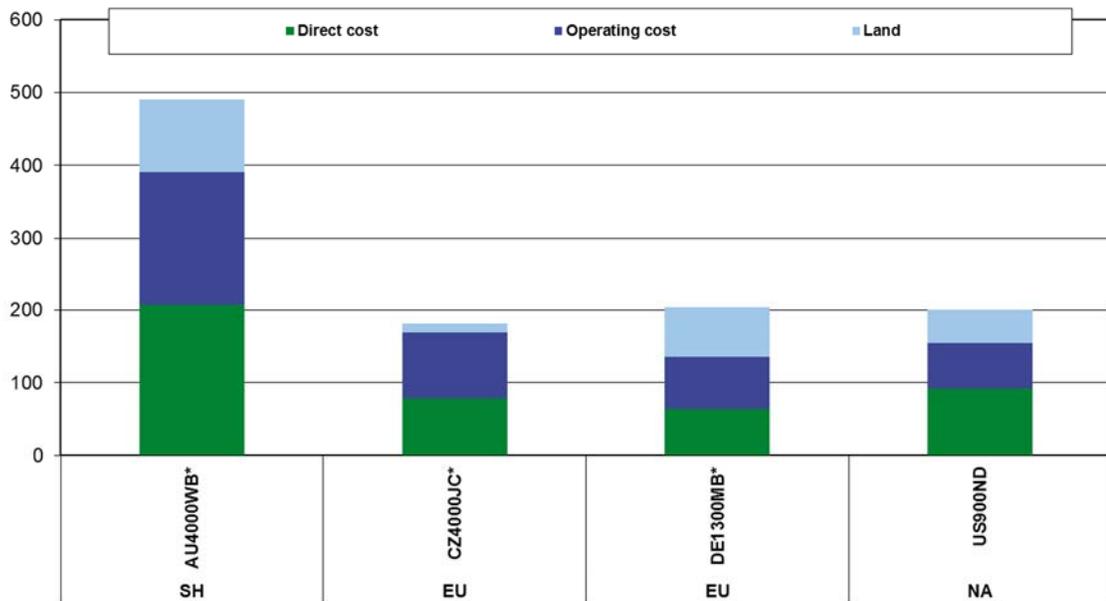
In figure 3.8 the operating costs are shown as portion of the key cost elements. The key cost elements are split in three categories of land, operating costs and direct costs. Operating costs are costs directly associated with the operation and consist of the following: machinery, diesel and labor (see figure 3.7). Land costs are defined as the sum of land rents actually paid per hectare times the share of rented land in total arable land plus the average opportunity cost for family owned land times the share of owned land in total arable land. The direct costs include expenditures for seed, fertilizer, crop protection insurance and irrigation, but do not include the cost for the application.

It sticks out, that the land costs on the Czech farm are low relative to the other farms. A potential explanation could be found in the different property rights that are present in Czech Republic as well as a potential uncertainty generated by a political system that does not provide a clear security of ownership for land. As a result, the market for land

might not be as competitive as in the other countries causing the price to be below market value of the land.

Another unique aspect of the Czech farm is the fact that only hired labor is used, while the other farms employ at least a portion of their labor from family. As the Czech Republic used to belong to the former Soviet Union, it is possible the farm still might be going through a process of de-collectivization and therefore only employs hired labor. A study by Erik Mathijs and Johan F.M. Swinnen discusses the impacts of de-collectivization in East Central Europe.¹² This study points out that the transition from state-owned farms to privately-owned farms is a highly political process and may be slow and incomplete as a result.

Figure 3.8 Key cost elements (\$/ton)



Source: agri benchmark data 2009-2011, Thünen Institut Braunschweig

¹² Source: Chicago Journals, Erik Mathijs and Johan F.M. Swinnen. The Economics of Agricultural Decollectivization in East Central Europe and the Former Soviet Union, published by The University of Chicago Press, accessed April 2014

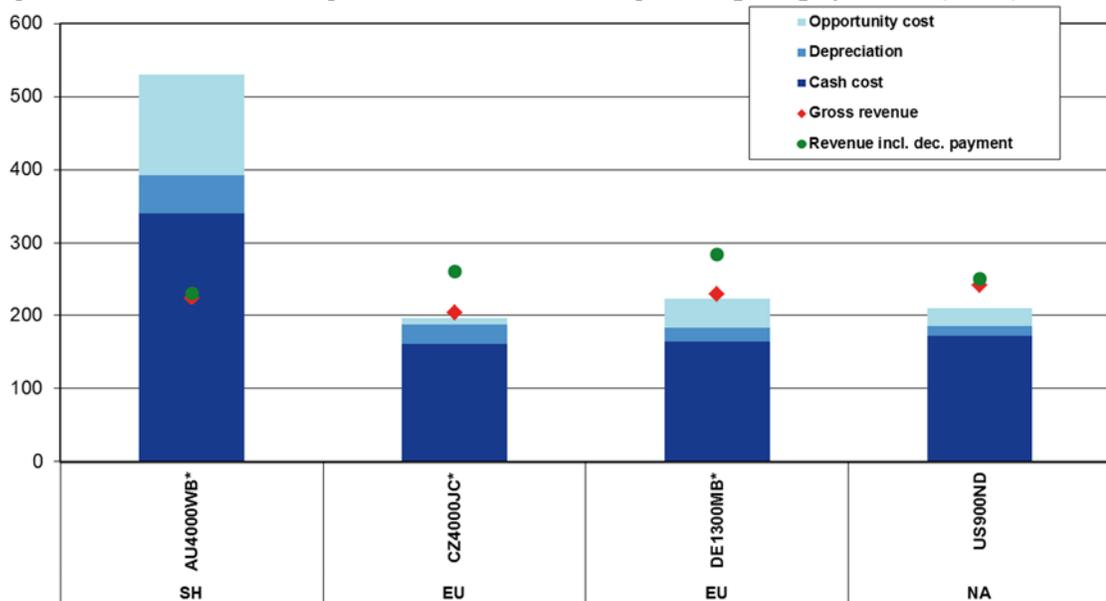
Figure 3.9 summarizes the total cost structure on a per ton basis and shows the revenue generated with and without direct decoupled payments. The highest revenue generated, excluding direct payments, occurs on the U.S. farm followed by the German and Czech farms. Including direct payments, the highest revenue is again generated on the German farm, as was the case on a per hectare basis. What is really interesting is that on a per ton basis the two European farms and the North Dakota farm show similar total costs ranging between \$198 and \$210 per ton. Low opportunity costs mainly make up for the slight differences between the top three. On all four farms the cash costs make up the majority of the total costs. Generally this graph shows that even with low yields, like on the farm in North Dakota, it is still possible to generate a net profit.

Again the land costs on the Czech farm are relatively low compared to the others. Given the evidence presented earlier on machinery and labor costs, it is likely the Czech farm is operated under some sort of cooperative ownership. If the Czech farm is still in the process of de-collectivization, it is possible the land values are underestimated relative to a fully open market value. In the paper from Erik Mathijs and Johan F.M. Swinnen we can find further support for this argument. The Czech Republic was part of the former communist system, which was characterized and influenced by the absence of markets for production factors. Therefore, markets for land, labor and machinery might still be immature even after several years have passed by. Further it is also stated that because of the unavailability of appropriate influences driving markets for land and machinery, the farms stay in the collective system and informal markets for land develop.¹³ Assuming that

¹³ Source: Chicago Journals, Erik Mathijs and Johan F.M. Swinnen. The Economics of Agricultural Decollectivization in East Central Europe and the Former Soviet Union, published by The University of Chicago Press, page 10, accessed April 2014

land markets are not completely operational, this could mean that the land value presented in figure 3.8 is based on a best guess of informal markets. Land values might be higher if property rights were both well-defined and potential buyers were confident they would be upheld in perpetuity. If those property rights are not, due to either a cooperative ownership structure and/or an unstable political system, potential investors may be unwilling or unable to pay top dollars for the land. If we follow this assumption we then would expect the land costs being similar to the German and North Dakota farm, which then could negatively impact the net profits of the farm.

Figure 3.9 Total cost and gross revenue, including decoupled payments (\$/ton)



Source: agri benchmark data 2009-2011, Thünen Institut Braunschweig

In the long run, we expect the profits of all farms to be zero. Given the three year span of the agri benchmark database, it is difficult to know if the long run is accurately represented by these cost and revenue figures. However, it does appear that the U.S. farm would remain operating due to positive net revenue without subsidization. The German and

Czech farm are closer to just breakeven without having direct payments in place and could face problems on their production costs per ton if commodity prices decline in the future. The German farm might not be able to fully benefit from economies of scale as compared to the farm in North Dakota due to the natural limitations given such as field size, higher precipitation that limit the days for harvesting and higher yield-driven field work resulting in more machines required to accomplish the job.

3.2 The impact of subsidies on land rents and land prices

In the previous discussion, it has been shown that land costs or money spent on renting ground by wheat producers can accounts for a fairly big share of the total costs. This observation motivated the question of interest considered in this these: Do direct subsidies affect the value of land across countries? The use of farm-level costs of production from countries with and without direct subsidies provides a basis for comparison.

The existing literature on land values and government payments is extensive. A study done by Dr. Gunnar Breustedt and Prof. Uwe Latacz-Lohmann from the institute of Agriculture economics at the University of Kiel¹⁴ have looked at the impact of subsidies on land values in the EU. Their main argument states that with the increase of direct payments (subsidies) farmers can afford to pay higher land rents and therefore the value of land prices increases. They used a statistical tool and did a regression analysis, which accounts for effects such as quality of land, differences between grass and cultivated land, annual precipitation, average temperature and a few other factors. The goal was to only show the

¹⁴ Source: Dr. Gunnar Breustedt, Prof. Uwe Latacz-Lohmann, 2012, Institute of Agriculture economics at the University of Kiel, available at: <http://www.betriebslehre.agric-econ.uni-kiel.de/de/forschung/praxis/dateien-p.-u.-b.-2012/pachtpreise.pdf>, accessed October 2013

impact of direct payments based on the regional animal density existing. They used annual reports from each farmer, which show how many direct payments were received and the land rent paid. One of the interesting statements found in the study is that there is a huge variation present between the land payments, indicating that there are a lot of factors that drive the land rent paid such as renting from relatives or neighbors. However, the study also found that with the increase of direct payments, the farmers tend to pay a higher rent. A farmer on average passes on about 40% of his subsidies to the landlord. It is also stated, that this value can vary from 20% up to as much as 60%.

The study also focused on the different animal densities present in specific areas, which causes the land rent automatically to increase, because of the fact that all farms have to dispose their slurry on land. Here the given rate of nitrogen allowed per hectare is the limiting factor. In other words, the more animals a farm has the more land is needed for the distribution and fertilization. The conclusions of the study were that the higher the animal density is in a particular area the higher is the land rent paid to the landlord. The result says that in an area with 0.5 large animal units per hectare more than normal, the land rents paid were 60 Euros higher per hectare.

Summing up all these facts the overall message is that the regional land rents paid in Germany are mainly connected to the direct payments but also to the animal densities present in a region. The study concludes that every land rent payment that was greater than 200 Euros per hectare 40% of it was passed on to directly to the land lord. The study furthermore states that it is not expected, with decreasing direct payment and subsidies that the land rents are expected to decline as landlords will try to maintain the current land rent levels.

Based on previous studies and the analysis presented in this study it still is unclear if the direct payments are bid directly and completely into the rents paid for land. There is some evidence that direct payments affect land values it, but it can't be concluded in general due to the differences in land values between the two EU countries considered in this analysis (Germany and Czech Republic) which receive the same direct subsidy amounts. Due to the high complexity and the various implications that make up for the land rents it is very difficult to exactly find the true price drivers.

CHAPTER IV SUMMARY

Based on the comparative analysis of costs of production for wheat farms from four different countries, there are a few important points to take away. First the review of agricultural policy development in the EU reveals that subsidization is quite complex and each country follows a different approach to meet their goals. Europe tries to focus on maintaining the rural country side as well securing food production. The U.S mainly focuses on crop insurance to provide the farmer with a risk management tool, while direct payments are no longer a primary subsidy tool.

Second, farming operations vary in their profitability due to differences in input costs, operating costs, and yield potential. The EU operations show higher costs for labor and the Czech operation has high expenses for machinery. Most of their advantage in harvesting twice as much is eaten up by those two sectors but mainly by expenses for labor. It is hard to say if subsidies trigger those farms to not operate at their economic optimum, but there is some evidence of that on the Czech farm.

Third it is hard to demonstrate a direct impact of subsidies on the value of land. Land values may be affected by the productive capacity of the soil, local climate conditions, and proximity to urban or industrial development, among other factors. However, some evidence exists when the German and Czech land costs are compared, that land values can be adversely affected if land is not traded under free market conditions. Potential causes of imperfect market competition include political instability and the adverse impact on long-term property rights or incomplete transitions to private ownership from former cooperative or state-owned farm land.

With the analysis of farm-based data it becomes clear that subsidies can impact the profitability of farming operations. It is interesting to see that farms with low yields

operating in a non-subsidized environment (U.S.) can reach a higher income than farms operating in subsidized environments with high yields (EU). The relative profitability of the North Dakota farm over the three years considered in this study is even higher if the direct payments to the Czech and German farms are omitted. The farms in Europe will need to closely watch their cost structures if direct payments are ever removed.

The comparative analysis presented in this thesis can be beneficial for producers who would like to better prepare for future changes in policy that may affect the existence and/or level of direct subsidies. It is also valuable for those who would like to understand the different production costs that wheat farmers incur worldwide and that agriculture can be challenging for those farmers that are not operating at a profitable level, especially if the production depends on subsidies.

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APPENDIX A

EU 28 Countries with Abbreviations

Country Name	Abbreviation
Belgium	BE
Bulgaria	BG
Czech Republic	CZ
Denmark	DK
Germany	DE
Estonia	EE
Ireland	IE
Greece	EL
Spain	ES
France	FR
Croatia	HR
Italy	IT
Cyprus	CY
Latvia	LV
Lithuania	LT
Luxembourg	LU
Hungary	HU
Malta	MT
Netherlands	NL
Austria	AT
Poland	PL
Portugal	PT
Romania	RO
Slovenia	SI
Slovakia	SK
Finland	FI
Sweden	SE
United Kingdom	UK