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*Anna Andersson*

# Societal Concerns

- Domestic Policy choice and international competitiveness



AgriFood Economics Centre

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## - Domestic policy choice and international competitiveness

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# FOREWORD

As the world has become more and more globalised, domestic policy choices increasingly have implications for our relations with the surrounding world. One such aspect is how the competitiveness of domestic producers is affected when they face stricter regulations than their foreign competitors. A good can be said to embody certain process characteristics derived from the chosen production method, like being produced in an environmentally friendly way or with respect to labor rights. Such process characteristics, however, often come at a cost for the producer. What is socially desirable in one society may be of less importance in another. The presence of conflicting values, and the ensuing differences in standards between countries, have raised questions regarding the economic and trade consequences of responses to domestic societal concerns.

The debate within the EU focuses on the risk of increased import competition following higher agricultural standards, motivated by environmental protection, animal welfare etc. It is argued that the playing field is not level, as foreign competitors are not required to comply with the regulations and therefore have lower costs than the EU farmers. Hence, the contention is that it should be possible to protect domestic social choices in some way; one suggestion is to introduce greater flexibility into the WTO rules.

It may seem like an obvious case – of course competition should be fair - but looking into the issue more deeply reveals it to be more complex than it appears at first sight. The costs and benefits of different measures to protect domestic societal concerns need to be evaluated in terms of feasibility, effectiveness and trade distortion. Besides, there is a need to ascertain whether the underlying presumption inspiring action is correct: Can domestic agricultural production in the EU be said to be threatened by imports because of differences in regulatory strictness between countries?

These issues are analyzed and empirically tested in this report, with a special focus on animal welfare legislation.

Lund, March 2011

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## Sammanfattning

Societal concerns är normer eller allmänt accepterade värderingar i ett samhälle. De kan sägas vara en del av samhällets identitet och de formas, till exempel, av samhällets traditioner och utvecklingsnivå. Olika samhällen tenderar därför att ha olika allmänt accepterade värderingar. Globaliseringen har fört länder och deras värderingar närmare varandra genom internationell handel. Detta har belyst eventuella konflikter olika värderingar kan leda till och väckt farhågor om möjligheten att försvara inhemska värderingar på en öppen marknad. Oro har särskilt uttryckts för svårigheterna att försvara nationella politiska åtgärder som leder till högre produktionskostnader för inhemska producenter och därmed till försämrad konkurrenskraft. Är det möjligt att upprätthålla sådana politiska val på lång sikt på en öppen marknad om producenter som följer fördyrande regelverk inte kompenseras för sina högre kostnader? Borde preferensbehandling av varor som produceras på ett sätt som speglar de allmänt accepterade värderingarna i ett samhälle tillåtas?

Syftet med denna rapport är att undersöka om preferensbehandling av varor kan vara ekonomiskt försvarbart för att skydda ett samhälles värderingar. Studiens fokus är på konkurrenskrafts- och handelseffekter av EU-lagstiftning för jordbruksproduktion. Särskild uppmärksamhet ägnas åt följande frågor:

- Vilka är kostnaderna för preferensbehandling och hur kan de jämföras med nyttan skyddet av samhälleliga värderingar ger?
- Hur påverkas konkurrenskraft och handel av lagstiftning infördd för att skydda djurvälfärd?

### Preferensbehandlingsåtgärder

Preferensbehandling av varor som produceras i enlighet med inhemska politiska åtgärder kan ges på många sätt. Denna rapport tar upp fyra möjliga åtgärder som kan ge preferensbehandling: märkning, import restriktioner, skatter och subventioner. Analysen av de fyra åtgärderna visar att det är mycket svårt att införa en form av preferensbehandling

som både är effektiv och genomförbar. Preferensbehandling riskerar i allmänhet också att leda till relativt höga kostnader. Att åtgärderna är svåra att genomföra beror till viss del på WTO-regler som begränsar möjligheten att inskränka handel med lika varor på grund av skillnader i produktionsmetoder. Som en lösning på detta problem har det föreslagits att WTO-reglerna bör ge större flexibilitet för skydd av samhällliga värderingar. Denna lösning är dock långt ifrån optimal eftersom den skulle leda till andra komplikationer och kostnader. En ändring av WTO:s regler kan till exempel utnyttjas av protektionistiska intressen och skulle förmodligen missgynna fattiga länder. Att införa en preferensbehandlingsåtgärd som på något sätt begränsar handel kommer dessutom att ge höga kostnader i form av minskad konkurrens, högre priser, mindre urval för konsumenterna, en mindre dynamisk inhemsk industri och mindre effektiv resursanvändning. Med andra ord, att tillåta mer flexibla WTO-regler kan leda till minskad global välfärd. WTO-reglernas utformning är bara ett exempel på varför det är komplicerat att införa preferensbehandlingsåtgärder. Ett annat är att det är svårt att bestämma vilka produkter som skulle vara berättigade till preferensbehandling. Detta eftersom det är mycket svårt att fastställa likvärdighet mellan olika länders lagstiftning och produktionsmetoder.

### **Är preferensbehandling värt det?**

Givet svårigheterna med och kostnaderna för preferensbehandlingsåtgärder är det viktigt att ett lands samhällliga värderingar faktiskt hotas av handel innan införandet av en sådan åtgärd kan vara motiverad. Är EU:s samhällliga värderingar om jordbruket verkligen så hotade för närvarande? Om inte, är det för tidigt att börja diskutera den preferensbehandlingsåtgärd som skulle vara den lämpligaste att införa. Det nuvarande hotet mot EU:s samhällliga värderingar om jordbruket och i synnerhet handelns potentiella hot mot strikta djurvälfsregler, verkar inte vara så allvarliga.

### ***Lagstiftnings påverkan på konkurrenskraft***

Hittills finns inga avgörande bevis för att lagstiftning som införs i syfte att skydda samhällliga värderingar är en viktig bestämningsfaktor för jordbrukets konkurrenskraft. Lagstiftning förefaller endast ha en liten ef-

fekt på produktionskostnader. Det bör dock noteras att det är svårt att ge ett generellt svar på hur lagstiftning påverkar jordbrukets produktionskostnader, eftersom effekten på produktionskostnader förväntas skilja sig åt mellan olika företag, typer av lagstiftning och frågor. Därför är det bäst att undersöka lagstiftnings påverkan på konkurrenskraft från fall till fall.

Denna rapport har valt att göra en fallstudie av hur EU-lagstiftning för djurvälstånd påverkar konkurrenskraft och handel. Studier av hur specifik EU-lagstiftning om djurvälstånd för grisar, slaktkycklingar och värphöns påverkar konkurrenskraft visar att denna lagstiftning endast har små effekter på konkurrenskraften. Djurvälståndslagstiftning kan inte förklara de ibland stora skillnaderna i produktionskostnader mellan EU och tredjeländ när det gäller ägg-, kyckling- och grisköttsproduktion. De överlägset viktigaste faktorerna för konkurrenskraft i dessa fall är istället kostnaden för foder, följt av kostnaderna för byggnader och arbete. Kommande, eller nyligen införda, strängare regler för grisar, slaktkycklingar och värphöns förväntas inte heller påverka de totala produktionskostnaderna på ett betydande sätt för de flesta EU-producenter. Ett möjligt undantag till denna slutsats är förbudet mot att inhysa värphöns i traditionella burar.

Alla pålagor som ökar kostnaden för en producent kan emellertid påverka konkurrenskraften på marginalen. Även om kostnaderna för djurvälstånd är låga i förhållande till andra kostnader kan de därför ändå ha en negativ effekt på konkurrenskraften. En aspekt är vidare att regler och standarder för djurvälstånd bestäms inom det egna landet, eller inom EU. Det finns därför en större möjlighet politiskt att påverka dessa kostnader jämfört med andra faktorer som bestämmer skillnader i kostnader, och därmed skillnader i konkurrenskraft, mellan länder.

För att se om en striktare lagstiftning för djurvälstånd påverkar konkurrenskraften studeras vilken inverkan ett lands lagstiftning *de facto* har på import och export.

### *Lagstiftnings påverkan på handel*

EU har en negativ handelsbalans för livsmedel. Detta beror främst på handelsunderskott för produkter som endast, om alls, produceras inom unionen i begränsad utsträckning, exempelvis bananer, kaffe, lax och räkor. Det kan alltså konstateras att EU:s jordbruksproducenter hanterar konkurrenstrycket från omvärlden relativt bra, trots att EU ställer höga krav på jordbruksproduktionen internationellt sett.

EU-producenter av griskött, kyckling och ägg har inte några större problem med konkurrens från import för närvarande. EU är faktiskt mer än självförsörjande och nettoexportör av dessa produkter. Å andra sidan innebär detta inte att EU:s djurväl-färdsbestämmelser för grisar, slaktkycklingar och värphöns inte påverkar handeln. För att kunna dra en sådan slutsats måste effekten av lagstiftning på import isoleras från andra möjliga faktorer.

En gravitationsmodell används för att analysera effekten av djurväl-färdslagstiftning på import inom EU, det vill säga på import mellan EU-länder. De förordningar som analyseras är förbud mot traditionella burar för äggproduktion, introduktion av ett beläggningsgradskrav för slaktkycklingar och krav på grupp-hållning av suggor för grisar. Dessa är alla del av kommande, eller nyligen införda strängare EU-regler för djurväl-färd. Statistiska metoder används för att undersöka om djurväl-färdslagstiftning påverkar importflöden. Vi finner inte att introduktion av de ovan nämnda bestämmelserna i ett importörland påverkar importen. Däremot, finner vi en signifikant negativ effekt på import av kyckling och ägg om ett exportörland inför ett krav på beläggningsgrad för slaktkycklingar eller förbjuder traditionella burar för värphöns. Att införa dessa djurväl-färdsbestämmelser leder alltså inte till högre importvolymen men möjligtvis till lägre exportvolymen när det gäller kyckling och ägg.

Detta är ett intressant resultat eftersom debatten om societal concerns främst fokuserar på hemmamarknaden och hypotesen att striktare regleringar leder till ökad import, vilket skulle hota den inhemska produktionen. I denna studie finner vi inget stöd för denna hypotes men visar

att exporten kan påverkas negativt av strikta regleringar. Denna fråga är betydligt mindre debatterad men, enligt studiens skattningar, en mer relevant fråga.

Sammanfattningsvis är det svårt att motivera ytterligare preferensbehandling av EU:s kyckling, fläskkött och äggproduktion baserat på argumentet att produktionen hotas av import till följd av högre kostnader för striktare regler för djurskydd. Nuvarande djurvälståndslagstiftning har endast en liten påverkan på konkurrenskraften, och kommande striktare regler förväntas inte påverka produktionskostnaderna på ett betydande sätt för de flesta EU-producenter. Det finns heller inga tecken på att införandet av de analyserade reglerna för djurvälstånd skulle leda till ökad import.



## **Executive summary**

Societal concerns are norms or generally accepted values in a society. They can be said to be part of a society's identity and are shaped by, for example, traditions and level of development of the society in question. Different societies hence tend to have diverging societal concerns. Globalization has brought countries and their societal concerns closer together through trade. This has highlighted the potential conflicts diverging societal concerns can lead to and raised fears about the possibility of defending domestic social values in an open market. Concern has particularly been expressed about the difficulties defending domestic policy choices that lead to higher production costs and thereby reduced competitiveness. Is it possible to sustain these policy choices long term in an open market if complying producers are not compensated for their higher costs? Should protection be allowed for goods produced in a way that reflects a society's societal concerns?

The main aim of this report is to examine if preferential treatment of goods can be economically justified to protect societal concerns. The focus is on competitiveness and trade impacts of EU regulation on agricultural production. Special attention is devoted to the following questions:

- What are the costs of preferential treatment and how do they compare to the benefits of societal concerns protection?
- How are competitiveness and trade flows affected by regulations introduced to protect animal welfare?

### **Preferential treatment measures**

Preferential treatment of goods produced in line with domestic policy can be given in many ways. This report looks at four possible measures that can provide preferential treatment: labeling, import restrictions, taxes and subsidies. The analysis of the four measures shows that it is very hard to introduce a form of preferential treatment that is both effective and feasible. Preferential treatment generally also risks leading to rather high costs. Part of the feasibility problem is due to WTO rules limiting the possibility of restricting trade in like goods on the basis of differences

in production methods. As a solution to this problem it has been suggested that the WTO rules should give greater flexibility for the protection of societal concerns. However, this solution is not a magic bullet and would lead to other complications and costs. A change of the WTO rules may be exploited by protectionist interests and would probably disadvantage poor countries. Introducing a complementary measure that restricts trade in any way will moreover come with high costs in the form of reduced competition, higher prices, less consumer choice, a less dynamic domestic industry and poor resource allocation. In other words, to allow more flexible WTO rules may lead to reduced global welfare. A change in the WTO rules would further not solve all feasibility issues of introducing preferential treatment measures. For instance, problems of determining equivalence between different countries regulations and production methods would remain.

### **Is preferential treatment worth it?**

Given the complexity and the costs of preferential treatment measures, a country's policy choices to protect societal concerns must be threatened by trade before introduction of any such measure can be justified. Are EU societal concerns in agriculture that much at risk at present? If not, it is too early to start discussing the preferential treatment measure that would be the most suitable to introduce. The present threat to EU societal concerns in agriculture, in particular the threat to high animal welfare standards, does not seem to be that severe.

### ***Competitiveness impact of regulation***

So far, there is no conclusive evidence that regulation introduced to protect societal concerns is a major determinant of competitiveness in agriculture. Regulation seems to have only a minor influence on production costs. It should nonetheless be noted that it is hard to give a general answer about how regulation affects production costs in agriculture, since the production cost impact is expected to differ between firms, types of regulation and issues. It is hence best to investigate competition impacts of regulation on a case-by-case basis.

This report conducts a case study of the competitiveness and trade impacts of EU animal welfare regulations, and reveals that regulations for pigs, broiler chickens and layer hens have only minor competitiveness impacts. Animal welfare regulation cannot explain the sometimes large production cost differences between the EU and third countries when it comes to egg, chicken and pig meat production. The most important determinants of competitiveness in these cases are by far the cost of feed, followed by the costs of housing and labor. Moreover, the coming, or very recently introduced, stricter regulations for pigs, broiler chickens and layer hens are not expected to affect total costs in a significant way for most EU producers. A possible exception to this conclusion is the ban on keeping layer hens in traditional cages.

Yet, cost advantages of producers in one country are often very slim. Even low additional costs as a result of regulation can therefore have a critical effect on international competitiveness. Further, regulations are set nationally or within the EU. This means that the strictness of regulations is more easily controlled politically than other factors determining competitiveness.

To investigate whether stricter animal welfare regulations affect competitiveness, the effect of regulations on import and export volumes is hence studied.

#### *Trade impact of regulation*

The EU has a negative trade balance in food and beverages. This is mainly due to trade deficits in products that are only, if at all, supplied within the union to a limited extent, such as bananas, coffee salmon and shrimp. It may therefore be stated that EU agrifood producers are handling the competitive pressures from abroad relatively well, despite the fact that the EU has high regulation requirements for agricultural production in an international perspective.

EU producers of pig meat, chicken and egg do not have any major problems with competition from imports at present. The EU is in fact more than self-sufficient and a net exporter of these products. On the other hand, this does not mean that the EU animal welfare regulations for

pigs, broiler chickens and layer hens have no effect on trade. To be able to draw such a conclusion, the effect of regulation on imports must be isolated from other possible influences.

A gravity model is used to analyze the effect of animal welfare regulation on internal EU imports. The regulations analyzed are a ban on traditional cages in egg production, an introduction of a stocking density requirement for broiler chickens and a ban on individual sow stalls for pigs. These are all part of the coming, or recently introduced stricter EU animal welfare regulations. Econometric methods are used to do the estimations, but none of them find that an introduction of one of the regulations in an importer country would affect exports. On the other hand, one of the estimations techniques does find a possibly significant negative effect on imports of chicken and eggs if the exporter country introduces a requirement on stocking density for broilers or bans traditional cages for layer hens. Thus, introducing these animal welfare regulations does not lead to higher import volumes but exports of chicken and eggs may be negatively affected.

These are quite interesting results since the debate about societal concerns often focuses on the home market and the hypothesis that introduction of regulation leads to increased imports which could threaten domestic production. Here, we find no support for this hypothesis, but reveal that exports may be negatively affected by the introduction of regulation. This is an issue that is much less debated but, according to the estimation results, appears to be more relevant.

In conclusion, it is hard to justify that additional protection of EU chicken, pig meat and egg production is needed, based on the argument that domestic production is threaten by imports due to stricter regulations for animal welfare. Present animal welfare regulation has only a minor impact on competitiveness, and coming stricter regulations are not expected to affect production costs in a significant way for most EU producers. Further, there is no evidence that the introduction of the animal welfare regulations would lead to increased import volumes.

# 1

## Introduction

Citizens have lately tended to become increasingly concerned about the impact of food production on the welfare of society. It is no longer accepted that cheap food and efficient production are the sole goals for food production - demands are being made for food safety and quality, environmental sustainability and ethically sound production practices.

Governments in many countries are consequently asked to respond to societal concerns, for example by implementing more stringent regulations for food production processes and methods.<sup>1</sup> Dealing with increasing societal concerns and expectations while honoring international trade obligations may be problematic for governments, though. More stringent production regulation may impose additional costs on domestic producers, putting them at a disadvantage vis-à-vis foreign suppliers. This might then create demands for restrictions of imports that have not been produced according to domestic regulations to level the playing field and to protect the domestic policy choice. Yet, current WTO-rules generally make it difficult to limit imports based on differences in production processes and methods. Governments, hence, risk getting trapped between societal concerns and trade rules.

Societal concerns have been high on the European political agenda since the then European Commissioner for Trade, Pascal Lamy, presented a study on collective preferences and their role in the world trading system in 2004.<sup>2</sup> Lamy highlighted the potential conflict between social choices and market opening, and suggested that the WTO-rules should give greater flexibility for protection of societal concerns. This suggestion was met with suspicion by European Union (EU) trade partners and stakeholders, since a change of the WTO-rules could be exploited by protectionist interests.<sup>3</sup> The question of whether or not trade restrictions should be allowed to protect social values is nonetheless still very much

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<sup>1</sup> Tothova (2009)

<sup>2</sup> Lamy (2004), the terms "collective preferences" and "societal concerns" are used interchangeably in the report

<sup>3</sup> Le Cotty and Voituriez (2008)

debated, especially since the progressive reductions of trade barriers around the world is expected to continue. Fewer trade barriers will increase international competition based on price, which could put more stress on social choices.

This report aims at examining if preferential treatment of goods can be economically justified to protect societal concerns. The focus is on competitiveness and trade impacts of EU regulation on agricultural production. Special attention is devoted to the following questions:

- What are the costs of preferential treatment and how do they compare to the benefits of societal concerns protection?
- How are competitiveness and trade flows affected by regulations introduced in order to protect societal concerns?

The concept of societal concerns is initially discussed in general terms. Some delimitation is necessary later in order to be able to dig deeper into the discussed issues. The latter parts of the report are therefore devoted to examination of a specific societal concern, namely animal welfare. When effects of animal welfare regulation are studied, the focus is solely on potential production cost, competitiveness and trade effects. Consequently, this report does not try to evaluate the effect of animal welfare regulations on animal welfare. It is important to note that the whole report is written from an economic perspective and concentrates on EU competitiveness and trade.

The first part of the report serves as a background. It defines the concept societal concerns, describes the emergence of societal concerns in agriculture and discusses governments' responsibility to respond to societal concerns. Chapter 3 investigates the trade perspective of societal concerns. Why is free trade promoted by the multilateral system and what are the options for countries that want to protect societal concerns in an open market? Thereafter, chapter 4 is devoted to the empirical example of animal welfare regulation in the EU. First, competitiveness and cost impacts of regulation are studied in a literature review. Second, EU

regulation on animal welfare is examined and compared to the rest of the world. Chapter 5 gives a short statistical description of EU trade in agrifood products. The potential trade impact of EU regulation on animal welfare is examined through an analysis of trade statistics for meat and egg products. This is followed by a gravity model analysis in chapter 6 that tries to quantify the trade impact of EU animal welfare regulation. Lastly, chapter 7 contains some concluding remarks.



# 2

## The Setting

This chapter defines and analyses the concept societal concerns. It also describes the emergence of societal concerns in agriculture and examines if these concerns can be considered to be well-spread. Lastly, it discusses what an appropriate government response to a societal concern can be from a theoretical perspective.

### 2.1 What Are Societal Concerns?

The term societal concerns has so far only been loosely defined. This report chooses to base its definition of societal concerns on Pascal Lamy's explanation of collective preferences. According to Lamy, "collective preferences are the end result of choices made by human communities that apply to the community as a whole".<sup>4</sup> Lamy further defined "community" as any group of people that has put in place institutions able to synthesize the preferences of individuals into standards that apply to everyone. In this sense both a country and a wider grouping like the EU may be classified as a community.

In other words, societal concerns are norms or generally accepted values in a society. These values can be seen as a part of a society's identity and are shaped by traditions, culture, past experiences and level of development of the society in question. Hence, all societies will not always make the same choices in response to a given issue; nor will societies always have the same opinion on what should be prioritized. Further, societal concerns evolve over time, are not always rational and are often based on an ethical opinion of what is right or wrong.<sup>5</sup> Examples of societal concerns can be environmental protection, human rights and public provision of welfare.<sup>6</sup>

Societal concerns are not unchangeable. New societal concerns arise with newly available knowledge, changes in incomes and technology improvements. Old societal concerns may lose importance when solutions

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<sup>4</sup> Lamy (2004)

<sup>5</sup> Tothova (2009)

<sup>6</sup> Lamy (2004)

are found to problems or when new and more urgent concerns develop. A new societal concern may start as a private concern, i.e. as an individual demand for a certain attribute, before it reaches wider acceptance and becomes a real societal concern. The definition of wider acceptance, however, is rather vague. Presently, a private concern is considered to have become a societal concern when a sufficient number of people associate themselves with the issue.<sup>7</sup> How many are “sufficient”, or if the sufficient number can change depending on the concern in question, has not been examined in detail. It is also important to note that all private concerns do not become societal concerns. Why some reach a greater number of supporters than others is mainly a political science question and beyond the scope of this report.

It is further possible to make a distinction between consumer and citizen concerns. A consumer concern is defined as a concern exclusively related to the consumption of a good by an individual. In other words, the consumer cares about her own consumption and wants to be able to shop according to her own preferences, but does not care about the consumption behavior of others. When the individual, on the other hand, does not solely have concerns about her own consumption, but about the consumption of others as well, the concerns are classified as citizen concerns. Both consumer and citizen concerns can start as private concerns before they evolve into societal concerns.<sup>8</sup>

Finally, another distinction has been made between inwardly directed and outwardly directed societal concerns. The key difference is that an outwardly directed concern is something that societies believe should apply to others as well as themselves, while an inwardly directed concern only affects choices made within the society. An inwardly directed concern is, for example, food wholesomeness and an outwardly directed concern can be promoting democracy in other countries.<sup>9</sup> According to the above mentioned difference between consumer and citizen concerns, it appears as if outwardly directed concerns are citizen concerns by definition, while inwardly directed concerns can be either consumer or citi-

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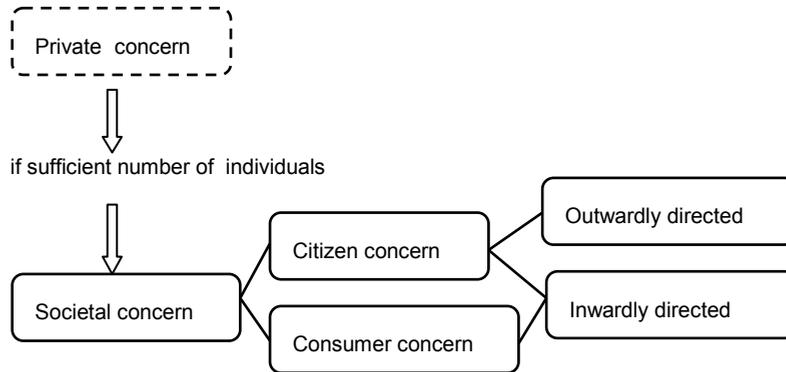
<sup>7</sup> Tothova (2009)

<sup>8</sup> Tothova (2009)

<sup>9</sup> Charnovitz (2005)

zen concerns. The different societal concerns are pictured in Figure 2.1 below.

**Figure 2.1 Different societal concerns**



## 2.2 Emergence of Societal Concerns in Agriculture

The emergence of societal concerns in agriculture depends on a number of factors. First, increasing incomes have made consumers less price and income responsive in their purchasing behavior. This means that consumers in high-income countries nowadays can afford to take things other than price into consideration when they make their food consumption choices. Thus, the general public have become more interested in what they eat and how food is being produced.<sup>10</sup>

### *Different societal concern in agriculture*

Changes in food production have further created concerns about food quality.<sup>11</sup> New production methods and the intensification of agriculture have resulted in greater efficiency and lower prices but also in a greater distance between primary producers and consumers. Consumers, at least in Europe, often associate food quality with traditional production methods and product origin.<sup>12</sup> Today's internationally-fragmentized intense food industry has often little in common with the consumers' ideal

<sup>10</sup> Tothova (2009)

<sup>11</sup> Gilg and Battershill (1998)

<sup>12</sup> Le Cotty and Voituriez (2008)

image of food production. Concerns about food quality and safety have further been fueled by serious outbreaks of food-borne illnesses from the mid-1980s and on.<sup>13</sup> The various food scares gravely damaged the confidence of consumers in the food industry and raised the demand for alternative food products. Advances in food technology and in particular the introduction of genetically modified organisms (GMOs) have also generated safety as well as environmental concerns.<sup>14</sup>

Modern methods of intensive agriculture have moreover created concerns about the treatment of animals by farmers. Concerns focus on the limited living spaces of animals and long animal transports to cut costs, as well as on the use of various drugs, such as antibiotics and hormones, to enhance the efficiency of farm animals. Breeding of new and more productive animal species has also been questioned on moral grounds. The meat producing breed, Belgian Blue cattle, is one example.<sup>15</sup>

There are also concerns that are not specific for agriculture, but nonetheless affect consumers' food choices; examples of such concerns are environmental and labor right concerns. Environmental sustainability is high on the political agenda after new scientific discoveries have reinforced environmental concerns about pollution, resource depletion and global warming.<sup>16</sup> Growing attention has naturally also been given to the environmental impacts of agriculture both at local and global levels. For example, concerns have been expressed about long food transports and environmental over-exploitation due to intensive agriculture.<sup>17</sup> There is also growing international agreement that certain core labor standards, equated with fundamental human rights protected in internationally accepted United Nations (UN) and International Labor Organization (ILO) conventions, should be globally acknowledged and protected.<sup>18</sup> A greater awareness of social standards and production methods around the

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<sup>13</sup> World Bank (2005) Example of food scares since the 1980s are: the BSE crisis in the UK, the presence of dioxin in animal feed in Belgium, various salmonella outbreaks, avian flu etc.

<sup>14</sup> Henson (2006)

<sup>15</sup> Blandford and Fulponi (1999)

<sup>16</sup> Anderson (1996)

<sup>17</sup> Gilg and Battershill (1998)

<sup>18</sup> Martin and Maskus (2001) The core labor standards are: 1) elimination of exploitative use of child labor, 2) prohibition of forced labor, 3) elimination of discrimination in employment, 4) freedom of association, and 5) provision of the right to organize and bargain collectively.

world has created concerns about that labor conditions in foremost poor countries do not always satisfy the core standards.<sup>19</sup>

### *How well-spread are these concerns?*

Since a societal concern, by definition, must be well-spread in society, it is interesting to see how large the support actually is for some of the above mentioned concerns. If no wider support is found, it is hard to argue that the concerns are societal, and that the current debate about a concerned general public derives from the people. In that case “societal concerns” would appear to be political constructions or the result of skillful lobbying, possibly with protectionist goals.

According to a recent Eurobarometer regarding the EU citizens’ opinions about agriculture and the Common Agricultural Policy (CAP), concerns about food quality and safety, environment and animal welfare are highly present.<sup>20</sup> A majority of the European public (59%) believe that one of the main priorities of the CAP should be to ensure that agricultural products are of good quality, healthy and safe. Protecting the environment and dealing with climate change is another topic that many (41%) rank as an important priority of the CAP. The main responsibility of farmers is further perceived to be to supply the population with healthy and safe food (56%), to protect the environment (29%), to supply the public with a diversity of quality products (24%) and to ensure the welfare of farm animals (21%). As much as 67% of the public think that farmers must change the way they work in order to fight climate change, even if this means that EU agriculture will be less competitive. There is also a high level of public agreement (84%) that organic production should be encouraged. Consumers would, in addition, like to have more information about different product attributes. There is high demand for more information about food safety (51%), the environmental effects of farming (31%) and the welfare of farm animals (23%).

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<sup>19</sup> This concern can be said to be an indirect consequence of globalization, which has increased the presence of poor countries on the global markets.

<sup>20</sup> European Commission (2010)

A global online survey on business ethics and fair trade examined how consumers in 51 countries valued corporate social responsibility.<sup>21</sup> Over 80% of the respondents thought that it was very or somewhat important that firms implement programs to improve the environment (88%) and/or society (84%). 67% could also imagine contributing to social and environmental causes through the purchase of ethical products. When it came to groceries, 78% believed it to be important that the raw material in the products did not harm the environment and 72% thought it was important that the products were not manufactured using unethical labor practices. The same survey also asked the respondents what role governments should play in regulating behavior in order to combat climate change. Globally, consumers felt that fighting climate change was up to governments and not so much up to firms. On average, 40% wanted governments to regulate carbon emissions and to lead research into renewable energy and energy efficient technology.

One should bear in mind that there tends to be a gap between stated consumer attitudes and actual consumer behavior. In practice, consumers generally do not shop according to their concerns to the same extent as they say they would like to.<sup>22</sup> Reasons why may be, for example, that ethical products are more expensive than conventional goods, perceived to be of lower quality or that the ethical cause is too complex to be left to the consumer to solve.<sup>23</sup> Organic goods constitute one example of consumers supporting an ethical goal but only buying goods that support this specific goal to a limited extent. A Swedish survey in 2010 showed that about 60% of respondents were very supportive of the major organic brand, KRAV, in Sweden.<sup>24</sup> At the same time, organic sales amounted to only 4% of total Swedish sales of food products and non-alcoholic beverages in 2009.<sup>25</sup> Free-riding behavior can also be a problem when it comes to shopping according to one's convictions. See below for a discussion on free-riding behavior. Attitude research hence does not always capture behavior very well. One problem is that respondents in attitude

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<sup>21</sup> Nielsen (2008)

<sup>22</sup> Carrigan and Attalla (2001)

<sup>23</sup> Chatzidakis et al (2007)

<sup>24</sup> TNS Sifo and KRAV (2010)

<sup>25</sup> SCB (2009)

research often give socially desirable answers.<sup>26</sup> The measured attitudes therefore tend to appear more positive than they actually are. Buying behavior can further be hard to capture with attitude survey research, because a survey is far from a realistic buying situation where a set of multiple attributes affect the buying decision. That there might be a trade-off between different product attributes is important to take into account when attitudes are measured.

In conclusion, surveys show that public concerns about agricultural production are present both in Europe and globally. These concerns are relatively well-spread and not solely found with minority groups. If the concerns can be classified as societal is, however, hard to say as long as the definition of when a concern becomes societal remains unclear. Nonetheless, people commonly claim that they would like to support ethical goals through their purchasing behavior and that price is not the only important determinant when food consumption choices are made. That ethical goals are more important than price or other product attributes in an actual buying situation is not certain, though. In addition, the public want government policy to respond to their concerns. It is perceived to be the responsibility of governments rather than businesses to fight problems that require behavioral changes such as climate change. Notwithstanding, the above surveys do not say anything about how much citizens are willing to pay for government responses to concerns.

### **2.3 Government Response to Societal Concerns**

As concerns about agricultural production spread governments are increasingly asked to respond to the growing societal demands. But what is an appropriate government response to a societal concern? The answer depends on if the concern in question is a consumer or citizen concern.

#### ***Consumer concerns***

An individual with a *consumer concern* does not want to change the behavior of others but wants to be able to buy products that match her preferences. Hence, consumer concerns do not require government regula-

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<sup>26</sup> De Pelsmacker et al (2005)

tion to induce general behavioral changes. Government involvement is often not necessary at all when it comes to consumer concerns because the market will tend to find a solution on its own.<sup>27</sup> It is the consumers who decide what should be produced in a market economy which means that producers must supply what the consumers demand in order to stay in business. If consumers demand products that contain certain attributes, firms will consequently try to satisfy that demand.

Something that can complicate the market's ability to respond to consumer concerns is that many of the product attributes associated with consumer concerns are credence attributes, i.e. attributes that are impossible to detect even after the purchase and consumption of a product.<sup>28</sup> Examples of credence attributes are process attributes that say something about how a product has been produced. For instance, you cannot determine if a product has been produced using child labor by looking at it or tasting it. Credence attributes create information problems that impair the function of the market. When there is no way of distinguishing product quality, consumers can no longer make optimal consumption decisions. In addition, higher-quality products risk being driven out of the market without credible quality signaling to consumers, despite the fact that consumers might actually prefer products of higher quality.<sup>29</sup> Some form of credible quality signaling is consequently necessary in order for the market to be able to answer consumer concerns. This is often solved through the creation of labeling schemes and third-party certification.<sup>30</sup> Labeling helps concerned consumers identify products that contain credence attributes that otherwise would have been impossible to detect. This, in turn, makes it possible to create niche markets where products meeting a certain above-average standard can be sold at higher prices to those concerned consumers that are willing to pay extra. Several labeling schemes for credence attributes exist on the market, for example schemes for organically produced or fair trade products.

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<sup>27</sup> Brom (2000) and Tothova (2009)

<sup>28</sup> Darby and Karni (1973)

<sup>29</sup> Akerlof (1970)

<sup>30</sup> Andersson and Gullstrand (2009)

Labeling can work as a pure market solution but government intervention might be necessary to ensure 1) that consumers are not misled or confused by the extra information labeling provides, and 2) that there is fair competition among actors in the supply chain wanting to use labeling as a marketing tool. In recent years studies have pointed out potential problems with labeling, see Box 1 below. If the market fails to create a labeling scheme for a highly sought after attribute, it may be reason for the government to intervene and form its own scheme. Market failure is generally the most obvious rationale for government intervention.<sup>31</sup>

**Box 1: Potential problems with labeling**

First, too many labeling schemes or schemes based on too detailed information or information not founded on scientific consensus can confuse consumers and make it hard to distinguish what is relevant. The extra information labeling provides may therefore be misunderstood or ignored. Second, it is important that labeling schemes fulfill their purposes and do this in an efficient way in order not to deceive consumers. Consumers should be able to trust that an eco-labeled product is better for the environment than a conventional good. Empirics show that labeling effectiveness and efficiency can be hard to achieve. Third, labeling may have negative effects on competition, especially if the labeling standard is not designed in a non-discriminatory way. It has been revealed that labeling sometimes disadvantages producers in developing countries and small-scale producers since their situation is not always taken into account in the design of labeling standards and certification processes. Fourth, most of the price premium consumers pay for labeled products may stay with the retailers even if primary producers bear most of the costs of labeling.

Sources: Teisl and Roe (1998), Johansson (2009), Johansson (2010) and Ponte (2007), Andersson and Gullstrand (2009) and Kilian et al (2006)

### *Citizen concerns*

In contrast to consumer concerns, *citizen concerns* often have an ethical dimension that relates to our responsibility as human beings. Individuals with citizen concerns therefore want to change the behavior of others as well as themselves. It is hard to argue that these concerns can be met in any other way than with regulation banning products or practices that do not live up to the citizens' ethical standard. Labeling is not a suitable

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<sup>31</sup> Tothova (2009)

response to citizen concerns, since it still gives consumers a choice of whether to buy above average standard products or not.<sup>32</sup>

As already mentioned, from an economic point of view, government intervention can mainly be justified by market failures. That is to say situations when the market does not find the efficient outcome by itself for some reason. Market failures that can justify government intervention in the case of citizen concerns are foremost the presence of externalities or public goods. Externalities are defined as costs (negative externalities) or benefits (positive externalities) arising indirectly from consumption or production that are not captured by prices.<sup>33</sup> If externalities are present, prices do not reflect the full costs or benefits of producing or consuming a product or service. As a result, too much (if negative externalities) or too little (if positive externalities) may be produced or consumed compared to the social optimum. Examples of externalities can be leakage of agrochemicals into waters (neg. production externality), air pollution as an indirect effect of driving a car (neg. consumption externality) or a beautiful landscape as an indirect effect of agriculture (pos. production externality). Since the market does not find the efficient outcome by itself, government intervention might be necessary to internalize the externalities.

A public good is non-rival (consumption of the good by one individual does not hinder the consumption of others), and non-excludable (no one can be excluded from using the good).<sup>34</sup> These characteristics create a special form of externality problem which makes it hard for the market to function efficiently. When consumers cannot be excluded from consumption of a good, they will have low or no incentives to pay for it. This leads to free-riding behavior where people enjoy the goods, but leave it to others to pay for them. In a setting where many try to free-ride, producers have few incentives to provide a sufficient amount of public goods, which leads to undersupply. Hence, the market does not generate an efficient allocation of public goods by itself. Government intervention may therefore be necessary to assure a socially efficient allo-

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<sup>32</sup> Tothova (2009)

<sup>33</sup> See for example Varian (2006) for a background on externalities

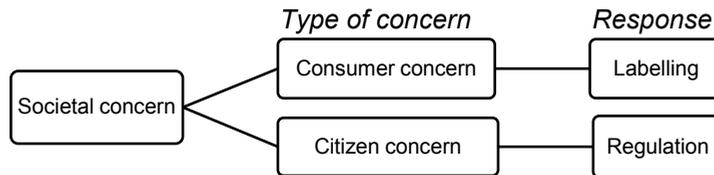
<sup>34</sup> The following discussion on public goods mainly concerns 1-0 situations

cation of public goods. Many citizen concerns have a public good character. Examples of public goods are clean air, human rights and animal welfare.<sup>35</sup>

### *Government intervention*

Government intervention to come to terms with externalities or allocation of public goods may come in different forms such as taxes, subsidies or regulation. Regulation is considered to be the most successful option when the goal is to ban certain behaviors.<sup>36</sup> It is important to stress that any government intervention should be efficient, as an inefficient intervention may lead to a worse outcome than no intervention at all. In designing the interventions, market failure has to be weighed against intervention failure.

**Figure 2.2 Responses to different types of societal concerns**



The above discussion focuses on appropriate government responses to societal concerns in a world without trade. Introducing trade into the picture complicates things and may demand further government action. The next chapter develops the trade and societal concerns connection.

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<sup>35</sup> See Cooper et al (2009) for more information about public goods in agriculture

<sup>36</sup> Tothova (2009)



# 3

## Societal Concerns and International Trade

The core of the debate on societal concerns is the potential conflict between social choices and trade liberalization. Chapter 3 begins with investigating why countries have reduced trade barriers and what a reduction of trade barriers can possibly mean for the protection of societal concerns. This is followed by an analysis of the effectiveness and feasibility of different measures that can be taken to limit the possible impact of trade liberalization on social choices.

### 3.1 The globalized world

Technological progress, reduced costs of transportation and multilateral trade liberalization have resulted in an economically integrated world with global markets and international supply chains. Trade volumes have consequently grown exceptionally and competition has increased as more countries take part in the global economy.<sup>37</sup>

The reduction of trade barriers and the endorsement of freer trade during the last decades have been a deliberate attempt to promote growth, prosperity and welfare around the world. Countries have been cooperating, first under the General Agreement on Tariffs and Trade (GATT) and since 1995 under the World Trade Organization (WTO) system, to ensure that trade runs as smoothly, freely and predictably as possible. This cooperation has led to a number of WTO-agreements that today work as the legal ground-rules for international commerce.<sup>38</sup>

#### *The case for free trade*

The belief in free trade is justified by economic theory, which predicts that international trade gives efficiency gains. According to classic trade theory, based on the ideas of David Ricardo about comparative advan-

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<sup>37</sup> Total world trade in 2000 was 22-times the level of 1950. Source: [http://www.wto.org/english/thewto\\_e/whatis\\_e/inbrief\\_e/inbr01\\_e.htm](http://www.wto.org/english/thewto_e/whatis_e/inbrief_e/inbr01_e.htm)

<sup>38</sup> [http://www.wto.org/english/thewto\\_e/whatis\\_e/inbrief\\_e/inbr00\\_e.htm](http://www.wto.org/english/thewto_e/whatis_e/inbrief_e/inbr00_e.htm)

tage, trade leads to mutual static efficiency gains for the trading parties.<sup>39</sup> Thanks to trade, countries no longer need to produce everything that is consumed within their borders. Instead countries can specialize in the type of production they do *relatively* best, i.e. according to comparative advantage, and import the rest. Since all countries have limited production resources that must be allocated to production of different goods, specialization leads to a more efficient use of the world's resources, and welfare gains for both trading parties even if one country produces all goods better than its trade partner.

Although both countries get static gains from trade and specialization in total, it is important to note that these gains will not be evenly distributed among individuals, according to the income distribution effects of the Stolper-Samuelson theorem in a Heckscher-Ohlin setting. The Heckscher-Ohlin model predicts that specialization and trade arise because of comparative advantages in factor endowments (capital or labor). A capital abundant country will specialize in and export products from capital-intensive industries and import products from labor-intensive industries. The situation will be reversed for a labor abundant country. If a country specializes in what it does relatively best, in a Heckscher-Ohlin setting resources will move from less efficient to more efficient sectors of the economy. This will give lower employment and income levels in the contracting scarce factor sector, but higher employment and income levels in the expanding abundant factor sector. Workers in the scarce factor sector will consequently be worse off because of trade, at least in the short run. This perspective makes redistribution policies necessary to make sure that each individual gains from trade.

In classic trade theory, trade arises and is beneficial because of differences in production capacity between countries. However, as showed already by Adam Smith, trading partners do not necessarily need to differ for trade to arise or to attain mutual gains from trade. According to the so-called Smithean perspective, specialization and trade emerge because increasing returns can be secured by concentrating on one activity in-

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<sup>39</sup> Comparative advantage develops either because of technology differences (Ricardo model) or differences in factor endowments (Heckscher-Ohlin model).

stead of doing a little bit of everything. Specializing and trading is simply more efficient than self-sufficiency. Since specialization in this case is not contingent on comparative advantage, individuals or countries are not assumed to be different. To extend the market, for example through trade, when no differences between people exist, the additional exploitation of specialization will increase the ratio of output value to input value for all. A larger market will hence lead to better exploitation of economies of scale, i.e. average cost will decrease as production scale increases, and a possibility of using productivity raising technologies suitable for large production quantities.<sup>40</sup> According to the Smithean perspective, trade does not give any net losers; transitional adjustments are possible though, and everyone gains from trade.<sup>41</sup>

New trade theory builds on the Smithean perspective. Besides the gains from better exploitation of economies of scale, new trade theory also highlights the fact that access to the international market leads to better differentiation possibilities for firms, which in turns gives consumers a larger choice and possibly higher utility. Other important effects of trade according to new trade theory are increased competition and possible dynamic efficiency gains. Increased competition from trade challenges the market power of domestic firms. This can give gains such as lower prices and faster technological innovation. Lastly, dynamic efficiency gains from trade may arise through increases in long-run productivity growth. There is no conclusive evidence that trade has a positive effect on growth, but there is evidence that open economies are richer and more productive than closed ones. Trade can affect productivity levels and growth through better resource allocation, deepening specialization, higher returns to investment in capital and R&D, and technology spillovers.<sup>42</sup>

Gains from trade should not be seen as given but as a possibility for countries that enter the global market. Complementary measures, e.g. redistribution policies, may be needed to fully materialize the gains from

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<sup>40</sup> Lower costs for firms may lower consumer prices, given that competition exists between firms.

<sup>41</sup> Buchanan and Yoon (2002)

<sup>42</sup> Nordás et al (2006)

trade. The potential of trade and the function of the international market may also be impeded by trade barriers. A trade barrier restricts international competition, which means that domestic producers can charge a higher price than otherwise. Trade barriers, thus, distort relative prices in favor of domestic producers in the protected sector, which harms both consumers and the domestic allocation of resources since the distorted prices no longer reflect the real costs of production in the protected sector. The protected sector will therefore attract more resources from alternative use that could have been more efficient. Trade barriers also distort international trade when countries with comparative advantages in the protected sector are prevented from using them because of limited access to the domestic market.

In sum, restricting trade comes at a certain cost in the form of reduced competition, higher prices, less consumer choice, a less dynamic domestic industry and poor resource allocation. Hence, working for freer trade and reduced trade barriers, as the world successfully has done over the last decades, helps to better materialize the possible gains from trade and promotes global welfare.

### *Globalization and societal concerns*

Globalization has brought countries and their societal concerns closer together through trade. This has highlighted the potential trade conflicts that the diverging concerns of countries may lead to.<sup>43</sup> As mentioned above, countries tend to have different priorities and make social choices depending on such things as traditions and income levels. It is therefore unlikely that all countries will have the same societal concerns and that they will respond to the concerns in similar ways. Incompatibility problems of societal concerns and conflicts between trade and domestic policy foremost arise when countries believe that their social choices should apply to others as well as themselves.<sup>44</sup> Trade conflicts are hence primarily expected in relation to outwardly directed citizen concerns. Following this reasoning, it is unlikely that consumer concerns could be a source of trade conflicts because individuals with consumer concerns on-

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<sup>43</sup> OECD (2010b)

<sup>44</sup> Lamy (2004)

ly care about their own consumption. Moreover, as mentioned above, consumer concerns generally do not require domestic policy changes. This means that potential trade consequences of consumer concerns are minimal.

In the past, when trade was limited due to high tariffs and quantitative barriers, diverging citizen concerns and related competitiveness effects were a minor problem since countries interacted less and international competition was low. People generally also had less information about other countries' production methods and were less demanding when it came to societal concerns protection. Today, globalization has created an environment where competition is fierce and diverging social choices increasingly come into contact through trade.<sup>45</sup> This has raised fears of the effect of international competition on domestic production, of trade conflicts due to diverging concerns, and of constraining effects of international trade agreements on the domestic power of government.<sup>46</sup>

Fears of the effects of international competition on domestic production focus on difficulties defending domestic policy choices that lead to relatively higher production costs in an open market. Imagine that a country responds to citizen concerns about a certain issue by introducing a strict mandatory regulation that raises production costs for domestic producers. This risks reducing domestic producers' competitiveness vis-à-vis non-complying foreign producers because, all else being equal, goods produced according to the regulation would become more expensive than those that are not. There are then disincentives for buyers to choose the domestically produced good, which can result in lost market shares for domestic producers in both international and domestic markets. That market shares risk being lost in the domestic market, despite the presence of citizen concerns, can be explained by free riding. There is a risk that, given the chance, people will buy the cheap non-complying imported goods even if consumers support the goal of the domestic regulation.

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<sup>45</sup> Lamy (2004)

<sup>46</sup> Many of the issues discussed in relation to societal concerns have been parts of previous debates about the effects of free trade, such as the non-trade concerns and multifunctionality debates. See for example Blandford and Boisvert (2002) and OECD (2001, 2003).

Since globalization has facilitated specialization and relocation of production to more cost efficient locations, there are fears that countries, in the long run, might not be able to sustain policy choices that lead to higher production costs in an open market. Hence, a country with stringent regulations or high standards may feel forced to lower them in the fight for investments and jobs.<sup>47</sup> The control of domestic policies and the possibility of satisfying citizen concerns in the long run therefore risk being lost because of market opening and trade. Growing feelings of lost control of domestic policies have been especially present among citizens in Europe, a region that traditionally has had preferences for high environmental and social standards.<sup>48</sup>

### **3.2 Complementary measures**

That international competition pressures risk undermining domestic policies that are introduced to defend citizen concerns may urge countries to introduce complementary measures to compensate domestic producers and change consumer behavior. The aim of any such complementary measure would be to give preferential treatment to products that are produced in a way that does not conflict with the domestic policy.

The ideal solution from a policy perspective would however be for countries to agree on common international standards. In this case no conflicts because of diverging standards would arise, and there would be no need for complementary measures. When it comes to transboundary externalities or global public goods, international cooperation is necessary to come to terms with market failures such as climate change or over-fishing.<sup>49</sup> Agreeing on common standard levels is unfortunately easier said than done, though. In fact, disagreement on appropriate standard levels is the very core of the conflict about societal concerns; different countries prefer different standards, which in turn might result in competitive disadvantages for some.<sup>50</sup> Even if it is hypothetically possible to

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<sup>47</sup> Grethe (2007) The potential downward pressure on standards that can arise in the fight for investments is sometimes called the "race-to-the-bottom".

<sup>48</sup> Le Cotty and Voituriez (2008)

<sup>49</sup> Esty (2001)

<sup>50</sup> Sometimes countries do manage to cooperate and solve international problems. The "Montreal Protocol on Substances That Deplete the Ozone Layer" is one example of successful international cooperation.

find a standard level that fits all, it would be a time-consuming process. It is therefore likely that countries would want to use complementary measures anyway, at least in the short run. This makes it important to look into what measures could be used. The following possible complementary measures are analyzed in detail below: 1) labeling, 2) import restrictions, 3) taxes and 4) subsidies.<sup>51</sup>

### *Labeling, import restrictions, taxes and subsidies*

Labeling has already been presented above as a possible solution to consumer concerns. If labeling was to be used as a complementary measure the rationale for doing so would be the same as above, namely to give consumers more information about different product attributes to enable better informed consumption decisions. Labeling helps consumers to identify products that have been produced according to, or in a similar way to, the domestic regulation (positive labeling) or products that have not been produced according to the domestic regulation (negative labeling). It is also possible to introduce a form of point system where products can be labeled according to the standards with which they are produced. All forms of labeling schemes can be voluntary or mandatory. Negative labeling would most likely be mandatory, since the incentives for a producer to voluntarily disclose that a product does not fulfill a certain standard are low.

Import restriction is another possible complementary measure. The most extreme restriction of imports is an import ban. All products that are not produced in a way that meets the requirements of the domestic regulation are then prohibited from entering the country. A more nuanced way to restrict imports is to introduce differentiated tariffs. Tariffs, new or existing, could be differentiated according to production standards as a form of compensation for higher production costs. An existing tariff rate could be either reduced for products produced according to domestic regulation, or raised for products not meeting domestic regulation.

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<sup>51</sup> The complementary policies labeling, import restrictions and taxes are discussed in Eaton et al (2005)

Consumer taxes could also be differentiated according to production standards. One option would be to differentiate an existing Value Added Tax (VAT) by raising the rate for products produced according to low standards. Another option could be to introduce excise taxes on specific products according to certain societal concerns. Tax rebates (subsidies) are also conceivable for products that follow high standards. It is important to note that differentiated taxes would be imposed on all products, not only on imports.

The last example of a possible complementary measure is direct subsidies to domestic producers. Producers would then receive payments for complying with higher standards and subsidies could be differentiated so that higher subsidies are granted to producers who comply with higher standards.

The different policy measures presented here do not need to be substitutes; it is possible to combine two or all three of them. Tariffs and taxes should perhaps be accompanied by labeling to inform consumers that the producers conform to higher standards.<sup>52</sup>

### *Effectiveness of complementary measures*

The effect of labeling as a complementary measure depends on how consumers react to the new information provided by labeling. If consumers are influenced by the information, demand can be expected to rise for products that are produced in a way that does not conflict with the domestic policy. This will benefit all domestic producers and foreign producers that comply with similar standards to the domestic regulation, while foreign producers that comply with lower standards risk losing market shares. The latter producers will consequently have incentives to raise their standards as long as the domestic market is not too small. When a point system is used, there will be incentives for domestic producers to improve their production standards as well, if consumers prefer products produced according to above average standards. If consumers are not influenced by the new information, demand will on the other

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<sup>52</sup> Eaton et al (2005)

hand remain unchanged and labeling will not affect production decisions.

There is a risk that the effect of labeling on production decisions in reality will be limited. As mentioned in Chapter 2, research suggests that there is a gap between attitudes and behavior. It might then not be enough to give consumers more information to change their behavior. So far, voluntary labeling schemes have generally only managed to get limited market shares, despite the fact that many consumers support the goals of the schemes.<sup>53</sup> The effectiveness of using voluntary labeling as a tool for changing production standards may therefore be questioned. Negative mandatory labeling is said to be more effective than positive voluntary labeling with respect to the aim of changing behavior, since more consumers may be prevented from buying a product by the existence of a negative label than by the nonexistence of a positive one.<sup>54</sup> Yet, since individuals tend to weigh individual private costs and benefits without taking externality costs into consideration when making consumption decisions, even mandatory negative labeling may not be an effective way to advance social goals and solve externality problems.<sup>55</sup> A main issue is also that labeling does not remove the price difference between products produced according to the domestic regulation, or standards similar to it, and those that are not. If the positive labeling option is chosen, there is even a risk that the price difference will increase since labeling and certification involve certain costs that most often are paid by producers. Consumers will therefore still have an opportunity to free ride. Thus, labeling is not a sufficient complementary measure if the goal is to reduce the economic incentive to choose products produced according to questionable standards.

Import restrictions are the second complementary measure suggested. To completely ban products that do not fulfill the domestic production requirements would be very effective when it comes to making consumers choose the “right” products. It would simply only be possible to buy

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<sup>53</sup> De Pelsmacker et al (2005), Andersson and Gullstrand (2009)

<sup>54</sup> Grethe (2007)

<sup>55</sup> Golan et al (2001)

products that are produced according to the domestic policy goal. Foreign producers would also have strong incentives to raise their standards, especially if the domestic market is relatively large. Tariffs differentiated according to production standard would also be a rather effective policy measure since it can be expected that higher tariffs give higher market prices. To increase the tariffs for products produced in a way that does not meet the requirements of the domestic regulation would consequently reduce or perhaps even remove the price difference, depending on how the tariff is set, between products produced according to domestic regulation and those that are not. This will, in turn, reduce the free riding opportunities for consumers. Market shares of producers not meeting the requirements of the domestic regulation are therefore expected to decline. That these producers are hit by extra costs and risk losing market shares further gives them incentives to adopt standards similar to the domestic regulation.

Lowering the tariffs for products produced according to the requirements of the domestic regulation would have a more limited effect on consumer behavior than the case just described. A lowered tariff would not affect the price difference between domestically produced goods and goods not produced according to domestic regulation. Still, the price difference between imported goods as well as between domestically produced and imported products produced according to domestic regulation would be reduced. Consumers would therefore have greater incentives to buy imported products produced according to domestic regulation than before, but the opportunity to free ride would remain. Because of this, one may also expect that producers would have stronger incentives to change their production standards if tariffs were increased instead of decreased.

The effects of differentiated consumer taxes are partly similar to differentiated tariffs. Both taxes and tariffs are financial instruments that change consumer prices and thereby economic incentives to choose one product over another. An important difference between tariffs and taxes worth noting again is that taxes do not distinguish between foreign and domestic products. If a tax is imposed on products not produced accord-

ing to domestic regulations, it will only be imposed on imports in practice. This kind of tax will have similar effects to the increased tariff example above. The tax would then have the potential to be an effective policy measure when it comes to changing consumer behavior and motivating foreign producers to implement stricter standards. Lowering the tax on products produced according to domestic regulation would also be a rather effective policy measure, since the price difference between all products meeting domestic requirements and those that do not will be reduced or removed, depending on the tax rebate. Unlike a tariff decrease, a tax decrease would hence be able to tackle the free rider problem and therefore also motivate foreign producers to change their standards. If a tax is to motivate domestic as well as foreign producers to implement stricter production standards, it needs to be differentiated according to a range of standards where some are stricter than the current domestic regulation.

A direct subsidy to domestic producers would lower the price of domestic products, which would then reduce or remove price differences between domestic and foreign products depending on the size of the subsidy. As this would lower the incentives to free ride for consumers, subsidies have the potential to be a rather effective complementary measure. Still, they will only be effective when it comes to making consumers buy more domestic products, because, unlike a tax decrease, no additional incentives will be given to consumers to buy imported products meeting the domestic requirements. If the subsidy is to give incentives for domestic producers to comply with stricter standards than the domestic regulation requires, the subsidy must, just like the tax, be differentiated according to a range of standards where some are stricter than current regulation. Subsidies to domestic producers do not give any incentives to foreign producers to raise their standards, since foreign producers are not eligible for the subsidies.

### *Feasibility of complementary measures*

A government has multiple policy goals and defending societal concerns is just one of them. This can complicate the introduction of complementary measures since they risk conflicting with other policy goals such as

having sound public finances or honoring international trade obligations. It can also be very difficult to practically implement certain measures, for instance because of a lack of knowledge or institutional quality. Complementary measures may simply not always be feasible despite being highly effective when it comes to defending a social goal. Which measures are realistic and what are their costs? The initial analysis below does not include trade complications and WTO compatibility of the different complementary measures. For more information on this, please see the sections *Trade effects* and *WTO compatibility* below.

Differences can be found in the feasibility of voluntary and mandatory *labeling*. If a voluntary labeling scheme is introduced, which is assumed here to be a positive labeling scheme, a certification process for products that are to be labeled is generally required. Certification standards must consequently be developed. To make sure that the labeling scheme is fair, it is essential that such standards are non-discriminatory and take production situations in different countries into account. The certification process must further function properly in third countries and should pay special attention to smaller producers.<sup>56</sup> Voluntary labeling might be a relatively easy option from a government perspective. In the case of a private labeling scheme, the government does not need to intervene at all. In the case of a public labeling scheme, the government can reduce its involvement by leaving the certification process to private companies and the cost of certification to producers.

Mandatory labeling is more complex from an institutional point of view, since it always requires some form of government intervention. The type of government intervention needed depends on who has the labeling responsibility. If the government has the labeling responsibility, it would have to identify which products to label. An initial problem in the identification process is to determine equivalence of regulations in different countries, which can be very difficult since production processes and methods differ and are context-dependent. Certain regulations might even be irrelevant in some countries because the production circum-

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<sup>56</sup> Smaller producers often experience higher certification costs than larger producers due to the many fixed cost elements of certification. See Andersson and Gullstrand (2009).

tances are so different. A second problem is that it is possible that producers in countries with nonequivalent regulations comply with higher standards than the law requires. Therefore, if a fair labeling scheme is to be introduced, it is not enough to base the labeling decision solely on regulation levels. In the ideal case one would have to find out how all products from countries with nonequivalent regulations were produced. Obviously this is a rather large project that will take both time and money to follow through, making it quite unrealistic. Another possible solution would be to leave the labeling responsibility to producers, but the government would still need to put in place some form of control system to make sure that the labeling rules are followed. Random checks among producers would be one possibility, while certification requirements would be another.

If a country were to try to introduce a *trade restriction*, a ban or a differentiated tariff, the first move would again be to determine equivalence of other countries' regulations. Ideally, one would also have to distinguish which products have been produced according to high standards in countries with lenient regulations, like the above mandatory labeling. When a differentiated tariff is to be introduced, the size of the tariff or the tariff rebate would also have to be determined. Setting an appropriate tariff is difficult, especially since rent-seeking domestic producers would probably try to influence the tariff setting process to their own advantage. In practice, it can be hard to raise tariffs since they are generally bound in the WTO. If tariffs were raised above the bound rate, it would be necessary to renegotiate tariff bindings, which is a complex procedure. Another practical problem can appear when it comes to decreasing tariffs for products produced according to domestic regulations. In order to be able to decrease a tariff, it must exist in the first place. Some products might have very low or even zero tariffs from the start, which makes tariff rebates impossible to implement. Another potential problem with tariff rebates is that they would lower government revenue, especially for poor countries. As more producers adopt higher standards government revenue would also continue to decline, making tariff reduction a less likely long-term solution than a tariff increase. From a consumer perspective, tariff rebates would be preferable to tariff

increases, since rebates would lower, instead of elevate, the average price level in the country; see the section on trade effects below.

The implementation problems of *taxes* are quite similar to those of tariffs. A country would have to determine the equivalence of regulations, possibly how all products were produced in countries with non-equivalent regulations, and the level of the tax or tax reduction. Tax reductions can also be problematic for the same reasons as the tariff reductions above. A difference between taxes and tariffs is that taxes can be applied to all products. Introducing a differentiated tax would hence mean that you would have to determine how domestic as well as foreign products have been produced. Imposing higher taxes on domestic producers could lead to reduced domestic production, which in turn could incur costs such as increased unemployment and reduced incomes. Two different tax measures are highlighted above, a differentiated VAT and an excise tax. In practice it would be impossible to introduce a differentiated VAT according to PPMs in the EU. The European Court of Justice has determined that different VAT rates for competing substitute products are not allowed, and would violate the principle of fiscal neutrality.<sup>57</sup>

Identifying producers entitled to *direct subsidies* is relatively easy considering that they are only given to domestic producers. If producers received subsidies just for complying with domestic regulation, it would mean that subsidies would be given to all those producers who actually comply with the law. On the other hand, if the subsidy is differentiated according to different standards, it would mean determining how all domestic products have been produced, which is more difficult. Additional feasibility problems with subsidies are how to determine the appropriate size of the subsidy, and the fact that subsidies are expensive for the government. Hence, it can be questioned whether subsidies in general are a viable long-term solution because of the cost they incur for the government. The advantages of subsidies are that they can encourage domestic production and possibly create employment which, in turn, can generate tax revenue. The fact that subsidies can lower the general price level is of course positive from a consumer perspective.

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<sup>57</sup> Eaton et al (2005)

Something that can complicate the introduction of any of the complementary measures for food products analyzed above is that a lot of the food consumed in the modern society is processed. If a food item consists of many different primary products produced in different ways, it is very hard to determine labeling requirements, tariffs or taxes based on PPMs. Additionally, it can be more difficult for consumers to connect a certain PPM to a processed product than to a primary product.<sup>58</sup> In fact, it is more likely that a consumer thinks of the welfare of a layer hen when buying eggs than when buying biscuits containing egg powder.

### *Trade effects*

An important part of a total feasibility analysis is if and how the different complementary measures would affect trade. This section discusses the trade effects of the different complementary measures as well as probable reactions of trade partners.

Labeling is a market solution that informs consumers about different product attributes. Access to the domestic market for products not produced according to domestic regulations is not restricted, which means that the trade effects of labeling are supposed to depend on consumer reactions and cannot be said to impede competition or trade possibilities in a market economy. If labeling is not to create trade distorted effects, it is essential that non-discriminatory labeling schemes and certification processes are set up. If labeling/certification standards and the certification processes are not correctly designed, empirics show that there is a risk that producers from poor countries and smaller producers will be shut out from the certified market.<sup>59</sup>

Assuming that a labeling scheme is correctly designed, voluntary labeling should not meet much resistance from trade partners, since everybody would be given the same opportunities to label their products. Mandatory labeling, on the other hand, may be more problematic, especially negative schemes that only label imports. The understanding of this kind of labeling risks being low in exporting countries that have dif-

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<sup>58</sup> Grethe (2007)

<sup>59</sup> See Box 1 above

ferent views of what constitutes an appropriate standard or regulation level. That societal concerns may coincide with protectionist interests can naturally exacerbate this conflict. It is hard for the exporting countries to trust that there is a real societal concern behind the labeling requirements as long as there is a possibility that interest groups use societal concerns as an excuse for protection of inefficient industries.

Import restrictions can naturally be expected to have larger trade impacts than labeling. Import bans are the most extreme form of import restrictions, as certain imports are not allowed at all. Differentiated tariffs have more limited trade impacts, since products can still enter the country if a fee is paid. The size of the impacts depends, of course, on how the tariffs are set. High tariffs have larger trade effects than low tariffs because tariffs restrict international competition and increase market prices, as mentioned above. This leads to a decline in demand for the imported products and, in turn, reduced import volumes. If the tariff is high enough it can even be prohibitive and in practice restrict all imports. Thus, a high tariff would be preferred to a low tariff if the only goal is to change consumer behavior and give incentives to producers to raise their standards.

The costs of trade barriers previously mentioned should not be forgotten. Distorting prices through a tariff increase harms consumers and domestic resource allocation as well as the international division of labor. This will lead to efficiency losses and a decline in global welfare. A tariff reduction would have the opposite effects of a tariff increase, which means that a tariff reduction is preferable to a tariff increase from a welfare perspective. A reduction of tariffs would also probably be easier to accept for trade partners than an increase or introduction of tariffs. Protests from trade partners against tariff increases or introductions are understandable since they can have protectionist objectives.

The trade effects of taxes are similar to the trade effects of tariffs, especially if only imports are taxed or given tax rebates. If taxes are only imposed on imports that do not meet domestic production regulations, the effects will be similar to those of the tariff increases described above.

Prices would then rise and the market share of foreign products would probably decline. A reduced tax on imports meeting the requirements of the domestic regulation would conversely give lower average price levels and possibly increased imports of products produced according to the domestic regulations. Taxing all products according to production standards can be expected to raise prices and affect production both abroad and domestically. Since this kind of tax, on average, would be highest for imports, because all domestic products are produced according to standards that at least follow the regulation, import volumes would probably be reduced by this kind of tax as well. Trade partners can be expected to protest against any tax increase that affects them negatively. As above, it is hard to prove that taxes are not used for protectionist purposes.

Subsidies to domestic producers would lower prices of domestic products relative to imported products. Import volumes can hence be expected to decrease. In comparison to the introduction of a tariff, this will however not lead to consumption distortions, because prices of imports are not increased. The welfare loss of introducing a subsidy is therefore smaller than that of introducing a tariff, as long as taxes are not raised substantially to finance the subsidy. Trade partners are likely to find subsidies unfair, though, and it would be hard to prove that a subsidy to domestic producers is not being used for protectionist purposes.

Trade effects of complementary measures can also be analyzed in a North-South context. Rich countries generally have more stringent regulation and production standards in agriculture than poor countries, as societal concerns tend to emerge first after countries reach a certain development level where the citizens' basic needs are met.<sup>60</sup> Poor countries simply seldom have the luxury to pay attention to environmental protection, animal welfare or labor regulations.<sup>61</sup> Nor do poor countries always have the technological or financial capacities necessary to implement

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<sup>60</sup> Tothova (2009)

<sup>61</sup> However, Nielsen (2008) found that environmental and labor standard concerns were present globally and not only in the rich parts of the world (Africa was not covered by the survey). Concerns might hence be present even if regulation is not yet in place.

strict food safety standards.<sup>62</sup> Producers from poor countries are hence more likely to be negatively affected than producers from rich countries by the introduction of complementary measures to protect societal concerns in agriculture. This may lead to reduced export possibilities for poor countries, which in turn can have significant economic effects. Many poor countries are highly involved in international food trade today; for example, agricultural goods represent 40% of total African exports.<sup>63</sup> Agriculture is also a very important income source in poor countries. For most developing countries, agriculture is the dominant sector and accounts for more than 50% of total employment. A reduction of export possibilities and, in turn, reduced agricultural production may consequently affect a large number of people and possibly increase poverty in already poor areas. As a comparison it can be mentioned that agriculture in the EU only accounts for about 4% of total employment.<sup>64</sup>

Complementary measures to protect societal concerns are also likely to be more effective for rich countries, as they have the majority of the world's purchasing power. There is therefore a risk that introducing complementary measures to protect societal concerns will mean that rich countries will impose their own preferences on poor countries, which can be considered as morally questionable.<sup>65</sup> If poor countries are forced to adopt stricter domestic regulations, which raise production costs, in order to be able to export, the risk is that it will worsen the often already restricted access to food for the less affluent in these countries.<sup>66</sup>

### *WTO compatibility*

An additional complication, when it comes to introducing complementary measures to defend societal concerns, is the international trade rules set by the WTO agreements. As mentioned above, the WTO works to ensure that trade runs as smoothly, freely and predictably as possible to better materialize the gains from trade. In other words, the organization aims to reduce trade barriers and to prevent protectionism. For this rea-

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<sup>62</sup> Athukorala and Jayasuriya (2003)

<sup>63</sup> OECD (2008)

<sup>64</sup> Blandford (2002)

<sup>65</sup> Wyplosz (2005)

<sup>66</sup> That regulation can restrict the access to food for poorer citizens is a problem that is also present in rich countries but, of course, to a lesser extent since incomes are higher.

son, current WTO rules can make the feasibility of some of the complementary measures difficult.

The WTO rules are based on the principle of non-discrimination. There are two components of non-discrimination in the WTO: 1) most-favored-nation treatment (MFN) and, 2) national treatment. MFN treatment means that a country must treat all like products from all trade partners equally. National treatment further signifies that imported products must be treated equally to domestic like products. The aim of the non-discrimination rules is to prevent the usage of policy measures for protectionist purposes.<sup>67</sup>

Exceptions to these general WTO-rules exist for specific situations. Countries are allowed to implement trade restricting measures necessary to protect certain societal concerns, as long as they do not constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail or a disguised restriction on international trade. Article XX of the GATT is known as the general exceptions clause and allows measures necessary to protect, for example, public morals and human, animal or plant life or health, see Appendix for the wording of the whole article. Exceptions also exist in the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and the Agreement on Technical Barriers to Trade (TBT Agreement). The SPS Agreement allows countries to set their own food safety and animal and plant health standards as long as they are based on science.<sup>68</sup> The TBT Agreement, in turn, allows countries to implement technical regulations and standards in order to protect, among other things, human safety and health, animal and plant life or health, the environment, national security and to hinder deceptive practices.<sup>69</sup> Lastly, the Agreement on Agriculture's article XX says that future agriculture negotiations have to take non-trade concerns into account.<sup>70</sup> It is further

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<sup>67</sup> Tothova (2009) The principle of non-discrimination is found in all major WTO-agreements (GATT, GATS and TRIPS). In GATT, the agreement which governs trade in goods, MFN treatment is found in article I and national treatment is found in article III.

See [http://www.wto.org/english/thewto\\_e/whatis\\_e/tif\\_e/fact2\\_e.htm](http://www.wto.org/english/thewto_e/whatis_e/tif_e/fact2_e.htm)

<sup>68</sup> SPS Agreement

<sup>69</sup> TBT Agreement

<sup>70</sup> Agreement on Agriculture

worth mentioning that a country is not allowed to use trade action in an attempt to enforce its domestic regulations in other countries.<sup>71</sup> Some disagreement does nonetheless exist when it comes to the interpretation of the WTO exceptions and the treatment of unincorporated PPMs. It cannot be ruled out that certain trade restrictions on the basis of PPM differences could be accepted to protect the societal concerns mentioned in, for example, article XX in the GATT.<sup>72</sup> Still, thorough analysis of WTO legal texts is beyond the scope of this report and should be left to WTO law experts. Box 2 exemplifies how the WTO reasons when it comes to using article XX of the GATT for protection of societal concerns, in this case the protection of endangered species.

**Box 2: The Shrimp-Turtle Dispute**

The shrimp-turtle dispute is one of the more famous environmental disputes in the WTO. In 1997 India, Malaysia, Pakistan and Thailand brought a complaint to the WTO against a US import ban of certain shrimp and shrimp products. The ban was introduced in order to protect five endangered species of sea turtles that risk getting trapped in the nets of shrimp fishers. Since 1973 shrimp fishers in the US have been required to use turtle excluder devices in areas where sea turtles might be encountered. In 1989 these regulations were imposed on imports as well. No shrimp harvested in a way that might hurt the five species of sea turtles could be imported which in practice meant that exporters had to use the same fishing methods as the US fishers. The WTO Appellate Body ruled that measures to protect sea turtles would be legitimate under GATT article XX but not the kind of measures the US had used. The US hence lost the case, not because it wanted to protect the environment, but because it had discriminated arbitrarily and unjustifiably against WTO members. Certain countries, mainly in the Caribbean, had been provided assistance and longer transition periods for their shrimp fishers than the complainants. The US regulation therefore failed to meet the introductory paragraph of article XX that demands non-discrimination in the measures taken.

Source: [http://www.wto.org/english/tratop\\_e/envir\\_e/edis08\\_e.htm](http://www.wto.org/english/tratop_e/envir_e/edis08_e.htm)

Since the complementary measures suggested above differentiate between products on the basis of PPMs that do not leave a tangible effect on the product, they risk being WTO incompatible, especially since they

<sup>71</sup> [http://www.wto.org/english/tratop\\_e/envir\\_e/edis04\\_e.htm](http://www.wto.org/english/tratop_e/envir_e/edis04_e.htm)

<sup>72</sup> Grethe (2007) and Eaton et al (2005)

<sup>73</sup> See for example Eaton et al (2005), Grethe (2007) and Le Cotty and Voituriez (2009) for further analysis of the WTO rules and societal concerns

<sup>74</sup> Eaton et al (2005)

<sup>75</sup> Grethe (2007)

will lead to different treatment of imports and domestic products. Of the suggested complementary measures, voluntary labeling is the measure that is less likely to be challenged in the WTO.<sup>76</sup> Private labeling schemes do not even fall under the jurisdiction of the WTO, which means that the WTO is unable to affect those schemes.<sup>77</sup>

Proponents of societal concerns believe that the current WTO rules do not leave enough room for countries to defend their true societal concerns. Consequently, changes in international trade rules have been suggested, so that larger flexibility is given to societal concerns protection. The introduction of a special safeguard clause for societal concerns into the WTO has been proposed. A safeguard clause would work as an insurance policy to guarantee that economic integration will not threaten social choices. The safeguard would be accompanied by a compensation mechanism to prevent misuse.<sup>78</sup> The introduction of such a safeguard and compensation mechanism in the WTO system has been criticized for discriminating against poor countries.<sup>79</sup> In view of the fact that using the safeguard would be contingent on paying compensation to affected exporters, poor countries with limited financial resources would have greater difficulties using the safeguard than rich countries.

### **3.3 Concluding discussion**

A good can be said to embody the producer country's values. When the good is traded, these values come face to face with the values of the consumer country. Incompatibility problems may therefore arise when the values of the producer and the consumer country differ. As a result of globalization, diverging societal concerns, or values, meet through trade more frequently than before. This has highlighted the potential conflict between trade and social choices as well as created fears of the effect of globalization on domestic choices. Special concern has been expressed about the difficulties defending domestic policy choices that lead to higher production costs in an open market. A policy that aims at protect-

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<sup>76</sup> Eaton et al (2005)

<sup>77</sup> Grethe (2007)

<sup>78</sup> Lamy (2004). Lamy is not the first to suggest that WTO rules should leave more flexibility for social choices. See Charnovitz (2004) for further background analysis.

<sup>79</sup> Charnovitz (2004)

ing a societal concern, and thus raises production costs, will reduce domestic producers' competitiveness vis-à-vis foreign competitors. This may lead to lost market shares for domestic producers, with the consequence that it will become harder to protect the societal concern the policy originally wanted to protect.

To protect societal concerns in the globalized world, countries may feel forced to introduce complementary measures whose aim is to give preferential treatment to products produced according to domestic policies. Labeling, trade restrictions, taxes and direct subsidies have been analyzed above as possible complementary measures. Table 3.1 summarizes the effectiveness, feasibility, trade impacts and WTO compatibility of these measures.

**Table 3.1 Complementary measures**

	<b>Effectiveness</b>	<b>Feasibility</b>	<b>Trade impact</b>	<b>WTO compatibility</b>
<b>Labeling</b>				
<i>voluntary:</i>	low	high	low	probably compatible
<i>mandatory:</i>	low	moderate	moderate	questionable
<b>Import re- strictions</b>				
<i>import ban:</i>	very high	low	very high	questionable
<i>tariffs:</i>	high	low	high	questionable
<b>Taxes</b>	high	low	high	questionable
<b>Subsidies</b>	moderate	moderate	high	questionable

The question is whether societal concerns protection really makes sense when all the potential costs and feasibility complications are considered. To be able to answer this question, one has to first examine how large the threat against domestic values really is. Is it possible that the threat has been exaggerated? Do stringent regulations lead to higher production costs and negative competitiveness impacts? Does regulation affect trade flows? Are imported products not meeting ethical standards and regulations a serious problem? The following sections will try to answer these questions in more detail by focusing on EU trade and competitiveness.

# 4

## Competitiveness and Animal Welfare

This chapter examines whether societal concerns in the EU can be considered to be threatened by international trade. The focus here is on competitiveness impacts of regulation put in place to protect societal concerns. Can regulation raise production costs and thereby reduce competitiveness? The analysis concentrates on competitiveness impacts of EU animal welfare regulations for farm animals. Chapter 4 begins with an overview of current EU animal welfare regulation and later continues with a literature review of studies that have examined competitiveness impacts of regulation.

### 4.1 EU regulation on animal welfare

Animal welfare is a relatively important question in the EU compared to many other parts of the world. The citizens' preferences for well-treated farm animals have resulted in a rather extensive body of animal welfare legislation. The first EU regulation on animal welfare was introduced in 1974 and was a directive on the stunning of animals before slaughter.<sup>80</sup> Today, general minimum welfare rules for farm animals are found in Directive 98/58/EC, which stipulates that farmers should take all reasonable steps to ensure that farm animals are not caused any unnecessary pain, suffering or injury.<sup>81</sup> Regulation governing animal transports was also adopted in late 2004.<sup>82</sup> More specific regulations further exist for the keeping of layer hens, chickens for meat production (broilers) and pigs. Except for calves, no animal-specific regulation is in force at EU level for cattle or sheep. Competitive distortions because of animal welfare regulation are, hence, most likely to occur in the pig and poultry sectors, as the European Commission has previously concluded.<sup>83</sup> The focus of this section of the report is therefore also on the pig and poultry sectors.

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<sup>80</sup> European Commission (2002)

<sup>81</sup> Council Directive 98/58/EC

<sup>82</sup> Council Regulation (EC) No 1/2005

<sup>83</sup> European Commission (2002)

### *Layer hen regulation*

The EU standards for layer hen welfare are stated in Directive 1999/74/EC,<sup>84</sup> the important points of which are: (i) the minimum space required per hen in traditional battery cages is 550cm<sup>2</sup> from 2003, (ii) traditional cages are prohibited from 2012, and (iii) the only cage alternative available after 2012 is the enriched cage. An enriched cage must give each hen at least 750cm<sup>2</sup> of space and contain a perch, a nest box and litter.

A few EU member states have implemented stricter rules than the Directive requires. Sweden introduced a ban on traditional cages as early as 1988, but gave producers 10 years to adjust to the new rules. The phase-out of traditional cages was completed in 2004.<sup>85</sup> Austria has had a ban on traditional cages from January 2009.<sup>86</sup> Germany banned traditional cages in January 2010 and a ban on enriched cages enters into force in 2012.<sup>87</sup> Denmark requires the minimum area per hen to be 600cm<sup>2</sup> in all traditional cages until the EU ban on traditional cages enters into force in 2012.<sup>88</sup>

Outside the EU, Switzerland is the only country that has implemented a ban on cages.<sup>89</sup> In fact, it has not produced eggs in cages since January 1992.<sup>90</sup> In North America, neither the US nor Canada has any nationwide legislation on layer welfare.<sup>91</sup> There are, however, voluntary certification programs and codes of practice recommending that each hen should have about 430cm<sup>2</sup> of cage space in both countries.<sup>92</sup> Asia and South America generally do not have any regulation for the welfare of laying hens.<sup>93</sup> An inventory in 2003 showed that hens in India, Ukraine and

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<sup>84</sup>Council Directive 1999/74/EC

<sup>85</sup> Brasch and Nilsson (2008)

<sup>86</sup> <http://www.landnet.at/article/articleview/71092/1/13208> and

<sup>87</sup> <http://www.thepoultrysite.com/articles/1533/upgrading-hen-housing-latest-developments-in-europe>

<sup>88</sup> [http://www.uk.foedevarestyrelsen.dk/AnimalWelfare/Farm\\_animals/Laying\\_Hens/forside.htm](http://www.uk.foedevarestyrelsen.dk/AnimalWelfare/Farm_animals/Laying_Hens/forside.htm)

<sup>89</sup> Van Horne et al (2007)

<sup>90</sup> Häne et al (2000)

<sup>91</sup> California and Michigan have recently decided to phase out traditional cages.

Source: <http://www.thepoultrysite.com/articles/1624/laying-hen-production-systems-welfare-and-social-sustainability> and <http://www.worldpoultry.net/news/us-new-welfare-law-ordains-hen-cage-sizes-id4429.html>

<sup>92</sup> Da Cunha (2007)

<sup>93</sup> Van Horne and Achterbosch (2008) Some Brazilian states have adopted animal welfare laws and codes of practice. Source: Da Cunha (2007)

Brazil most often are kept in traditional cages that give each hen a space allowance of 300-400cm<sup>2</sup>. In 2003, most layer hens in the US were also kept in traditional cages with 342cm<sup>2</sup> per bird.<sup>94</sup>

### *Broiler regulation*

In 2007, the European Commission agreed on a new Directive, 2007/43/EC, covering the welfare of broilers.<sup>95</sup> The Directive aims at increasing the space given per chicken and sets a maximum stocking density of 33kg/m<sup>2</sup>. Nonetheless, it allows stocking density to increase to 39kg/m<sup>2</sup> under certain welfare conditions, and accepts a stocking density of 42kg/m<sup>2</sup> if exceptionally high welfare standards are followed. General welfare rules concerning lighting, litter, feeding and ventilation are also part of the Directive. The minimum standards had to be met by all EU-producers by June 2010 at the latest.

Previous to 2007, no welfare requirements for broilers were in place at EU-level and no regulations were implemented for stocking density before June 2010. Two member states, Denmark and Sweden, had implemented these kinds of rules prior to that. Denmark introduced regulation for broilers in 2001 and has regulated maximum stocking density from 2003. In 2003 a maximum stocking density of 43kg/m<sup>2</sup> was allowed, but this was further reduced by 1kg/m<sup>2</sup> in 2004 and 2005. Since 2006, maximum stocking density has been set to 40kg/m<sup>2</sup>.<sup>96</sup> Sweden currently has a maximum stocking density of 20kg/m<sup>2</sup>, but accepts 36kg/m<sup>2</sup> under certain welfare conditions.<sup>97</sup> It has had stocking density regulation in place since 1989.<sup>98</sup> Voluntary guidelines for stocking density existed in both Germany and the UK before the EU regulation entered into force. Germany recommended a limit of 30-37kg/m<sup>2</sup> depending on the management conditions while the UK recommended a stocking density of 34kg/m<sup>2</sup>.<sup>99</sup>

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<sup>94</sup> Van Horne and Bondt (2003)

<sup>95</sup> Council Directive 2007/43/EC

<sup>96</sup> [http://www.uk.foedevarestyrelsen.dk/AnimalWelfare/Farm\\_animals/Broilers/forside.htm](http://www.uk.foedevarestyrelsen.dk/AnimalWelfare/Farm_animals/Broilers/forside.htm)

<sup>97</sup> <http://www.sjv.se/amnesomraden/djur/fjaderfan/mattforstallbyggnaderochburar/honsochkycklingar.4.6beab0f111fb74e78a780001693.html>

<sup>98</sup> Kristina Odén, Swedish Board of Agriculture

<sup>99</sup> Turner et al (2005)

Outside the EU, Switzerland and Norway appear to be the only countries in the world that also have regulation concerning stocking density of broilers. Switzerland has a maximum stocking density of 30kg/m<sup>2</sup>.<sup>100</sup> In Norway the maximum stocking density is set to 34kg/m<sup>2</sup>.<sup>101</sup> Voluntary guidelines in the US recommend a density of 38kg/m<sup>2</sup>. Brazil, another major broiler producer, has no regulation on stocking density, but, due to its climate conditions, broilers are not usually kept at higher densities than 35kg/m<sup>2</sup>.<sup>102</sup>

### *Pig production regulation*

Directive 2001/88/EC sets the minimum standards for pig production in the EU.<sup>103</sup> The Directive, introduced in 2001, amended Directive 91/630/EEC that originally laid down the minimum standard for the protection of pigs. The new Directive aims to ban individual sow stalls for pregnant sows, ban tethering, improve the quality of the floor spaces and increase the living space for sows and gilts. The ban on tethering entered into effect in 2006. The other requirements have been applicable to all newly built or rebuilt holdings since 2003. For older holdings, the requirements will become mandatory from January 2013. The European Commission has, in parallel, also adopted Directive 2001/93/EC amending the Annex to Directive 91/630/EEC on the welfare of pigs.<sup>104</sup> The aim of Directive 2001/93/EC is to improve standards such as light requirements, maximum noise levels and access to rooting and playing materials.

Some member states have stricter regulations than the current EU standards. Stricter regulation is foremost found in Sweden, Germany, Denmark and the Netherlands. Austria, the UK, Belgium and Bulgaria also go beyond EU standards to a more limited degree. Countries that demand substantial additions to the space requirements for weaner and rearing pigs are Sweden, Germany and the Netherlands.<sup>105</sup> Group housing for sows is already required in Sweden (since 1994), in the UK (since

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<sup>100</sup> Van Horne and Achterbosch (2008)

<sup>101</sup> Bock and van Leeuwen (2005)

<sup>102</sup> Van Horne and Achterbosch (2008)

<sup>103</sup> Council Directive 2001/88/EC

<sup>104</sup> [http://ec.europa.eu/food/animal/welfare/farm/pigs\\_en.htm](http://ec.europa.eu/food/animal/welfare/farm/pigs_en.htm)

<sup>105</sup> Mul et al (2010)

1999) and in the Netherlands (since 2008).<sup>106</sup> Outside the EU, Norway and Switzerland have also banned sow stalls.<sup>107</sup> In the US, sow stalls are banned in Florida and are being phased out in Arizona, Oregon, Colorado, California and Maine.<sup>108</sup>

Table 4.1 gives a summary of the EU countries that have introduced stricter animal welfare regulations than the EU requires. More specifically the table lists coming or already introduced EU regulation in certain countries. Countries that have introduced strict animal welfare regulations have done so mainly during the last ten years.

**Table 4.1 Which EU countries have introduced specific animal welfare regulations faster than the EU requires?**

Ban on traditional cages for egg production		Ban on individual sow stalls		Introduction of maximum stocking density for broilers	
Sweden	1988-2004	Sweden	1994	Sweden	1989
Austria	2009	UK	1999	Denmark	2003
Germany	2010	Netherlands	2008		
EU	2012	EU	2013	EU	June 2010

## 4.2 Competitiveness impact of regulation according to previous studies

What the debate about societal concerns and trade boils down to is basically whether or not there is a link between protection of societal concerns and competitiveness. The rationale for introducing trade barriers to protect societal concerns often relies on the assumption that regulation incurs higher production costs and lower competitiveness in relation to

<sup>106</sup>[http://www.ciwf.org.uk/includes/documents/cm\\_docs/2008/w/welfare\\_of\\_europes\\_sows\\_in\\_close\\_confinement\\_stalls.pdf](http://www.ciwf.org.uk/includes/documents/cm_docs/2008/w/welfare_of_europes_sows_in_close_confinement_stalls.pdf), <http://www.defra.gov.uk/foodfarm/policy/publicsectorfood/documents/psfpi-advice-note081222.pdf> and Backus and Dijkhuizen (2002)

<sup>107</sup>[http://www.regjeringen.no/upload/kilde/lmd/prm/2005/0555/ddd/pdfv/246168-parliamentary\\_report\\_number\\_12\\_on\\_animal\\_husbandry\\_and\\_animal\\_welfare\\_recovered.pdf](http://www.regjeringen.no/upload/kilde/lmd/prm/2005/0555/ddd/pdfv/246168-parliamentary_report_number_12_on_animal_husbandry_and_animal_welfare_recovered.pdf), Arey and Brooke (2006)

<sup>108</sup><http://www.humanesociety.org/assets/pdfs/farm/HSUS-Report-on-Gestation-Crates-for-Pregnant-Sows.pdf>

foreign suppliers.<sup>109</sup> This should not be taken for granted without further examination.

Stricter regulation and higher standards may impose higher costs on a firm and adversely affect productivity, but may also increase efficiency, promote cost-reducing innovations and create a larger demand for the firm's output.<sup>110</sup> Further, in the case where strict regulations and high standards do have a negative effect on competitiveness, it is not certain that this effect is economically significant relative to other determinants of competitiveness.

### *Regulation and competitiveness*

So far, the empirical evidence of the connection between stricter regulation/higher standards and competitiveness is inconclusive. Several studies concerning the link between environmental policy and competitiveness were recently reviewed in an OECD report.<sup>111</sup> The conclusion was that it was impossible to give any general answers about if and how environmental policy affected competitiveness. A problem is that the relationship is easily lost in aggregation because the magnitude and direction of competitiveness impacts may differ between different industries and firms, types of policy measures and issues. Competitiveness impacts must hence be investigated on a case-by-case basis and preferably at a detailed level to facilitate clear-cut results.

Few studies have investigated the competitiveness impact of stricter regulation and higher standards in agriculture specifically. Brouwer et al have compared environmental and health-related regulations and standards in the EU, the US, Canada, Australia and New Zealand in order to examine agricultural production cost differences and competitiveness impacts.<sup>112</sup> Their conclusion was that the cost of compliance with regulation may be higher in agriculture than in other sectors, but costs are still very low and are expected to remain low compared to other production costs. Regulation, hence, does not and will not generally drive produc-

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<sup>109</sup> Tothova (2009)

<sup>110</sup> Martin and Maskus (2001) and OECD (2010a)

<sup>111</sup> OECD (2010a)

<sup>112</sup> Brouwer et al (2000)

tion location decisions. The only form of agricultural production where regulation might have a significant effect on the location of production in the future was found to be livestock production. Colyer has also carried out a literature review of studies that examine the link between environmental regulation and competitiveness in agriculture.<sup>113</sup> He concluded that while the literature was inconclusive, it indicated that the costs of environmental regulations are relatively small and do not tend to have a significant impact on competitiveness. Yet, Colyer also pointed out that cost advantages of producers in one country often are very slim. Even low additional costs as a result of regulation can therefore have a critical effect on international competitiveness.

### *Animal welfare regulation and competitiveness*

It has been suggested that animal welfare regulations and standards might have larger competitiveness impacts than other regulations concerning agriculture because of higher compliance costs.<sup>114</sup> Since mandatory regulation about farming methods have been rather uncommon, animal welfare has not been a major issue when it comes to competitiveness until recently. Only limited research has therefore been carried out on the impact of animal welfare regulation on competitiveness. The current trend of increasing legislation on animal welfare in the EU has nonetheless spurred a few studies that investigate cost effects of space requirements for layer hens, broilers and pigs.

When it comes to *layer hens*, cost comparisons of different keeping systems generally find a relationship between production costs and the space standard for hens. In all studies examined, the traditional battery cage is found to be the most cost effective keeping system, but also the one that gives the hens the least amount of space compared to the alternatives enriched cage, barn and free range and organic systems.<sup>115</sup> For example, Van Horne et al compared a traditional cage (550cm<sup>2</sup>/hen) with an enriched cage (750cm<sup>2</sup>/hen) and a barn system (1111cm<sup>2</sup>/hen) in the

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<sup>113</sup> Colyer (2004)

<sup>114</sup> Grethe (2007)

<sup>115</sup> Agra CEAS Consulting (2004), van Horne et al (2007), van Horne and Bondt (2003), Europegroup for animal welfare and RSPCA (2001)

Netherlands.<sup>116</sup> Total production costs for the enriched cage were 7.8% higher than the traditional cage, mainly because of higher housing costs, while production costs for the barn system were 21.4% higher than the traditional cage, because of higher feeding, housing and labor costs as well as a more expensive bird and lower egg production per hen.

On behalf of the European Commission, AgraCeas Consulting studied costs of different keeping systems for layers in the EU and found no significant cost difference between the traditional and the enriched cage, but large cost differences between the traditional cage and the other alternative systems.<sup>117</sup> Weighted average total costs of the barn system were estimated to be 26% higher than those of the traditional cage system. The costs of free range systems were found to be 45% higher than the costs of the traditional cage system. The higher costs were mainly due to higher labor, housing and equipment costs. The costs of the organic system were more than twice as high as the costs of the traditional cage system, foremost because of higher feed, labor, housing and equipment costs.

Van Horne compared production costs of cage eggs in Europe with production costs in the US and Brazil and found that US and Brazilian producers faced 32% and 33% lower costs, respectively, than Dutch producers.<sup>118</sup> Most of the cost difference could be explained by cheaper feed prices in the US and Brazil. Besides, US production takes place in relatively cheap barns on large efficient farms. Brazil additionally benefits from low labor costs. Both countries also have fewer regulations than the EU concerning housing standards, the use of meat-and-bone meal in poultry feed and beak trimming. The absence of such explained 20-25% of the total cost difference between third countries and the EU, implying that regulation would increase the costs of EU producers by 6-7%.

The impact of a reduced stocking density for *broiler chickens* in the EU was simulated in 2000 by the European Commission.<sup>119</sup> Simulations

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<sup>116</sup> Van Horne et al (2007)

<sup>117</sup> Agra CEAS Consulting (2004)

<sup>118</sup> Van Horne (2008)

<sup>119</sup> European Commission (2000)

were based on French conditions, since France had a median position between Northern and Southern European countries when it came to production systems. Three stocking densities (20, 25 and 30kg/m<sup>2</sup>) were compared with the, at that time, common density of 38.4kg/m<sup>2</sup>.<sup>120</sup> It was estimated that production costs would increase by 5.3%, 10.2% and 17.5% when stocking density was reduced to 30, 25 and 20kg/m<sup>2</sup>, respectively, given that no performance improvement resulted from the reduced density. The French case was also compared to what a reduction in stocking density would mean cost-wise in Sweden and Spain. In Sweden, costs would increase by 3.7%, 7.5% and 14.2% at stocking densities of 30, 25 and 20kg/m<sup>2</sup> respectively.<sup>121</sup> Spanish production costs, on the other hand, would be unaffected since stocking density there is usually already lower than 20kg/m<sup>2</sup>.

In a more recent study Van Horne made an international comparison of production costs of broiler meat. Five EU countries (the Netherlands, Germany, France, the UK and Poland) were compared with the US, Thailand and Brazil.<sup>122</sup> Countries outside the EU had significantly lower production costs. The US had 32% lower costs, Brazil 33% lower costs and Thailand 13% lower costs than the Netherlands. That the US and Brazilian production costs were so much lower was mostly explained by lower feed prices, a result of a large local supply of feed ingredients. Brazil and Thailand also had favorable climate conditions and low labor costs. A less important factor for the cost differences was the more stringent EU regulations. For instance, antimicrobial growth stimulators and meat-and-bone meal in feed are not allowed in the EU.<sup>123</sup> Simulations were also done to examine what future changes of regulation in the EU would mean for producers in different countries. Reducing ammonia emissions and controlling salmonella were generally found to have larger cost impacts than increasing animal welfare in terms of reducing bird density. Only the Netherlands would be significantly affected by a re-

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<sup>120</sup> The stocking densities compared with the standard case were hence all lower than the density required in Directive 2007/43/EC, which ranges between 33kg/m<sup>2</sup> and 42kg/m<sup>2</sup>.

<sup>121</sup> Remember that stocking density in Sweden was set to a maximum of 36kg/m<sup>2</sup> at the time of the study.

<sup>122</sup> Van Horne (2009)

<sup>123</sup> At the time of the study, the EU did not have any regulation on maximum stocking density.

duction in stocking density since average bird density is higher in the Netherlands than other countries.

The costs of *pig* production and the impact of animal welfare regulation have also been examined. Hoste and Puister have compared production in EU countries with production in the US and Brazil.<sup>124</sup> The main results are similar to those of egg and broiler production. Production costs are considerably lower outside the EU and this is foremost due to cheaper feed costs. Housing costs are also lower in both the US and Brazil while labor costs are particularly low in Brazil. Additional costs of policy measures in the EU were also examined in different EU countries. Animal welfare regulations were generally estimated to be of minor importance for total production costs both now and in 2013 when more stringent regulation is supposed to be in place. Only the Netherlands and Germany would be affected by animal welfare regulations, which demand, for example, a larger surface area per pig, in any significant way. Environmental and public health regulations often had a larger impact on pig production costs than animal welfare measures.

Hoste also analyzed in detail the economic consequences of increased living spaces for pigs.<sup>125</sup> Different scenarios were estimated based on either an extension of the barn or on a reduction of the number of animals. If the barn was extended and the area per pig went from 0.7m<sup>2</sup> to 1.0m<sup>2</sup>, total costs increased by 1.8%. If the number of pigs instead was reduced, but the area per pig still went from 0.7m<sup>2</sup> to 1.0m<sup>2</sup>, costs would increase by 6%. Furthermore, the European Commission calculated what the abolition of individual sow stalls would mean for production costs.<sup>126</sup> It estimated that production costs would increase by €0.006-0.02 per kilo pig carcass with the introduction of group housing for sows.

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<sup>124</sup> Hoste and Puister (2009)

<sup>125</sup> Hoste (2010)

<sup>126</sup> European Commission (2001)

### **4.3 Conclusion**

In sum, there is no evidence so far that regulation to protect societal concerns is a major determinant of competitiveness in agriculture. Regulation in general and animal welfare regulation in particular seem to have only a minor influence on production costs. Differences in animal welfare regulation cannot explain the sometimes large production cost differences between the EU and third countries when it comes to egg, chicken and pig production. The most important determinant of competitiveness in these cases is by far the cost of feed, followed by the costs of housing and labor. Even regulations that introduce more stringent space requirements for farm animals are not expected to affect total costs in a significant way for most EU producers. The regulation that is estimated to have the largest influence on production costs among the animal-specific EU animal welfare regulations is the ban on traditional cages for egg production. This coming ban can raise production costs by about 8%. A future total ban on cages, i.e. on enriched cages as well as traditional cages, could further raise egg production costs by at least 20%. At present, no such ban is being decided on an EU level.



# 5

## EU Trade with Agrifood Products

Chapter 5 continues the analysis of the potential threat trade and trade liberalization pose to domestic values in the EU. This chapter is devoted to an investigation of EU trade in agrifood products. What are the trade patterns of the EU, a region with relatively stringent regulation requirements for agrifood production? Are trade deficits present in many products?

### 5.1 EU trade with food and beverages

The EU is the world's leading exporter and importer of food and beverages. In 2008 the total value of EU imports of food and beverages amounted to EUR 81 billion, while the total value of exports of the same was EUR 68 billion. The total EU food and beverages trade (imports plus exports) consequently had a value of EUR 149 billion. This can be compared to the value of the total output of the agricultural industry which was EUR 379 billion in EU27 in 2008.<sup>127</sup> The value of total trade of the world's second largest food trader, the United States (US), was EUR 122 billion the same year. As shown in Figure 5.1 below, other large exporters and importers of food and beverages do not come close to the trade values of the EU and the US. Figure 5.1 also shows the trade balances of the major players in the worldwide food and drink trade. Both the EU and Japan showed trade deficits, i.e. they imported more than they exported, in food and beverages in 2008 while the US more or less broke even. Canada and China on the other hand had trade surpluses; they exported more than they imported.

Figure 5.2 shows the evolution of EU27 trade with food and beverages from 1999 to 2008. In the beginning of the 2000s, the value of both extra-EU27 exports and imports, i.e. trade with non-EU27 members, remained rather stable, but the values rose steadily after 2004.<sup>128</sup> Between 1999 and

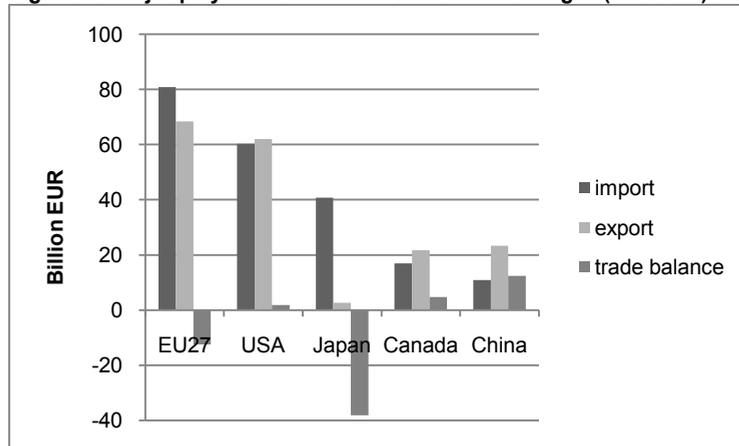
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<sup>127</sup> Eurostat. Total output is valued at basic prices which are defined as the price received by the producer, after deduction of all taxes but inclusion of all subsidies, on products. The output of the agricultural industry is made up of the sum of the output of agricultural products, agricultural services and goods and services produced in inseparable non-agricultural secondary activities.

<sup>128</sup> It can be mentioned that this shift in growth rate coincides with the EU enlargement in 2004

2008 both extra EU-27 exports and imports increased by roughly 60%.<sup>129</sup> Exports and imports had a similar development during the whole examined period and imports exceeded exports every year. This trade deficit grew slightly in the last few years.

**Figure 5.1 Major players in worldwide food and beverages (SITC 0+1) trade 2008**

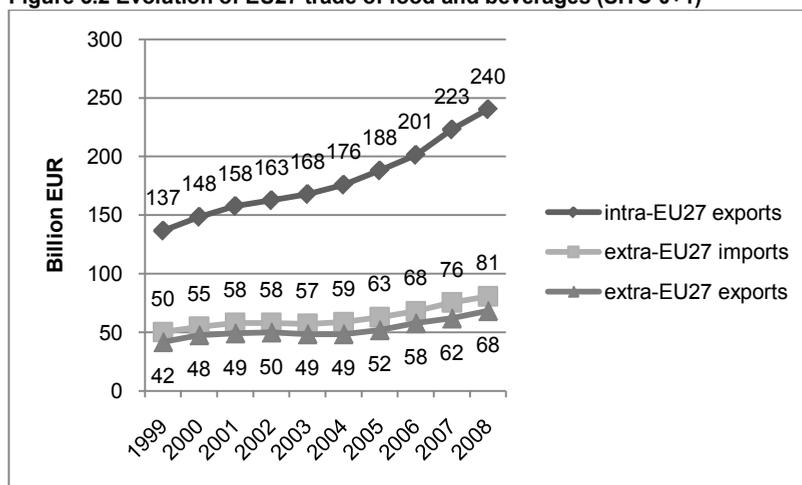


Source: Eurostat

Figure 5.2 depicts intra-EU27 exports to give an idea of how important external trade is in comparison to internal trade. As can be seen, the value of internal EU27 trade of food and beverages outweighed, by far, the value of external trade of the same products. External exports (imports) were equivalent to about a third of the internal exports (imports) in 2008. Internal EU27 trade also grew more rapidly and more consistently than external trade. In total, internal exports of food and beverages grew by 75% from 1999 to 2008.

<sup>129</sup> The increase is calculated in nominal terms

**Figure 5.2 Evolution of EU27 trade of food and beverages (SITC 0+1)**



Source: Eurostat

A more detailed description of extra-EU27 exports, imports and trade balances of different food products for the last years is found in Table 5.1a-b below. Exports of all main food products except *sugars, sugar preparations and honey* increased between 2004 and 2008. The largest annual export value growth during the period was recorded for *vegetables and fruit* and the largest export growth in a single year was noted for *cereals and cereal preparations*. Other products that experienced a very positive export development were *feeding stuff for animals* and *coffee, tea, cocoa and spices*. The most exported product during the period was *beverages*, but its share of total exports declined as especially *cereals and cereal preparations* and *vegetables and fruit* became more important export goods. It can further be mentioned that the most exported beverage in 2008 was alcoholic beverages and wine in particular.<sup>130</sup>

When it comes to extra-EU27 imports, Table 5.1a shows that the import value of most food products increased between 2004 and 2008. There were decreases, though, for *live animals; dairy products and bird's eggs* and *tobacco*. Large increases were recorded for *cereals and cereal preparations; coffee, tea, cocoa and spices*, and for *meat and meat preparations* as well as for *feeding stuff for animals*.

<sup>130</sup> Eurostat (2009a)

**Table 5.1a Extra-EU27 trade of food and beverages (SITC 0+1) in million EUR**

	2004	2005	2006	2007	2008
<b>Exports</b>					
<b>0 Food and live animals</b>	33670	35852	39399	42556	48898
00 live animals	975	1041	1043	1096	1103
01 meat and meat preparations	4018	3930	4109	4235	5403
02 dairy products and birds' eggs	5316	5293	5162	6373	6750
03 fish, crustaceans and molluscs	2170	2300	2414	2580	2775
04 cereals and cereal preparations	5041	5402	5795	6699	9967
05 vegetables and fruit	5224	5542	6502	7382	7940
06 sugars, sugar prep., honey	1653	2250	2898	1579	1467
07 coffee, tea, cocoa and spices	2981	3227	3656	4042	4276
08 feeding stuff for animals	1503	1661	1911	2145	2436
09 miscellaneous edible products and preparations	4788	5206	5908	6425	6782
<b>1 Beverages and tobacco</b>	14888	16143	18526	19471	19448
11 beverages	12874	13840	16202	17127	16735
12 tobacco	2007	2299	2321	2337	2701
<b>Imports</b>					
<b>0 Food and live animals</b>	53009	57177	61814	68976	74479
00 live animals	436	535	579	457	352
01 meat and meat preparations	3695	4360	4697	5026	5271
02 dairy products and birds' eggs	763	698	729	759	745
03 fish, crustaceans and molluscs	12145	13758	15818	16125	16117
04 cereals and cereal preparations	3016	2437	2607	5218	6350
05 vegetables and fruit	16098	17803	18667	20519	21230
06 sugars, sugar prep., honey	2034	2095	2246	2181	2368
07 coffee, tea, cocoa and spices	6869	7999	8741	9743	11116
08 feeding stuff for animals	6525	5898	5998	7011	8833
09 miscellaneous edible products and preparations	1428	1593	1732	1938	2099
<b>1 Beverages and tobacco</b>	5812	5830	6179	6627	6332
11 beverages	3740	3795	4137	4552	4435
12 tobacco	2027	2016	2022	2068	1890

Source: Eurostat (2009b)

The most imported product groups during the period were *vegetables and fruit* followed by *fish, crustaceans and molluscs*. In 2008 the most imported

products within these two product groups were bananas and frozen fish fillets.<sup>131</sup> Vegetables and fruit were mainly imported from Turkey, the US, Brazil and South Africa. Fish, crustaceans and molluscs were primarily sourced from Norway, China and Iceland.<sup>132</sup>

**Table 5.2b Extra-EU27 food and beverages (SITC 0+1) trade balance in million EUR**

	2004	2005	2006	2007	2008
<b>Trade balance</b>					
<b>0 Food and live animals</b>	-19339	-21324	-22415	-26420	-25580
00 live animals	539	506	464	640	751
01 meat and meat preparations	323	-430	-588	-791	132
02 dairy products and birds' eggs	4554	4595	4433	5614	6006
03 fish, crustaceans and molluscs	-9975	-11458	-13404	-13545	-13342
04 cereals and cereal preparations	2025	2965	3188	1481	3617
05 vegetables and fruit	-10874	-12261	-12465	-13138	-13290
06 sugars, sugar prep., honey	-380	155	652	-601	-901
07 coffee, tea, cocoa and spices	-3888	-4773	-5085	-5701	-6840
08 feeding stuff for animals	-5021	-4237	-4088	-4866	-6396
09 miscellaneous edible products and preparations	3360	3613	4176	4487	4682
<b>1 Beverages and tobacco</b>	9076	10313	12348	12843	13116
11 beverages	9134	10045	12065	12574	12300
12 tobacco	-19	283	299	269	811

Source: Eurostat (2009b)

The EU27 trade balance for food products was negative during the whole period from 2004 to 2008, as can be seen in Table 5.1b. This negative trade balance was mainly due to large trade deficits in four product groups: *fish, crustaceans and mollusks; vegetables and fruit; coffee, tea, cocoa and spices* and *feeding stuff for animals*. Trade deficits were consistent and increasing for these groups, despite positive export developments. Trade surpluses were nonetheless recorded for several products. *Beverages* had a trade surplus every year and the greatest surplus of all the examined products. Other significant surpluses were found for *dairy products and*

<sup>131</sup> UN Comtrade

<sup>132</sup> Eurostat (2009a)

*birds' eggs; miscellaneous edible products and preparations and cereals and cereal preparations.*

## **5.2 Main trade partners**

The US was the main destination for EU food and beverages exports over the period 2004 to 2008, as shown in Table 5.2 below. The proportion of exports to the US of total EU27 exports fell, though, since exports to the US remained stable while exports to other countries increased. One country that significantly increased its share of EU27 exports was Russia, the EU's second most important export partner. Exports to China, Turkey and Brazil also grew strongly, but these countries' shares of total EU27 exports are still low. Switzerland and Japan were other important export destinations for EU food and beverages.

The ten most important export destinations for EU food and beverages are also the ten most important sources of EU food and beverages imports. Brazil was the EU27's main source of food and beverages imports every year from 2004 to 2008. The share of imports from Brazil also increased steadily over the whole period. Other key import partners were Argentina and the US. Imports from the US remained rather stable during the examined period while imports from Argentina increased. Imports from China and Switzerland also grew strongly.

The EU27 had the largest trade deficit with Brazil from 2004 to 2008. A quite substantial trade deficit was also recorded for Argentina during the whole period while smaller deficits were noted for China, Turkey and Norway. At the same time, the EU27 had trade surpluses with the US, Russia, Switzerland, Japan and Canada. However, these were smaller than the total trade deficits, which gave the EU a negative trade balance with its main trade partners.

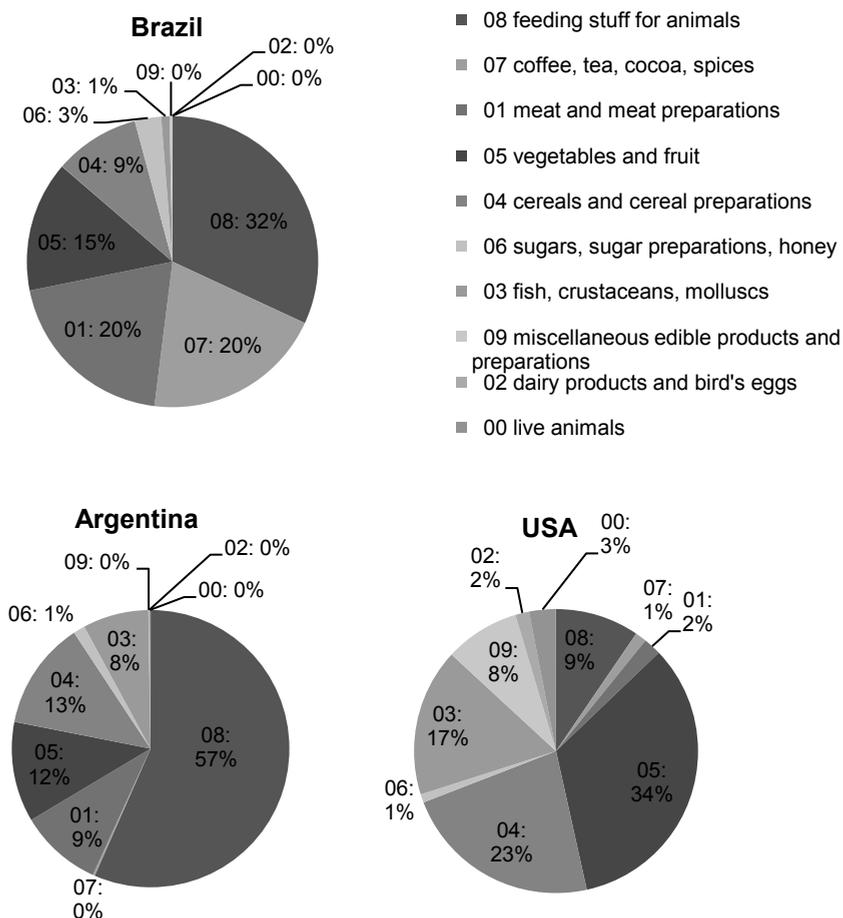
**Table 5.3 Extra-EU27 trade of food and beverages (SITC 0+1) by main partners in billion EUR**

	2004	2005	2006	2007	2008
<b>Exports</b>					
Extra EU-27	48.56	52	57.93	62.03	68.35
United States	9.89	10.15	11.35	11.2	10.01
Russian Federation	4.04	4.62	5.92	6.76	7.57
Switzerland	3.68	3.77	4.14	4.38	5.02
Japan	3.8	3.63	3.64	3.73	3.89
Norway	1.53	1.68	1.91	2.22	2.42
Canada	1.52	1.62	1.85	1.9	1.95
China (excl. Hong Kong)	0.63	0.8	0.88	1.19	1.33
Turkey	0.58	0.76	0.78	0.99	1.17
Brazil	0.32	0.36	0.44	0.52	0.6
Argentina	0.05	0.05	0.06	0.08	0.08
<b>Imports</b>					
Extra EU-27	58.82	63.01	67.99	75.6	80.81
Brazil	6.84	7	7.26	9.12	9.49
Argentina	4.41	4.3	4.93	5.93	7.32
United States	5.44	5.44	5.49	5.87	6.01
China (excl. Hong Kong)	1.82	2.27	2.81	3.36	3.55
Turkey	2.45	2.95	3.02	3.05	3.14
Norway	2.2	2.57	3.02	3.06	3
Switzerland	1.56	1.69	2.05	2.41	2.72
Canada	1.32	1.23	1.32	1.42	1.45
Russian Federation	0.62	0.66	0.8	0.89	0.86
Japan	0.1	0.11	0.12	0.11	0.12
<b>Trade balance</b>					
Extra EU-27	-10.26	-11.01	-10.07	-13.58	-12.46
United States	4.45	4.71	5.86	5.33	4
Brazil	-6.52	-6.64	-6.82	-8.6	-8.89
Russian Federation	3.42	3.96	5.12	5.87	6.72
Switzerland	2.12	2.09	2.09	1.97	2.3
Argentina	-4.37	-4.25	-4.86	-5.86	-7.24
Norway	-0.67	-0.89	-1.1	-0.84	-0.59
China (excl. Hong Kong)	-1.19	-1.47	-1.92	-2.17	-2.22
Turkey	-1.87	-2.19	-2.23	-2.06	-1.96
Japan	3.7	3.51	3.53	3.62	3.77
Canada	0.21	0.39	0.53	0.48	0.5

Source: Eurostat

Figure 5.3 depicts EU27 imports from its top three import partners (Brazil, Argentina and the US) in 2008 by product. The most imported food product from both Brazil and Argentina was *feeding stuff for animals* while the most imported product from the US was *vegetables and fruit*. Other major imports from Brazil were *coffee, tea, cocoa and spices*; *meat and meat preparations* and *vegetables and fruit*. *Vegetables and fruit* were one of the main imports from Argentina as well and so were *cereals and cereal preparations*. The second and third most important imports from the US were *cereals and cereal preparations* and *fish, crustaceans and molluscs*.

**Figure 5.3 EU27 imports of food (SITC 0) from its top three import partners in 2008 by product**



Source: UN Comtrade

In sum, the most imported food products from the EU27's main trade partners coincide to a large extent with the most imported food products of the EU27. All the products in which the EU27 has a large trade deficit are also represented among the most imported products from the main trade partners.

In conclusion, the EU has had an increasing negative trade balance in food and beverages the last few years despite rising export values. The negative trade balance is mainly due to large trade deficits in four product groups: *fish, crustaceans and molluscs*; *vegetables and fruit*; *coffee, tea, cocoa and spices* and *feeding stuff for animals*. The EU's main export partners are the US, Russia and Switzerland, while the main import partners are Brazil, Argentina and the US. The EU had the largest trade deficits with Brazil and Argentina in 2008. It is worth pointing out that the large EU trade deficits in the product groups, *vegetables and fruit* and *coffee, tea, cocoa and spices* are mainly due to imports of tropical products that are only, if at all, grown in the EU to a limited extent.<sup>133</sup> A trade deficit in these groups is hence rather expected. The trade deficit in *fish, crustaceans and molluscs* can at least partly be explained by a high EU demand for certain fish products such as salmon and shrimp, for which there is a limited supply within the union.<sup>134</sup>

### 5.3 EU-trade with eggs, poultry and pig meat

The products that are affected by specific animal welfare regulation in the EU are eggs, poultry and pig meat. A look at the last years' import trends and self-sufficiency levels of these products indicates how well EU producers handle the current competitive pressures from abroad. Figure 5.4 shows EU27 import values of eggs, poultry and pig meat for the period 2000-2009 and reveals general import trends before any of the specific animal welfare regulations mentioned above entered into force.

Imports of eggs, poultry and pig meat increased overall during the 2000s, but not consistently over the whole period, as shown in Figure 5.4.

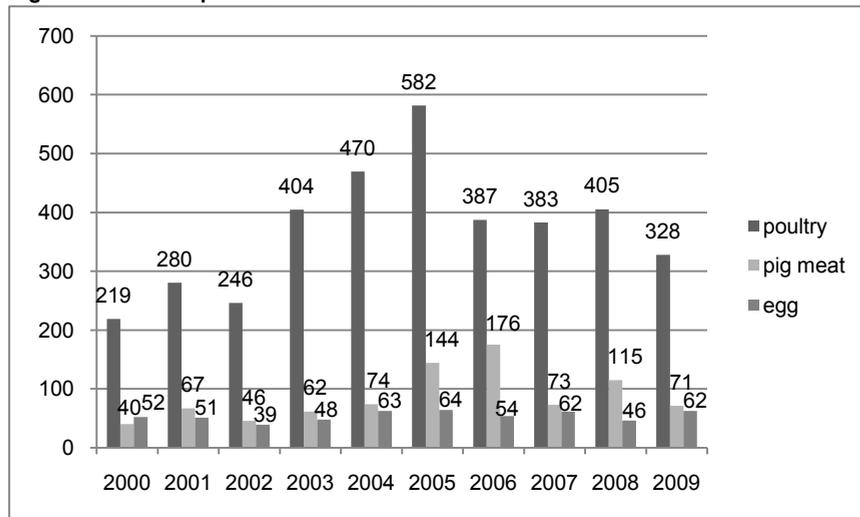
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<sup>133</sup> The most imported product from the *vegetables and fruit* group is, as previously mentioned, bananas and the most imported product in the *coffee, tea, cocoa and spices* group is coffee

<sup>134</sup> [http://trade.ec.europa.eu/doclib/docs/2007/march/tradoc\\_133509.pdf](http://trade.ec.europa.eu/doclib/docs/2007/march/tradoc_133509.pdf)

Imports of poultry and pig meat increased rapidly in the beginning of the 2000s, but decreased rather substantially after the peak years (2005 for poultry and 2006 for pig meat). Eggs had a more stable import development than poultry and pig meat, and only small import fluctuations occurred from 2000 to 2009. Imports of all three products were nonetheless higher in the end than in the beginning of the decade. Lastly, it can be mentioned that poultry was, by far, the most imported product of the three during the whole period examined, followed by pig meat and eggs.

**Figure 5.4 EU27 imports 2000-2009 in million EUR**



Source: Eurostat. Egg imports consist of HS categories 0407 and 0408, poultry imports of HS category 0207 and pig meat imports of HS category 0203.

To put the import values in Figure 5.4 in perspective, Table 5.3 shows the EU self-sufficiency levels of eggs, poultry and pig meat from 2003 to 2007. The EU was a net exporter of all the examined products during the whole period.<sup>135</sup> Self-sufficiency levels were relatively stable despite the fact that imports, especially poultry and pig meat, fluctuated substantially. That self-sufficiency levels were not more affected by the fluctuations of imports may be explained by the fact that EU imports of eggs, poultry

<sup>135</sup> This does not mean that each EU-country is self-sufficient, only that the EU in total is. Competitiveness differs between different EU producers.

and pig meat were quite small in comparison to EU production. For example, in 2005 the EU produced 21.1 million tonnes of pig meat and only imported 22 000 tonnes (imports were equivalent to 0.01% of total production). The same year the EU produced 10.1 million tonnes of poultry and imported 590 000 tonnes (imports were equivalent to 6% of total production). Lastly, the EU produced 7.0 million tonnes of eggs in 2005 and imported a mere 30 000 tonnes (imports were equivalent to 4% of total production).<sup>136</sup> Thus, imports only accounted for a small share of EU consumption of these products.

**Table 5.3 EU self-sufficiency levels (%)**

	<b>Egg</b>	<b>Poultry</b>	<b>Pig meat</b>
<b>2003</b>	101.3	102.6	n.a.
<b>2004</b>	102.5 (EU25)	104.3 (EU25)	107.0 (EU25)
<b>2005</b>	102.4	102.9	107.6
<b>2006</b>	102.3	103.0	108.2
<b>2007</b>	n.a.	n.a.	106.9 (EU27)

Source: [http://ec.europa.eu/agriculture/markets/eggs/index\\_en.htm](http://ec.europa.eu/agriculture/markets/eggs/index_en.htm),  
[http://ec.europa.eu/agriculture/markets/poultry/index\\_en.htm](http://ec.europa.eu/agriculture/markets/poultry/index_en.htm) and  
[http://ec.europa.eu/agriculture/markets/pig/index\\_en.htm](http://ec.europa.eu/agriculture/markets/pig/index_en.htm)

In conclusion, EU producers of eggs, poultry and pig meat handled the competitive pressures from abroad reasonably well before the specific animal welfare regulations entered into force. The attentive reader might find this surprising, as it was mentioned above that third countries, such as Brazil and the US, have a comparative advantage in eggs, poultry, and pig meat production due to lower feed and labor costs. That import volumes from third countries remained low was mainly due to high import tariffs, quotas and sanitary protection.<sup>137</sup> For example, average EU import tariffs on meat and meat products were 40% for the period 1995-2007.<sup>138</sup> The substantial financial support paid to EU producers as part of the Common Agriculture Policy (CAP) likely contributed to sustained

<sup>136</sup> Note: 1 tonne = 1 metric ton. Sources: [http://ec.europa.eu/agriculture/markets/eggs/index\\_en.htm](http://ec.europa.eu/agriculture/markets/eggs/index_en.htm),  
[http://ec.europa.eu/agriculture/markets/poultry/index\\_en.htm](http://ec.europa.eu/agriculture/markets/poultry/index_en.htm) and  
[http://ec.europa.eu/agriculture/markets/pig/index\\_en.htm](http://ec.europa.eu/agriculture/markets/pig/index_en.htm)

<sup>137</sup> European Commission (2007)

<sup>138</sup> Hammarlund (2011)

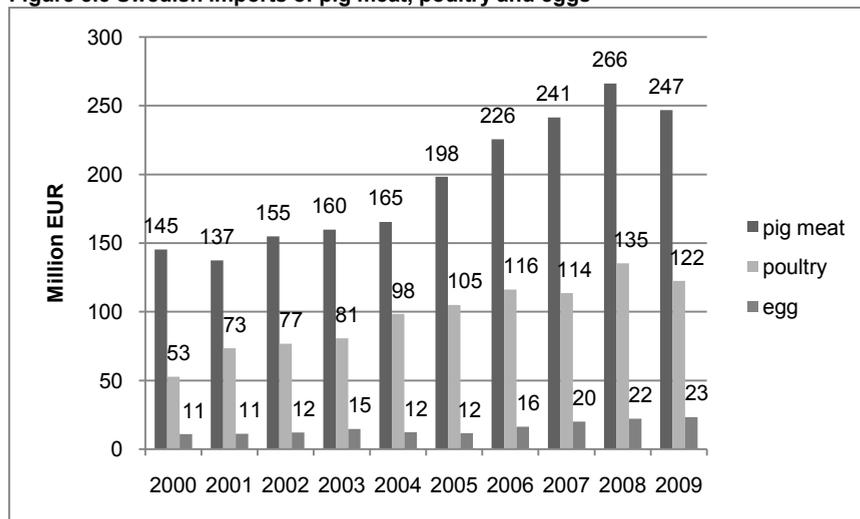
self-sufficiency levels of products where the EU has a comparative disadvantage.

Future import volumes may be affected by the coming specific animal welfare regulations. According to the research cited above, this is improbable. Regulation is not a major determinant of competitiveness in general and only minor cost increases are expected of these specific regulations. This being said, it is still interesting to examine imports and self-sufficiency levels of EU-countries that have introduced parts of the coming regulations in advance, especially since, as noted above, even low additional costs can affect competitiveness if the cost advantages of producers in a country are slim.

### *The case of Sweden*

Table 4.1 shows that Sweden is the only EU country that has introduced a ban on traditional cages, a ban on individual sow stalls and stocking-density EU regulations in advance. Sweden will therefore serve as the example of an EU country with more stringent regulations.

**Figure 5.5 Swedish imports of pig meat, poultry and eggs**



Source: Eurostat. Egg consists of HS categories 0407 and 0408, poultry of HS category 0207 and pig meat of HS category 0203.

Figure 5.5 illustrates Swedish imports of pig meat, poultry and eggs from 2000 to 2009.<sup>139</sup> Imports of all products increased during the decade and the increases were more consistent than those of total EU imports in Figure 5.4 above. When comparing the relative import increases between 2000 and 2009, it can be seen that these were generally larger in the Swedish case than in the EU case. It should be noted that Figure 5.5 includes imports from both EU countries and third countries. Most Swedish imports originate in another EU country, which is expected because the EU is a single market and therefore does not have any internal tariffs or import quotas.<sup>140</sup>

**Table 5.4 Swedish self-sufficiency levels (%)**

	<b>Pig meat</b>	<b>Poultry</b>	<b>Egg</b>
<b>2000</b>	87.4	87.4	92.9
<b>2001</b>	89.3	85.5	91.9
<b>2002</b>	87.7	84.0	92.6
<b>2003</b>	88.9	82.4	88.9
<b>2004</b>	89.7	75.1	88.4
<b>2005</b>	85.9	75.0	88.3
<b>2006</b>	83.0	74.4	85.5
<b>2007</b>	81.3	74.6	81.9
<b>2008</b>	81.4	69.6	87.3

Source: Swedish Board of Agriculture and author's calculations<sup>141</sup>

Swedish self-sufficiency levels for pig meat, poultry and eggs were below 100% for all products every year from 2000 to 2008, as can be seen in

<sup>139</sup> The import values in Figure 5.5 can be compared to the production values of the same products. In 2007, for example, pig meat was produced to a value of SEK 3383 million (equivalent to MEUR 360), poultry meat was produced to a value of SEK 1000 million (equivalent to MEUR 106) and eggs were produced to a value of SEK 1000 million (equivalent to MEUR 106). Source: Jordbruksverket and SCB (2009) (currency conversion made by author)

<sup>140</sup> Eurostat and author's calculations.

<sup>141</sup> Self-sufficiency levels are calculated as production/consumption. Production and consumption figures are gathered from the Swedish Board of Agriculture. Consumption is calculated as production + import – export by the Swedish Board of Agriculture.

<http://www.jordbruksverket.se/amnesomraden/handel/politikochframtid/eusjordbrukspolitik/griskott.4.67e843d911ff9f551db80008884.html>,

<http://www.jordbruksverket.se/amnesomraden/handel/politikochframtid/eusjordbrukspolitik/fagelkott.4.1bd41dbf120d2f595da80005401.html>,

<http://www.jordbruksverket.se/amnesomraden/handel/politikochframtid/eusjordbrukspolitik/agg.4.6f6c5d8512157aa59fc8000105.html>

Table 5.4. Furthermore, self-sufficiency levels decreased during the examined period. Self-sufficiency of poultry decreased the most and went from 87.4% in 2000 to 69.6% in 2008. This situation is very different from the one pictured in Table 5.3 above. Swedish self-sufficiency was clearly lower than EU self-sufficiency and also experienced a more negative development.

Examining trade statistics and self-sufficiency levels only takes you so far. Even if it is interesting to compare numbers and see that Sweden imports more and has lower self-sufficiency levels than the EU, the more interesting question of why is left unanswered. What we really want to know here is whether stricter animal welfare regulations have contributed to larger import volumes. Or is Sweden just not as efficient as other EU countries when it comes to production of eggs, poultry and pig meat? More advanced methods are necessary to examine this. The next chapter will try to take the analysis to the next level by quantifying the effect of animal welfare regulation on imports.

# 6

## The Effect of Animal Welfare on EU intra-trade

In this chapter the effect of animal welfare regulation on internal EU trade is quantified with a gravity model. The regulations in focus are the above mentioned ones, concerning pig meat, broiler chicken and egg production that have just entered, or are about to enter, into effect on an EU level. The aim of the following analysis is to see if trade flows of pig meat, chicken and eggs have been affected in EU countries that have chosen to introduce these regulations, or parts of them, in advance. Readers not interested in details of the econometric model can skip directly to the non-technical conclusion of this chapter.

### 6.1 The Gravity Model

Since the ground-breaking work of Tinbergen in the 1960s, the gravity model has been used to analyze bilateral trade flows.<sup>142</sup> The model, originally inspired by Newton's law of gravity, presumes that economic mass and commercial distance, or trade resistance, are the core determinants of bilateral trade flows. Economic mass is assumed to affect trade flows positively, while commercial distance is assumed to have a negative effect on trade flows. Consequently, bilateral trade is expected to increase with the size and proximity of trade partners.

The application of the gravity model was at first somewhat controversial because 1) the presumptions of the model were not embedded in any theoretical model of trade and, 2) some econometric issues related to estimation were unresolved. Despite this, the gravity model has become immensely popular since it has performed very well empirically.<sup>143</sup> Over the years, the theoretical shortcomings of the model have been attended to and better estimation techniques have been developed.<sup>144</sup> It has now been shown that the gravity model is derivable from different models of

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<sup>142</sup> Tinbergen (1962)

<sup>143</sup> Greenaway and Milner (2002)

<sup>144</sup> Anderson (1979), Helpman and Krugman (1985), Deardorff (1998), Feenstra (2002), Anderson and van Wincoop (2003) and Helpman et al (2007)

trade in both homogeneous and differentiated products.<sup>145</sup> The gravity model is thus founded in both traditional and new trade theory.<sup>146</sup>

A key insight in the recent contributions of the theoretical foundations of the gravity model is the importance of how trade resistance is defined. In the traditional gravity model, trade resistance is reflected by different proxies for bilateral trade costs. As shown by Anderson and van Wincoop, trade resistance between two countries depends on the bilateral trade costs between them relative to average trade costs that both countries face with all trade partners.<sup>147</sup> When specifying trade resistance, both bilateral and multilateral resistance should therefore be taken into account, since it is the relative trade costs that are important for bilateral trade flows. If multilateral resistance variables are not included in the gravity model, we will have an omitted variable problem leading to biased estimates.<sup>148</sup>

A theory consistent gravity equation based on Anderson and van Wincoop's theoretical foundation of the gravity model can be expressed as:

$$M_{ij} = \frac{Y_i C_j}{Y_w} \left( \frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma}, \quad \Pi_i = \left( \sum_j (t_{ij}/P_j)^{1-\sigma} \theta_j \right)^{1/(1-\sigma)} \quad (6.1)$$

where  $M_{ij}$  is imports by country  $i$  from country  $j$ ,  $Y$  is country  $j$ 's or the world's production,  $C_j$  is the consumption of country  $i$ ,  $\Pi_i$  and  $P_j$  are multilateral resistance variables of  $i$  and  $j$ ,  $t_{ij}$  are absolute trade costs between  $i$  and  $j$ ,  $\theta_j$  is  $j$ 's share of world income and  $\sigma$  represents the elasticity of substitution. This equation suggests what was written in words above, namely that trade between two countries depends on economic mass and the bilateral barriers between them relative to both countries' average trade barriers to other trade partners.

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<sup>145</sup> Greenaway and Milner (2002)

<sup>146</sup> For more information on the theoretical foundations of the gravity model, see Gullstrand (forthcoming)

<sup>147</sup> Anderson and van Wincoop (2003) Given a bilateral trade cost for trade between exporter  $i$  and importer  $j$ , higher trade costs between  $j$  and its other trade partners will give a reduction of the relative price of goods from  $i$  and consequently increase imports from  $i$ . If exporter  $i$  faces higher trade costs with other partners, the demand for its products will go down and hence also its supply price. This will result in increased trade between  $i$  and  $j$  given bilateral trade costs between the two countries.

<sup>148</sup> Multilateral resistance correlates with bilateral trade costs. When multilateral resistance variables are excluded from the model the error term will correlate with distance and other variables determining bilateral trade costs. This will bias the estimate of distance and other variables reflecting bilateral trade upwards.

The most common way to analyze the gravity equation is to use a log-log specification:

$$\ln M_{ij} = \ln \alpha + \ln Y_i + \ln C_j + (1 - \sigma) \ln D_{ij} + (1 - \sigma)(\delta_{ij}) \ln B_{ij} - \ln(\Pi_i)^{\sigma-1} - \ln(P_j)^{\sigma-1} \quad (6.2)$$

In the log-log specification  $\alpha$  represents the gravity constant  $1/y_w$ . Absolute trade costs between  $i$  and  $j$ ,  $t_{ij}$ , have further been divided into its two components:  $D_{ij}$ , which is distance between the trade partners, and  $B_{ij}$ , which is border costs.<sup>149</sup>  $B_{ij}$  is equal to 1 for domestic trade flows and  $B_{ij} - 1$  is equal to the tariff equivalent of the border costs. Lastly,  $\delta$  is the effect of distance on trade flows. When estimating the gravity model, it is common to expand the cost function with a range of other observable costs such as cultural barriers (indicators of common languages, religion etc.), manmade costs (tariffs, preferential trade agreements etc.) and natural barriers (indicators of adjacency, if a country is landlocked etc.). As can be seen in equation 6.2, all trade costs interact with the elasticity of substitution. This means that it is impossible to distinguish the true elasticity of distance and border costs as long as the value of  $\sigma$  is unknown. Still, it is possible to interpret the estimated coefficient of border costs as how much more trade there is within a country compared to across the border.<sup>150</sup>

The multilateral resistance terms suggested by Anderson and van Wincoop are calculated with price indices derived from a general equilibrium model.<sup>151</sup> This method is rather complex and does not guarantee unbiased results in a world with asymmetric trade costs. Different approaches have therefore been developed to take account of the unobservable multilateral resistance variables in the estimation of the gravity equation.<sup>152</sup> Often used approaches are to calculate remoteness variables or to use country-specific exporter and importer dummy variables to

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<sup>149</sup> It is assumed that  $t_{ij}$  can be expressed in log-linear form such as  $t_{ij} = b_{ij} d_{ij}^{\delta}$

<sup>150</sup> Gullstrand (forthcoming). Another problem with the elasticity of substitution is that it can vary between different sectors. This effect is on the intensive margin of trade, or in other words how much existing exporters expand their export when trade costs are reduced.

<sup>151</sup> See Anderson and van Wincoop (2003)

<sup>152</sup> Gullstrand (forthcoming)

capture fixed effects.<sup>153</sup> The second option is often preferred for its simplicity, and because it has the advantage of sweeping out other unobservable variables omitted in the trade cost function.<sup>154</sup> The benefit of using the Anderson and van Wincoop calculation method, i.e. more efficient estimates, is relatively small compared to the computational simplicity of the fixed effect approach.<sup>155</sup> Note that using country-specific exporter and importer dummy variables are not enough to capture multilateral resistance in panel data, since that does not remove time-series bias. One solution to this problem is to let the country-specific dummy variables vary with time.<sup>156</sup>

### *Zero Trade Flows*

Zero or missing trade flows are an empirical reality in most data sets, but vary with country selection and level of aggregation. All countries simply do not produce every good or demand every product. Haveman and Hummels have shown that in 1990 importers bought from fewer than 10% of the available exporters in 58% of the cases examined.<sup>157</sup> When zero trade flows are present, the common log-log specification of the gravity model leads to econometric difficulties, since the logarithm of zero is undefined.

Different solutions have been suggested to come to terms with the problem that zero trade flows entail. One common strategy is to omit all zero-valued trade flows. Another option is to arbitrarily add a small number to all trade flows, for example 1, so that the logarithm of trade flows is defined for all countries. Omitting zero-valued flows means that we lose information on low levels of trade, which may lead to biased results. This is especially problematic if the zero-valued trade flows are non-randomly distributed. Adding a small number to all trade flows is not an adequate method, because the added value is arbitrary and does not reflect the underlying expected value. Adding an arbitrary value hence does not guarantee consistent estimates. Yet another option to correct for

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<sup>153</sup> See for example Carrère (2006) for information on remoteness variables and Hummels (2001) and Feenstra (2002) for information about exporter and importer dummy variables.

<sup>154</sup> Olper and Raimondi (2008)

<sup>155</sup> Feenstra (2002)

<sup>156</sup> Baldwin and Taglioni (2006)

<sup>157</sup> Haveman and Hummels (2004)

zeros is to use a Tobit model, which assumes a situation where some of the observations on the dependent variable have been censored and instead mapped to a specific value, often zero. In a trade context this could occur when small values of trade have been rounded down to zero. If no censoring of the data has taken place, the Tobit model is not a suitable technique. In our case no trade flows have been rounded off in the data set that will be used for the gravity model estimations. Our zeros are therefore not a result of censoring, which means that the Tobit model should not be used.

If zero trade flows are not a result of censoring, they are likely to be a consequence of economic decision making. An appropriate way to proceed would therefore be to model the decision that produces zero trade flows, i.e. to model the decision whether to trade or not.<sup>158</sup> This can be done by using the Heckman sample selection model.<sup>159</sup> In brief, the Heckman model first specifies the probability of trade between two countries. Second, it takes the predictions from the first step and puts them into a gravity model to estimate the size of trade, given that trade exists between the countries. Formally, the Heckman model specifies two equations, the selection equation<sup>160</sup>:

$$s = \mathbf{z}\boldsymbol{\gamma} + v \quad (6.3)$$

and the equation of interest (here the gravity equation):

$$y = \mathbf{x}\boldsymbol{\beta} + u \quad (6.4)$$

where  $s$  is the probability of trade and  $y$  is the size of trade flows.  $s$  equals 1 if trade occurs between the two countries and 0 otherwise.  $\mathbf{z}$  and  $\mathbf{x}$  are sets of explanatory variables explaining the probability of trade and the size of trade flows respectively, while  $v$  and  $u$  are disturbance terms that are assumed to be jointly normal with correlation  $\rho$ . The expected value of trade flows, given that trade occurs, can then be expressed as:

$$E(y|\mathbf{z}, s = 1) = \mathbf{x}\boldsymbol{\beta} + \rho\lambda(\mathbf{z}\boldsymbol{\gamma}) \quad (6.5)$$

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<sup>158</sup> Linders and de Groot (2006)

<sup>159</sup> Heckman (1979)

<sup>160</sup> This section draws on Wooldridge (2006)

where  $\lambda(z\gamma)$  is the inverse Mills ratio which measures the probability of being in the sample. In other words, we can estimate  $\beta$  (what we originally wanted to do) using only the selected sample, i.e. using only the observations when trade occurs, as long as we include  $\lambda(z\gamma)$  as an additional regressor.<sup>161</sup> To determine  $\lambda$ , a probit model is first run on the selection equation to estimate  $\gamma$ . This information is used to calculate  $\lambda$  which subsequently is inserted into our equation of interest. The equation of interest can finally be estimated by standard ordinary least squares (OLS).<sup>162</sup>

To know something about the probability of trade is of course an important building block in the Heckman procedure. The decision to trade or not may be explained either by traditional trade theory or by the heterogeneous firm model. As mentioned above, traditional trade theory is based on assumptions of comparative advantage. If a country does not trade in a specific product, this may be explained by the fact that the country has a comparative disadvantage in that sector. The heterogeneous firm model, developed by Melitz, focuses on trade with differentiated products à la new trade theory and emphasizes the fixed costs of exporting.<sup>163</sup> In a heterogeneous firm setting, all firms do not have the same productivity levels and only those with a high enough level will make sufficient profits to cover the fixed costs of exporting. If the fixed costs are high enough, no firms will find it profitable to trade, and no trade will then take place between the countries.

Helpman, Melitz and Rubenstein (HMR) have developed a technique that takes account of both the selection of country pairs into trade and the proportion of firms in a country that export in a heterogeneous firm setting.<sup>164</sup> They use a two-stage estimation method similar to the Heckman procedure, but construct controls for the firm selection as well as the country selection effect. Hence a probit selection equation is esti-

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<sup>161</sup> If  $\rho = 0$  there is no sample selection problem, meaning that the sample is completely random. Standard OLS estimation of the equation of interest is then sufficient.

<sup>162</sup> See Appendix for further explanation of the Heckman model. It can also be noted that it is possible to estimate the Heckman model by maximum likelihood as well as by the two-step procedure. Maximum likelihood is a more burdensome method though it can perform slightly better than the two-step procedure (Martin and Pham 2008).

<sup>163</sup> Melitz (2003)

<sup>164</sup> Helpman et al (2007)

mated to construct the two controls which are later inserted into our equation of interest. The standard Heckman procedure described above is only valid in a world without firm heterogeneity or where this heterogeneity is not correlated with export decisions.

## 6.2 Model Specification

Following the discussion above, our basic gravity model used to quantify the effect of certain animal welfare regulations on internal EU trade is specified as follows:

$$\begin{aligned} \ln M_{ij} = & \beta_0 + \beta_1 \ln Mass_{ij} + \beta_2 \ln D_{ij} + \beta_3 border_{ij} + \beta_4 contig_{ij} + \\ & \beta_5 animal_i + \beta_6 animal_j + \beta_7 country_i + \beta_8 country_j + \beta_9 \eta_{ti} + \\ & \beta_{10} \omega_{tj} + \beta_{11} \tau_t + \varepsilon_{ij} \end{aligned} \quad (6.6)$$

$M_{ij}$  is imports of pig meat, chicken or eggs by EU country  $i$  from EU country  $j$ .  $Mass_{ij}$  is the product of the importer's consumption and the exporter's production of the good in question which reflects economic mass.  $D_{ij}$  is the geographical distance between the two trade partners.  $Border_{ij}$  is a dummy variable that takes the value 1 if the trade reported is solely domestic and 0 if trade is international.  $Contig_{ij}$  is another dummy variable that takes the value 1 if the importer and the exporter are contiguous and 0 otherwise.  $Animal_i$  and  $animal_j$  are dummy variables that are supposed to capture the effect of animal welfare regulation on trade.  $Animal$  takes the value 1 if a certain animal welfare regulation is in place in either the importer ( $i$ ) or exporter ( $j$ ) country. If no regulation has been introduced,  $animal$  takes the value 0. The rest of the variables are included to control for fixed effects and to capture multilateral resistance.  $Country_i$  and  $country_j$  are importer and exporter dummy variables that capture time-invariant fixed effects. Since we are working with panel data, additional variables are necessary to correct for time-series bias.  $\eta_{ti}$  and  $\omega_{tj}$ , that represent time-varying importer and exporter fixed effects, are therefore also included in the model.<sup>165</sup> In addition,  $\tau_t$  is a year-specific dummy variable that captures time fixed effects and  $\varepsilon_{ij}$  is a normally distributed disturbance term.

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<sup>165</sup> To construct time-varying importer and exporter fixed effects, a trend variable has been multiplied with a dummy variable for importer and exporter countries.

The specification of *Animal* needs further explanation since it differs depending on the product in question. Trade in three products, pig meat, chicken and eggs, is examined. These are the products that recently have been, or are about to be, affected by EU-level specific animal welfare regulation. The regulations in focus for *Animal* for the different products are:

- Pig meat: the ban on individual sow stalls
- Chicken: the introduction of a stocking density requirement
- Eggs: the ban on traditional cages for egg production

Hence,  $Animal_{i(j)}$  takes the value 1 if the importer (exporter) of pig meat has introduced a ban on individual sow stalls and 0 otherwise.  $Animal_{i(j)}$  also takes the value 1 if the importer (exporter) of chicken has introduced a stocking-density requirement for broilers and 0 otherwise. Lastly,  $Animal_{i(j)}$  takes the value 1 if the importer (exporter) of eggs has introduced a ban on traditional cages in egg production and 0 otherwise. Clearly these regulations are not the only ones that can be used to capture animal welfare and they are not necessarily the best ones to do so either. They are nonetheless used here since they are important elements in the coming EU regulations, and the aim of this exercise is to see if early introduction of these has affected internal EU trade. For more details on the different specifications of the other variables in the model, see Appendix.

The expected signs of the estimated coefficients are found in Table 6.1 below. As can be seen, the coefficient of  $\ln Mass_{ij}$ ,  $\beta_1$ , is expected to be positive, which means that an increase in economic mass is expected to increase imports. This is because a large consumption in the importer country increases the absorption capacity of imports, and a large production in the exporter country increases the quantities that can be exported.  $\beta_2$ , the coefficient of  $\ln D_{ij}$ , is expected to be negative, since a greater distance between trade partners is expected to have a negative effect on bilateral trade flows. It is, moreover, probable that it is easier to trade domestically than internationally, which means that domestic trade is expected to be larger than international trade. The coefficient of

$border_{ij}$ ,  $\beta_3$ , is consequently expected to be positive. In addition, contiguity can be assumed to increase trade meaning that the expected sign of  $\beta_4$ , the coefficient on  $contig_{ij}$ , is positive as well.

**Table 6.1 Expected sign of coefficients**

Variable	Coefficient	Expected sign
$lnMass_{ij}$	$\beta_1$	+
$lnD_{ij}$	$\beta_2$	-
$border_{ij}$	$\beta_3$	+
$contig_{ij}$	$\beta_4$	+
$animal_i$	$\beta_5$	+/-
$animal_j$	$\beta_6$	+/-

Lastly, if the importer introduces a regulation on animal welfare as a response to a societal concern, imports may increase if the regulation in question increases production costs and if consumers tend to free ride. If the exporter introduces a regulation on animal welfare, imports sourced from this country can be expected to decrease, again given that regulation actually increases production costs and given that the consumers in the importing country do not have preferences for high animal welfare. That regulation on animal welfare actually raises production costs is not something that should be taken for granted, as the review of research on production cost impacts showed above, and consumer behavior is not easily predicted. The expected signs of the coefficients of  $animal_i$  and  $animal_j$ ,  $\beta_5$  and  $\beta_6$ , are therefore somewhat ambiguous.

#### *Heckman model specification*

As explained above, the Heckman procedure used to take account of zero trade flows estimates two different equations: the selection equation and the regression equation of interest. The equation of interest is the one already specified above, i.e. our gravity equation. The selection equation is specified as follows:

$$s_{ij} = \beta_0 + \beta_1 lnMass_{ij} + \beta_2 lnD_{ij} + \beta_3 border_{ij} + \beta_4 contig_{ij} + \beta_5 animal_i + \beta_6 animal_j + \beta_7 RCA + \beta_8 country_i + \beta_9 country_j + \beta_{10} \eta_{ti} + \beta_{11} \omega_{tj} + \beta_{12} \tau_t + v_{ij} \quad (6.7)$$

where  $s_{ij}$  is the probability of trade that equals 1 if trade occurs and 0 otherwise,  $RCA_{ij}$  is a measure of comparative advantages in different commodities and  $v_{ij}$  is the disturbance term. RCA (Revealed Comparative Advantage) is believed to affect the probability of trade between two countries. The variable is included to identify the selection process and is only included in the selection equation. That a measure of comparative advantage is used as the selection variable can be justified by classic trade theory, which says that trade arises because of differences in comparative advantage, see discussion in Chapter 3 above. For information about how RCA is calculated, see Appendix. The rest of the variables in equation 6.7 are the same as above and they are all believed to affect the probability of trade as well. As explained above, the results from the selection regression are used to calculate a variable that controls for sample selection bias,  $\lambda$ , which is then inserted into our equation of interest, equation 6.6. This yields the following model to test in the second step of the Heckman procedure:

$$\begin{aligned} \ln M_{ij} = & \beta_0 + \beta_1 \ln Mass_{ij} + \beta_2 \ln D_{ij} + \beta_3 border_{ij} + \beta_4 contig_{ij} + \\ & \beta_5 animal_i + \beta_6 animal_j + \beta_7 country_i + \beta_8 country_j + \beta_9 \eta_{ti} + \\ & \beta_{10} \omega_{tj} + \beta_{11} \tau_t + \beta_{12} \lambda + \varepsilon_{ij} \end{aligned} \quad (6.8)$$

### 6.3 Data

The analysis focuses on internal EU trade with pig meat, chicken and eggs. However, only trade within EU14 is included in the sample, since the period covered is 1995-2007.<sup>166</sup> Including only internal trade simplifies the analysis since the EU is a common market with a common agricultural policy (CAP). This means that one does not need to take tariffs and non-tariff barriers such as import quotas into account when analyzing internal trade flows. Since trade flows more freely and smoothly within the EU than between the EU and third countries, it should be easier to pick up an effect of regulation on internal than on external EU trade. There are simply fewer explanations to a possible trade increase if regulation affects competitiveness. Furthermore, the EU trades mostly

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<sup>166</sup> EU-14 is Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the UK. Consequently, EU14 consists of all the EU member countries in 1995 minus Luxembourg.

with itself. This fact alone makes it interesting to analyze effects on internal EU trade only.

**Table 6.1 Descriptive statistics of variables used in the gravity model**

	Mean	Std. Dev.	Min	Max	Obs.
<b>Import</b>					
chicken	3.84E+07	1.61E+08	0	2.03E+09	2548
pig meat	1.35E+08	6.33E+08	0	8.50E+09	2548
egg	2.92E+07	1.38E+08	0	1.53E+09	2548
<b>Mass</b>					
chicken	3.30E+17	6.05E+17	0	6.34E+18	2548
pig meat	3.85E+18	6.75E+18	0	9.65E+19	2548
egg	1.74E+17	3.15E+17	2.22E+12	2.95E+18	2548
<b>Animal_imp</b>					
chicken	0.093	0.291	0	1	2548
pig meat	0.115	0.320	0	1	2548
egg	0.016	0.127	0	1	2548
<b>Animal_exp</b>					
chicken	0.093	0.291	0	1	2548
pig meat	0.115	0.320	0	1	2548
egg	0.016	0.127	0	1	2548
<b>RCA</b>					
chicken	-0.137	0.594	-0.979	0.928	2548
pig meat	0.038	0.700	-0.999	0.995	2548
egg	-0.049	0.497	-0.951	1	2548
<b>Distance</b>	1315	770	68	3363	2548
<b>Contig</b>	0.133	0.339	0	1	2548
<b>Border</b>	0.071	0.258	0	1	2548

*Note: The very large numbers are written in scientific E notation. For example, 3.84E+07 means 3.84 times ten to the power of 7, or 38400000.*

Data on bilateral imports are collected from Eurostat and the products included in the sample are the following: pig meat (HS codes 020311, 020312, 020321 and 020322), chicken (HS codes 020711, 020712, 020713 and 020714) and eggs (HS code 040700). Egg imports hence only consist

of egg-in-shell.<sup>167</sup> Production and consumption data are gathered from FAOSTAT and distance data come from CEPIL. Trade data from UN COMTRADE have also been used to calculate RCA. Information on which of the EU14 countries introduced the animal welfare regulations studied here (a ban on traditional cages for egg production, a ban on individual sow stalls and an introduction of maximum stocking density requirements for broiler chickens) during the period 1995-2007 is gathered from the literature review above. Very few countries actually implemented any of the regulations before 2007. A ban on individual sow stalls was introduced in Sweden in 1994 and in the UK in 1999. Maximum stocking density requirements for broilers were introduced in Sweden in 1989 and in Denmark in 2003, and a ban on traditional cages for egg production was introduced in Sweden in 2004. That only a few countries introduced the studied regulations before 2007 should be kept in mind when interpreting the results. Descriptive statistics of the variables used in the gravity model are found in Table 6.1. A complete description of the different variables used and their data sources can be found in the Appendix.

Zeros are present in the data set. When it comes to chicken imports, 26% of the trade flows take the value zero. Moreover, 27% of pig meat trade flows take the value zero and 37% of egg trade flows take the value zero. This suggests that action needs to be taken to deal with the zero trade flows.

## 6.4 Results

Table 6.2 shows the regression results based on equation 6.6 estimated by Ordinary Least Squares (OLS). The estimations are done for chicken, pig meat and eggs separately. All regressions include time-invariant and time-varying importer and exporter fixed effects as well as time fixed effects. The estimations are done with robust standard errors. Since the logarithm of zero is undefined, all zero-valued trade flows have been omitted from the samples used for the OLS estimations. As can be seen below, coefficients of traditional gravity variables are not all statistically

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<sup>167</sup> In contrast to shell egg production and trade, data on the production of and trade in egg products such as liquid, frozen and dried egg products are hard to come by.

significant.<sup>168</sup> Coefficients of distance, border and contiguity are highly significant for all products and have the expected signs, while the coefficients of economic mass are not significant for any product. This tells us is that 1) trade decreases with distance, 2) trade is positively affected if the trading partners are contiguous, 3) countries trade more domestically than with each other, and 4) economic mass does not seem to affect trade flows. Except for the insignificance of economic mass, these results are all in line with previous predictions.<sup>169</sup> The fact that economic mass turns out to be insignificant is likely related to the fixed effects variables included in the model.

**Table 6.2 OLS estimations without zero-valued trade flows**

	Chicken	Pig meat	Egg
<b>Constant</b>	25.50*** (5.86)	22.66*** (7.05)	17.89*** (2.73)
<b>InMass</b>	-0.02 (0.15)	-0.06 (0.17)	0.11 (0.07)
<b>InDistance</b>	-1.99*** (0.10)	-1.29*** (0.10)	-1.76*** (0.09)
<b>Border dummy</b>	2.47*** (0.25)	5.3*** (0.24)	3.74*** (0.23)
<b>Contiguity dummy</b>	0.69*** (0.12)	1.30*** (0.13)	1.44*** (0.12)
<b>Animal welfare (imp)</b>	0.41 (0.56)	0.59 (0.47)	0.86 (0.94)
<b>Animal welfare (exp)</b>	-0.90 (0.70)	-0.04 (0.50)	-1.30 (0.80)
<b>R<sup>2</sup></b>	0.74	0.75	0.72
<b>No. of observations</b>	1790	1893	1599

*All regressions include time-invariant and time-varying importer and exporter fixed effects as well as time fixed effects. Robust standard errors are shown in parentheses.*

*\*p<0.1, \*\*p<0.05, \*\*\*p<0.01*

<sup>168</sup> Stars represent statistical significance at 90(\*), 95(\*\*) and 99(\*\*\*) percent levels in Table 6.2. Hence, the more stars the higher the significance.

<sup>169</sup> That economic mass turns out to be insignificant is likely related to the model's many fixed effects variables. The effect of economic mass is probably captured by the fixed effects.

Moving on to the coefficients of animal welfare, it can be seen that these are insignificant for all products. Chicken, pig meat and egg imports are, according to the estimation results, consequently not significantly affected by the introduction of animal welfare regulation in either the importer or the exporter country.

Significant coefficients of continuous variables in a log-log OLS regression should be interpreted as marginal effects (elasticities), or, in other words, as the percent change in the dependent variable for a percent change in the continuous variable. This means that when all other variables are held constant, an increase in distance, for example, by 1% leads to a decrease in imports of chicken by 1.99%. To see the effect of significant dummy variable coefficients on the dependent variable is slightly more complicated, since one needs to take the exponent of the estimated coefficients. For example, the border dummy coefficient is 2.47 for chicken. Taking the exponent of 2.47 we get the result that intra-country trade of chicken is on average 11.8 times larger than cross-border trade in the EU. To get the percentage effect of a dummy variable, take the exponent of the coefficient minus 1 and then multiply this number with 100. The percentage effect of border for chicken imports is hence 1082%  $((\exp[2.47]-1)*100)$ , or domestic trade is 1082% larger than cross-border trade. This can appear to be a large number but the results are not unreasonable since domestic trade is a great deal larger than cross-border trade.

Worth noting is also how the  $R^2$  should be interpreted. The  $R^2$  is a goodness-of-fit measurement that says to what extent the dependent variable can be explained by the explanatory variables included in the model. If the model is a perfect fit, the  $R^2$  takes the value 1. In our case the  $R^2$  ranges between 0.72 and 0.75. These are relatively high values that mean that our model explains 72-75% of bilateral trade flows of chicken, pig meat and eggs in the EU.<sup>170</sup>

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<sup>170</sup> Strong correlations, i.e. high  $R^2$ s, can be found between two completely unrelated variables if both of them are affected by a third variable that is not taken into account. The  $R^2$  also always increases when new variables are added to the model. The interpretation of high  $R^2$ s should therefore be made with caution.

The OLS estimations accounted for above omitted all zero trade flows because the logarithm of zero is undefined. Omitting zero flows may, however, lead to biased regression coefficients, which suggests that another technique should be tried to come to terms with zero trade flows. As stated above, the Heckman sample selection model is a suitable approach to deal with the zeros in our data set, since the zeros are likely to be a result of economic decision making. Table 6.3 presents the results of Heckman estimations, confirming that sample selection bias is a problem when only positive trade flows are included in the sample. We can see this because the coefficient of Mills lambda is highly significant for all products. To use the Heckman model instead of OLS is hence more suitable for our data.

If the results from the Heckman estimations are to be comparable with the OLS estimations results, marginal effects must be calculated for the Heckman estimation results. Unlike the OLS estimates, it is possible that the magnitude, sign and statistical significance of the Heckman estimates differ from the marginal effects. In our case, the magnitudes of the marginal effects are quite similar to the Heckman estimates for all variables of interest.<sup>171</sup> The statistical significances of the marginal effects and of the estimates are also similar. The small differences between the marginal effects and estimates are to be expected because the large number of variables used in the model diminishes the effect on the probability of exporting. When interpreting the significance of the marginal effects, it should be noted that the possibility of estimating standard errors of marginal effects of the Heckman model is limited by the statistical software used here. There is a risk that the standard errors of the marginal effects, and therefore also the significance of the marginal effects, are not entirely correct.

A comparison of marginal effects of the Heckman and OLS estimations shows that different estimations methods yield different marginal effects. Generally OLS is biased downwards, which could be expected

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<sup>171</sup> The marginal effects calculated are so called "conditional marginal effects" that show how much trade will change given that trade existed in the first place.

when zero trade flows are omitted from the sample.<sup>172</sup> Omitting zero trade flows thus underestimates the effects of the variables on trade.

**Table 6.3 Heckman estimations**

	Chicken	Marginal effects	Pig meat	Marginal effects	Egg	Marginal effects
<b>Constant</b>	30.10*** (6.19)		23.94*** (7.41)		17.61*** (2.71)	
<b>InMass</b>	-0.10 (0.16)	-0.10 (0.16)	-0.12 (0.16)	-0.11 (0.18)	0.09 (0.07)	0.11 (0.07)
<b>InDistance</b>	-1.71*** (0.12)	-1.71*** (0.12)	-1.08*** (0.12)	-1.13*** (0.12)	-1.52*** (0.12)	-1.90*** (0.13)
<b>Border dummy</b>	2.79*** (0.28)	2.79*** (0.28)	5.56*** (0.28)	5.50*** (0.29)	3.82*** (0.27)	3.99*** (0.28)
<b>Contiguity dummy</b>	0.69*** (0.16)	0.69*** (0.16)	1.30*** (0.16)	1.37*** (0.16)	1.32*** (0.16)	1.61*** (0.16)
<b>Animal welfare (imp)</b>	0.20 (0.58)	0.20 (0.58)	0.63 (0.61)	0.63 (0.61)	0.97 (0.70)	0.89 (0.71)
<b>Animal welfare (exp)</b>	-1.06* (0.56)	-1.06* (0.56)	-0.03 (0.58)	-0.04 (0.58)	-1.45* (0.67)	-1.32** (0.67)
<b>Mills lambda</b>	-1.58*** (0.24)		-1.03*** (0.22)		-0.86*** (0.17)	
No. of observations	2436		2464		2548	
Uncensored observations	1790		1893		1599	

*All regressions include time-invariant and time-varying importer and exporter fixed effects as well as time fixed effects. Standard errors are shown in parentheses. Standard errors are forced. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$*

The significance of the OLS estimates and the Heckman marginal effects, on the other hand, do not differ between the estimation methods, except

<sup>172</sup> Linders and De Groot (2006)

for *Animal welfare (exp)*. The signs of the significant estimates are also the same.

Interestingly, the Heckman estimations show that imports of chicken and eggs can be significantly negatively affected if the exporter introduces animal welfare regulation. This means that a country may export less chicken and eggs after regulation is introduced. As a reminder, the regulation in question for chicken is a requirement on stocking density for broiler chicken and for eggs the regulation in question is a ban on traditional cages. As in the OLS estimation, no statistically significant effect of regulation in the importer country is found on imports, regardless of what product the analysis focuses on. In other words, introducing stricter animal welfare regulation has not led to an increase in imports of any of the products studied here. These are quite interesting results since the debate about societal concerns often focuses on the home market and the hypothesis that introduction of regulation leads to increased imports which could threaten domestic production. Here, we find no support for this hypothesis, but reveal that exports may be negatively affected by the introduction of regulation. This is an issue that is much less debated but, according to the estimation results, appears to be more relevant.

A third estimation technique, HMR, is tried to control for selection of country pairs into trade and firm heterogeneity. This is done as a robustness check of the above estimation results since the standard Heckman procedure is valid only in a world without firm heterogeneity or where this is not correlated with export decisions. Compared to the Heckman model, additional control variables for firm heterogeneity, *z*'s, are included in the HMR model. If all control variables are significant, the HMR technique may be an alternative to the Heckman technique. As it turns out, the HMR model does not add anything to our analysis. The control variables are either insignificant or we end up with serious multicollinearity problems that make it impossible to trust our estimates.<sup>173</sup> We can therefore conclude that the Heckman technique is

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<sup>173</sup> Multicollinearity occurs when two or more explanatory variables in our model are correlated. It often leads to confusing results since individual p-values can be misleading and confidence intervals become very wide.

more suitable than the HMR technique for our data, and that we cannot find that firm heterogeneity has an effect on the decision to export. The HMR model specification and the estimation results are found in the Appendix.

## **6.5 Summarizing conclusion**

This chapter uses three different statistical methods to investigate if introducing specific animal welfare regulations affected internal EU trade flows in the period 1995-2007. The regulations in question are a ban on traditional cages for layer hens, a ban on individual sow stalls for pigs and a maximum stocking density requirement for broiler chickens. These regulations were not introduced on an EU level during the period examined here but were already implemented in some individual EU countries before 2007. The aim of this chapter's analysis is to see if internal EU trade flows of chicken, eggs and pig meat have been affected in those EU countries that introduced the regulations in advance. Do above-average animal welfare regulations affect trade flows?

None of the estimation techniques used here, find that introducing regulation has a significant effect on imports. Introduction of any of the regulations does not affect imports of any of the products. This analysis therefore finds no support for the claim that stricter regulations would lead to increased imports. On the other hand, the preferred estimation techniques finds that introducing a ban on traditional cages for layer hens or a maximum stocking density requirement for broiler chickens may have a negative effect on exports of eggs and chicken. The introduction of regulations may, hence, lead to lower export volumes.

As this is a first attempt to quantify the effect of animal welfare regulation on trade flows, the results should be interpreted with caution. It is worth noting that only three EU countries implemented the regulations during the period looked at here. This could reduce the reliability of the results.

The estimation results are in relatively good agreement with the results from the literature review of the impact of regulation on production

costs in chapter 4. The chapter concluded that regulation in general had a limited impact on production costs. This was particularly true for the ban on individual sow stalls, and a maximum stocking density requirement for broiler chickens only increased costs to a limited extent. Banning traditional cages in egg production could nonetheless have some impact on production costs. Hence, it is only to be expected that no effect of regulation is to be found on imports in general in this chapter's estimations. If trade in one of the products were to be affected by regulation, it would be eggs, according to chapter 4. It is therefore not that surprising that egg exports may be affected by a ban on traditional cages for layer hens. Neither is the result that no significant effect of a ban on individual sow stalls is found on pig meat imports or exports. Nonetheless, the finding that exports of chicken may be affected by maximum stocking density requirements is more unexpected since maximum stocking density requirements should increase production costs only to a limited extent. The fact that relatively modest cost increases may affect exports of chicken may be due to high competition in the chicken sector.

Why do we find a difference between the impacts of regulation on imports and exports? This is of course hard to answer without further investigation, but some plausible explanations exist. One explanation could be that the animal welfare regulations concerning layer hens and broiler chicken do not raise production costs, and thereby consumer prices, enough for domestic consumers to give up their societal concerns and choose a cheaper imported product, i.e. consumers do not have enough incentives to free ride. Imports are therefore not affected by the introduction of regulation. Foreign consumers may, on the other hand, not share the societal concerns of the domestic consumers. When the consumer price increases, foreign consumers would then not see the point in paying extra for a product attribute, animal welfare, which they do not want. This could lead to a reduction of exports.

Alternatively, a reduction of exports may occur even if foreign and domestic consumers have the same societal concerns. Since animal welfare is a credence attribute, it is impossible for consumers to detect without knowledge of regulation levels and if no credible quality signaling exists.

It is likely that it is harder for foreign consumers to detect the animal welfare attribute in the good because their knowledge of other countries' regulations can be assumed to be low. If consumers cannot detect the attribute that makes the good more expensive, they are not likely to pay extra for it. Exports can therefore decline if foreign consumers do not have enough product information.

# 7

## Concluding remarks

There is no conclusive evidence that regulation introduced in order to protect societal concerns has a negative effect on competitiveness in agriculture. Competitiveness effects may differ, though, both in the magnitude and direction of different firms, sectors and types of regulations. This report has therefore focused on the competitiveness and trade impacts of EU animal welfare regulations. Special attention is devoted to three specific coming, or recently introduced, regulations: a ban on traditional cages for layer hens, a ban on individual sow stalls for pigs and maximum stocking density requirements for broiler chickens.

A literature review first shows that present EU animal welfare regulation only has minor impacts on competitiveness through production costs increases. The coming, or recently introduced, specific regulations mentioned above are not expected to increase production costs significantly for most EU producers either. A ban on traditional cages for layer hens may nonetheless have larger production cost impacts than the other two regulations. It is also concluded that animal welfare regulation generally cannot explain the sometimes large production cost differences between the EU and third countries when it comes to pig meat, chicken and egg production. By far, the most important determinants of competitiveness in these cases are instead the costs of feed, followed by housing and labor.

Second, an analysis of trade statistics shows that the EU has a negative trade balance in food and beverages. This is mainly due to large trade deficits in products that are only, if at all, produced to a limited extent within the union. The EU is also found to be a net exporter of the products affected by the specific animal welfare regulations (egg, pig meat and chicken), despite the fact that the EU has a comparative disadvantage in all products. At present, EU producers seem to be handling the competitive pressures from abroad reasonably well thanks to already existing border protection and agricultural support.

Third, a gravity model analysis is used to isolate the effect of the specific animal welfare regulations on internal EU imports. The analysis shows

Third, a gravity model analysis is used to isolate the effect of the specific animal welfare regulations on internal EU imports. The analysis shows no significant effect of introducing any of the animal welfare regulations on imports of eggs, chicken and pig meat. Still, a possible negative effect on exports of eggs and chicken is found if a ban on traditional cages for layer hens, or a maximum stocking density requirements for broiler chickens, is introduced.

Taken together the results do not find any support for the claim that stricter animal welfare regulations lead to increased imports. It is therefore hard to justify additional protection of EU pig meat, chicken and egg production, at least on animal welfare grounds.

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# Appendix

## **GATT Article XX**

Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures:

- (a) necessary to protect public morals;
- (b) necessary to protect human, animal or plant life or health;
- (c) relating to the importations or exportations of gold or silver;
- (d) necessary to secure compliance with laws or regulations which are not inconsistent with the provisions of this Agreement, including those relating to customs enforcement, the enforcement of monopolies operated under paragraph 4 of Article II and Article XVII, the protection of patents, trade marks and copyrights, and the prevention of deceptive practices;
- (e) relating to the products of prison labour;
- (f) imposed for the protection of national treasures of artistic, historic or archaeological value;
- (g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption;
- (h) undertaken in pursuance of obligations under any intergovernmental commodity agreement which conforms to criteria submitted to

the CONTRACTING PARTIES and not disapproved by them or which is itself so submitted and not so disapproved;\*

(i) involving restrictions on exports of domestic materials necessary to ensure essential quantities of such materials to a domestic processing industry during periods when the domestic price of such materials is held below the world price as part of a governmental stabilization plan; *Provided* that such restrictions shall not operate to increase the exports of or the protection afforded to such domestic industry, and shall not depart from the provisions of this Agreement relating to non-discrimination;

(j) essential to the acquisition or distribution of products in general or local short supply; *Provided* that any such measures shall be consistent with the principle that all contracting parties are entitled to an equitable share of the international supply of such products, and that any such measures, which are inconsistent with the other provisions of the Agreement shall be discontinued as soon as the conditions giving rise to them have ceased to exist. The CONTRACTING PARTIES shall review the need for this sub-paragraph not later than 30 June 1960.

### **The Heckman Model<sup>174</sup>**

As mentioned above the Heckman model is a two-step procedure to deal with sample selection. In the context of the gravity model, the Heckman model helps to us to deal with zero trade flows that are the result of an economic decision of whether or not to trade. By using the Heckman model, we can first model the probability of trading with a selection equation and then use these predictions to run the gravity model and estimate the size of trade flows.

The first step when it comes to using the Heckman model is hence to specify our selection equation, which in our case tells us how probable it is that two countries will trade with each other.

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<sup>174</sup> This section draws heavily on Wooldridge (2006)

The selection equation can be expressed as:

$$s = \mathbf{z}\boldsymbol{\gamma} + v$$

where  $s$  is the probability of trade,  $\mathbf{z}$  is a set of explanatory observable variables and  $v$  is a disturbance term.  $s$  equals 1 if trade is observed and 0 otherwise. We also need to specify our equation of interest, in our case an equation that estimates the size of trade flows (i.e. the gravity equation). Schematically the size of trade flows can be specified as:

$$y = \mathbf{x}\boldsymbol{\beta} + u$$

where  $y$  is trade flows (not observed if no selection into trade takes place),  $\mathbf{x}$  is a set of explanatory variables and  $u$  is a disturbance term. It is assumed that  $\mathbf{x}$  is a strict subset of  $\mathbf{z}$ , any element in  $\mathbf{x}$  is hence also an element in  $\mathbf{z}$ , but not all elements in  $\mathbf{z}$  are elements in  $\mathbf{x}$ . The disturbance terms  $v$  and  $u$  are further assumed to be jointly normal, such that the expected value of  $u$  given  $v$  is  $\rho v$  for some parameter  $\rho$ . This gives in turn:

$$E(y|\mathbf{z}, v) = \mathbf{x}\boldsymbol{\beta} + \rho v$$

$v$  is not observable, but the above equation can be used to calculate  $E(y|\mathbf{z}, s)$  and then specialize it to  $s = 1$ . This yields:

$$E(y|\mathbf{z}, s) = \mathbf{x}\boldsymbol{\beta} + \rho E(v|\mathbf{z}, s)$$

Given that  $s$  and  $v$  are related by the selection equation and that  $v$  is normally distributed, it is possible to show that  $E(v|\mathbf{z}, s)$  is the inverse Mills ratio  $\lambda(\mathbf{z}\boldsymbol{\gamma})$  when  $s = 1$ . All this leads to:

$$E(y|\mathbf{z}, s = 1) = \mathbf{x}\boldsymbol{\beta} + \rho\lambda(\mathbf{z}\boldsymbol{\gamma})$$

This says that the expected size of trade flows given  $\mathbf{z}$ , and given that selection into trade has taken place, is equal to  $\mathbf{x}\boldsymbol{\beta}$  plus a term that depends on the inverse Mills ratio evaluated at  $\mathbf{z}\boldsymbol{\gamma}$ . In other words, we can estimate  $\boldsymbol{\beta}$  (which is what we originally wanted to do) using only the selected sample, when trade is observed, as long as we include  $\lambda(\mathbf{z}\boldsymbol{\gamma})$  as an additional regressor. When  $\rho = 0$ ,  $\lambda(\mathbf{z}\boldsymbol{\gamma})$  does not appear, which means that there is no sample selection problem and OLS of  $y$  on  $\mathbf{x}$  yields con-

sistent estimates. When  $\rho \neq 0$ ,  $\lambda(z\gamma)$  must be included to avoid an omitted variable problem. Given the above mentioned assumptions  $s_i$ , given  $z_i$  follows a probit model  $P(s_i = 1 | z_i) = \Phi(z_i\gamma)$ , which makes it possible to estimate  $\gamma$  by probit of  $s_i$  on  $z_i$  using the entire sample.  $\lambda$  is then calculated and included in our equation of interest, here the gravity equation, which can be estimated by standard OLS.

### **Description of variables used in the gravity model**

Below follows a description of the variables used in the gravity model and their data sources. The model covers internal EU14 trade in the period 1995-2007.

- **Import**

Data on bilateral imports of pig meat, chicken and egg are gathered from Eurostat. Imports of the different products consist of the following HS codes:

- pig meat (HS codes 020311, 020312, 020321 and 020322)
- chicken (HS codes 020711, 020712, 020713 and 020714)
- egg (HS code 040700)

Note that imports of eggs only consist of egg-in-shell.

Domestic trade is calculated as total production minus total export to the rest of the world:

$$M_{iik} = Y_{ik} - X_{ik}$$

$M_{iik}$  hence represents imports of country  $i$  to itself. This measure is needed to create a dummy variable for domestic trade that is supposed to capture the border effect. The data gathered from FAOSTAT, which are used for the domestic trade calculations, cover production and exports of the following products: pig meat (FAO code 1035), chicken (FAO code 1058) and egg (FAO codes 1091 and 1062). Imports of eggs again only consist of egg-in-shell.

- **Mass**

Economic mass is constructed as:

$$Mass = Y_{jk} * C_{ik}$$

where  $C_{ik}$  represents consumption in the import country of product  $k$  and  $Y_{jk}$  represents production in the exporter country of product  $k$ . Product  $k$  is pig meat, chicken or eggs.

Production is further calculated as:

$$Y = q * p,$$

where  $q$  is quantity and  $p$  is price. Data on both quantity and price have been gathered from FAOSTAT. If information on price is missing in the FAO database, the world market price is used instead.

Consumption is calculated as:

$$C = q * p - x + m, \text{ or } m - x,$$

where  $x$  is exports and  $m$  imports.  $q$  is quantity and  $p$  is price as above. Data for the consumption calculations have been gathered from FAOSTAT. The FAO product codes used to gather data for the production and consumption calculations are the same as above.

- **Distance**

The distance variable,  $D_{ij}$ , is gathered from the CEPII database. The distance measure between two countries is based on the great circle that uses longitudes and latitudes of most important cities in terms of population.

- **Contiguous**

The contiguous variable,  $contig_{ij}$ , is a dummy variable that takes the value 1 if the two trading countries are contiguous, i.e. if

they are adjacent. This dummy variable is taken from the CEPII database.

- **Border**

The border variable,  $border_{ij}$ , is a dummy variable that takes the value 1 if trade is domestic. This variable is included in the model to capture the border effect, or in other words how much more a country trades with itself than with other countries. The domestic trade calculations described above are used to identify domestic trade.

- **Animal**

$Animal_{i(j)}$  is a dummy variable that takes the value 1 if a certain animal welfare regulation is in place in the importer (exporter) exporter country. The regulations  $Animal_{i(j)}$  for the different products are based on:

- Egg: the ban on traditional cages for egg production
- Pig meat: the ban on individual sow stalls
- Chicken: the introduction of a stocking-density requirement

The following table shows the countries that are considered to have had regulations in place during the examined period, 1995-2007, and when these regulations were introduced.

Ban on traditional cages for egg production		Ban on individual sow stalls		Introduction of maximum stocking density for broilers	
Sweden	2004	Sweden	1994	Sweden	1989
		UK	1999	Denmark	2003

Source: Table 4.1 above

- **RCA**

RCA, developed by Balassa, means Revealed Comparative Advantage and is a measure of a country's comparative advantages. RCA, or the Balassa index, is calculated as:

$$RCA = (x_{ik} - m_{ik}) / (x_{ik} + m_{ik})$$

where  $m_{ik}$  is country  $i$ 's net imports from the world of good  $k$  and  $x_{ik}$  is all countries' total reported net import from country  $i$  of good  $k$ . Reported import is used for export data as well since import data generally is more reliable. No transit trade is included in the data, which are gathered from UN COMTRADE. Imports (exports) have been given the value 0 where values are missing but export (import) occurs. The RCA can take values between -1 and 1. If the  $RCA > 0$ , the country has a comparative advantage, and if the  $RCA < 0$ , the country has a comparative disadvantage in the commodity in question.

- **Note on country selection**

The countries included in the analysis are EU14, meaning Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the UK. Belgium and Luxembourg reported together until 1999. Belgium's data hence also contain Luxembourg data until 1999 in our data set.

### **HMR estimations**

The HMR estimation procedure is similar to the Heckman two-step procedure. First, a selection equation is estimated in order to create control variables for sample selection bias and firm heterogeneity that are subsequently inserted into the equation of interest, the gravity equation specified in equation 6.6. The selection equation is specified in the same way as the selection equation for the Heckman procedure. The HMR selection equation is hence specified as:

$$s_{ij} = \beta_0 + \beta_1 \ln Mass_{ij} + \beta_2 \ln D_{ij} + \beta_3 border_{ij} + \beta_4 contig_{ij} + \beta_5 animal_i + \beta_6 animal_j + \beta_7 RCA + \beta_8 country_i + \beta_9 country_j + \beta_{10} \eta_{ti} + \beta_{11} \omega_{tj} + \beta_{12} \tau_t + v_{ij}$$

where all the variables are the same as in equation 6.7 above. Control variables are then calculated and inserted into the gravity model that now becomes:

$$\ln M_{ij} = \beta_0 + \beta_1 \ln Mass_{ij} + \beta_2 \ln D_{ij} + \beta_3 border_{ij} + \beta_4 contig_{ij} + \beta_5 animal_i + \beta_6 animal_j + \beta_7 country_i + \beta_8 country_j + \beta_9 \eta_{ti} + \beta_{10} \omega_{tj} + \beta_{11} \tau_t + \beta_{12} \lambda_{ij} + \beta_{13} (\hat{z}_{ij}^* + \lambda_{ij}) + \beta_{14} (\hat{z}_{ij}^* + \lambda_{ij})^2 + \beta_{15} z_{ij}^* + \lambda_{ij} + \varepsilon_{ij}$$

where all variables are the same as in equation 6.8 above except for the  $(\hat{z}_{ij}^* + \lambda_{ij})$  terms. These are the new control variables for firm heterogeneity.<sup>175</sup>

The HMR estimation results, see Table A.1 below, show that HMR is not a suitable model for our data. All control variables turn out to be insignificant for chicken trade which means that firm heterogeneity does not affect the decision to export chicken. For pig meat and egg we seem to have a multicollinearity problem which makes it hard to trust our estimates. For example, the signs of several coefficients are unexpected. It can be concluded that Heckman seems to be a more suitable model than HMR for our data.

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<sup>175</sup> See Helpman, Meltiz and Rubenstein (2007) for more information about how to calculate the control variables

**Table A.1 HMR estimations**

	<b>Chicken</b>	<b>Pig meat</b>	<b>Egg</b>
<b>Constant</b>	28.48*** (6.06)	18.88** (8.24)	-9.10 (5.68)
<b>lnMass</b>	0.03 (0.23)	-0.51** (0.23)	-0.15* (0.08)
<b>lnDistance</b>	-2.56*** (0.96)	1.90 (1.78)	3.94*** (1.13)
<b>Border dummy</b>	1.85* (1.12)	6.87*** (1.18)	0.32 (1.00)
<b>Contiguity dummy</b>	0.96** (0.44)	omitted because of collinearity	-8.02*** (2.00)
<b>Animal welfare (imp)</b>	0.48 (0.71)	0.73** (0.32)	1.99** (0.90)
<b>Animal welfare (exp)</b>	-1.01* (0.61)	1.15 (0.75)	-3.36*** (0.93)
<b>Mills lambda</b>	-0.80 (0.84)	-0.93 (1.31)	-3.34*** (0.87)
<b>zhatm</b>	-0.70 (0.80)	3.87*** (1.29)	5.45 *** (0.94)
<b>zhatm2</b>	-0.002 (0.002)	-0.31** (0.16)	-0.37*** (0.13)
<b>zhatm3</b>	0.00001 (0.00002)	0.01* (0.01)	0.02*** (0.01)
No. of observations	1790	1561	1599

*All regressions include time-invariant and time-varying importer and exporter fixed effects as well as time fixed effects. Robust standard errors are shown in parentheses.*

*\*p<0.1, \*\*p<0.05, \*\*\*p<0.01*



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