Bloody Business:
A study on the justification of the Dutch blood price.

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Chapter 1 – Overview

1.1 Introduction
As a blood donor myself, questions arise as to why a blood bank, which acquires its resource from voluntary donors, would ask a higher price than its neighbouring countries do. This is concluded in a Dutch documentary ‘De Rekenkamer’ in which they investigate the origin of the price of blood. The manner in which blood is supplied in the Netherlands is voluntary and non-remunerated. In the Netherlands, Sanquin, a not-for-profit organisation, is assigned exclusively to perform this task. Since 1988, the Dutch government has regulated the blood supply. Besides its function as a blood bank, Sanquin also facilitates a large scale of other blood related activities, such as research. The organisation’s current structure dates back to 1998 and originates from the Dutch Red Cross. The blood that is supplied can be divided into three final products, of which red blood cells are the most important for hospitals, since these are provided to patients for operations and after accidents. Figure 1.1 illustrates European prices of red blood cells. This last year, the above-average price that Sanquin charges Dutch hospitals for red blood cells has become a topic of discussion. This thesis aims to provide an understanding of how the price of blood is established and whether this price is justified.

1.2 Who pays for a high price?
The funding of blood in the Netherlands is illustrated in Figure 1.2. Its numbers correspond to the numbers in the following explanation. The patient pays the health insurer a premium (1) and simultaneously consumes the hospital’s goods and services, including blood (2). The hospital sends an invoice to insurers (4) for the use of blood it buys from the blood bank (3). Accordingly, if the blood price

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1 The red line refers to the average of the eight countries from the figure. The quantity is generally measured in units, equal in all countries. Spain 1&2 refer to two national regions; Italy 1&2 refer to the two different suppliers. For sources of figures and tables in this thesis, see Appendix III.
Sanquin charges the hospitals increases, the amount health insurers have to pay the hospitals will also have to increase (5). The insurers will settle this by an increase in insurance premiums (1). This means that all Dutch citizens effectively pay for a higher blood price, as in the Netherlands it is mandatory by law to have a health insurance. In return the donors do not profit from a higher price, since donations are non-remunerated.

1.3 Research Question

The observed high price leads to the following research question: **Is the price of blood in the Netherlands too high?**

The research question will lead to an evaluation of the price-quality relation of blood. The measurement used for the price of blood is the price of red blood cells, which is after all the donation driver. Prices can be evaluated in two ways:

1. The comparison of the price to a certain average or median. Since blood provision in the Netherlands is set along a European policy line, it is plausible to take a European average. Table 1.1 describes the Dutch price for red blood cells and the other blood products. The price of red blood cells exceeds the average by 32% and the median—to correct for outliers—by 37%.

<table>
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<th>Table 1.1 – Prices blood products 2008 in €</th>
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<td></td>
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<tr>
<td>Netherlands</td>
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2. The difference in price of a good and the costs incurred for the production of that good. According to Dutch law, Article 14 of the WIB\(^2\), the blood bank is not allowed to charge a price higher than production costs. As it will become clear in this thesis, this is difficult to establish without cost data.

An economist starts his analysis by outlining the public interests. After all, a price alone cannot be evaluated without comparing it to the accompanied quality. In the blood market, quality is determined

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\(^2\) Wet Inzake Bloedvoorziening 1998, Dutch law regarding blood provision.
by whether blood is safe, delivered on time and sufficiently supplied. It is important is to evaluate in which circumstances these interests are best satisfied. A price can be considered too high if public interests can also be fully satisfied at a lower price. The way to establish this is by starting with an analysis of the market. If it fails to serve these interests, then a government intervention in this market is justified. If a government then also fails to effectively satisfy public interests and the analysis points towards potential efficiency gain, then the price of blood in the Netherlands may indeed be too high. Such a market and its regulation ask for a reform. Note that it is not the goal of this thesis to quantify the appropriate price-quality ratio. It merely gives a framework that structures an economic assessment of the question whether and how, efficiency can be improved in the blood market.

1.4 Scope research
This research will examine factors that possibly may affect the blood price. The Dutch price of red blood cells is compared to other European countries. Since all of the blood products (i.e. red blood cells, plasma and platelets) are traded in independent markets, the comparison could be applied to all three products. However, this thesis will focus on red blood cells alone, because of the following reasons that indicate why this product in particular is most suitable to answer my research question. Firstly, they are the main donation driver, which means the need for red blood cells has always driven the quantity of donated whole blood. It was not until later that the efficiency gain became clear from using the products separately. Secondly, the manner in which red blood cells are treated is done on a comparable basis throughout Europe, while both plasma and platelets receive different treatments across the different countries. These laboratory treatments may heavily affect prices and, hence, make the assessment more difficult. The scope of this thesis will cover price and market for plasma only in an attempt to explain the high price of red blood cells. Platelets will be fully left out of this review. Furthermore, besides an in-depth review of the Dutch blood market, the scope will extend to seven other European countries: Belgium, France, the United Kingdom, Finland, Spain, Italy and Germany.

1.5 Method
Literature and reports together form the cornerstones of an economic framework for the analysis of this price. Meetings with the authors of the Conquaestor report, the Ministry of Health (VWS) and the medical director of Plasma Products of Sanquin, complement this framework. In order to get a clear picture of the complexity of blood provision, this thesis starts by describing the organisation structure of Sanquin and of the production of the different blood products in chapter 2. Chapter 3 provides a theoretical economic framework, which is used to predict market outcomes as if a government would not interfere. In economic terms, government involvement is necessary if the market fails to satisfy public welfare. Governmental interferences affect the blood price and quality and therefore chapter 4
continues with a European comparison of the price in the light of different structures of blood supply. A closer look on the law, regulation and subsidies is used to give an answer to the question how and to what extent the Dutch government involvement affects the price. The data used comes from an independent American research bureau. The most recent information on prices available dates 2009. Since no major policy changes in the Dutch structure have occurred until now, the data can still be used for this thesis. The review will continue in chapter 5 by looking at the pursued safety standard by Sanquin. Furthermore, Sanquin, as a not-for-profit organisation, also operates in the competitive market for plasma medicine. Because of this duality, chapter 6 will assess the incentive for Sanquin to cross-subsidize its products. This is followed in chapter 7 by an evaluation of the scientific research that Sanquin participates in. In this way, all the different factors, which might cause an increase in the price of red blood cells in the Netherlands, are evaluated. In practice we find that Sanquin could be disciplined through the following four factors:

i) domestic competition
ii) imports
iii) internal supervision by the Supervisory Board and
iv) external supervision by the Ministry and
v) media

The tendency to increase costs and prices of blood can be controlled by these factors. These will be analysed to find an improvement in regulating Sanquin. In the conclusion, it will be evaluated whether or not the price of blood may be considered too high.

1.6 Main conclusions

The expectation on the market outcome without government involvement draws a picture of poor quality, lower prices, and less security of supply. This market failure provides a role for government intervention. The current regulation, however, does not serve its purpose efficiently and effectively. In the analysis of this study we find that the blood regulation has an unduly upward effect on price. Moreover, the elements, which are not outlined in the law, also have an increase in price. Sanquin uses the room that the government has left the organisation to operate independently by raising prices and not necessarily quality. Hence, the high price finds its origin in market as well as government failure. If public interests can also be satisfied at a lower price, then the price is too high. Despite the difficulty in measuring price-quality ratio in the blood market, this study closes by indicating that efficiency gains can be obtained and where this gain can be found.
Chapter 2 - Sanquin

Although blood supply in the Netherlands has seen many changes over the decades, it has always been based on voluntary non-remunerated blood. Centralization and technological progress intensified the complex nature of the collection, processing and production of blood products. In order to answer the research question, it is instructive to outline Sanquin’s history and current organisation structure.

2.1 History

The first blood transfusion service was founded in 1930 in Rotterdam and grew under the Dutch Red Cross into many regional blood banks in other cities. It was not until the Second World War that it became necessary to reorganise such that a continuous supply of blood was available. Together with the medical division of the army, the Red Cross started a storage facility in Amsterdam to satisfy the increase in demand for blood. Originated from this facility, the CLB\(^3\) started in 1947 with the production of medicine from plasma. Apart from plasma production, the CLB was responsible for the laboratory work and research. The large number of smaller regional blood banks converged into 22 blood banks when technique allowed storage of blood in 1973. From a system where the selected donors were called in whenever their blood was needed, blood could now be collected beforehand based on expected demand. After the merge of the CLB and all the regional blood banks in 1998, resulting in the organisation Sanquin is today, the number was brought back to four blood banks in 2001.

2.2 Current organisation

The private organisation counts six divisions: the Blood Bank, five other divisions and one business unit.\(^4\) The Blood Bank is the only non-competitive division. Figure 2.1 clarifies the organisation structure.

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\(^3\) Centraal Laboratorium van de Bloedtransfusiedienst.

\(^4\) This distinction is based on the number of employees, being much smaller in a business unit.
All of the divisions of Sanquin legally and administratively fall under the not-for-profit foundation Sanquin and are not allowed to pay out dividends. The divisions Plasma Products, Diagnostics and Research were formerly CLB units and are now referred to as the PDR. The blood banks are responsible for recruitment, collection, processing and delivering to the hospitals of blood. The four regional blood banks use, besides mobile blood banks, over hundred fixed locations to collect the blood. Also, the responsibility of the production of all the blood products, including quarantine plasma, lies with the blood banks (details on the products can be found in the next section). The division Plasma Products handles the preparation of plasma products from plasma. Sanquin belongs to the first in the market to fraction human blood plasma. Diagnostics does laboratory work for both the blood bank and hospitals and is often deployed for their elaborate knowledge regarding transfusion problems. Sanquin is responsible for the storage of Europe’s most rare blood groups. The Council of Europe has assigned the division Diagnostics of Sanquin to safeguard these erythrocytes. Education, trainings and scientific research are brought under the division Research. Many (PhD) students and other scholars perform research under the umbrella this division and in 2011 it published 170 papers in scientific journals.

2.3 From donor to hospitals

Figure 2.2 – Donation process Steps

Donors have to apply themselves at Sanquin in order to becoming one, marked by step 1 in Figure 2.3. This is followed by a consult and testing phase (2). After the approval (healthy and safe), the donor can give whole blood or plasma (3). During a donation of whole blood, 500ml of blood is extracted from the donor’s veins. At that point, the blood contains three elements: red blood cells (erythrocytes), blood platelets (thrombocytes) and plasma. Since their expiration date follows shortly after collection, they are also called short-lasting blood products. In order to separate these products, the blood has to be fractioned, which in most countries, including the Netherlands, is done by the blood banks themselves (4). Since the white blood cells remaining in the products may cause transfusion complications, they are depleted from the blood. The percentage of this leucocyte depletion differs throughout countries, but is fully done (100%) in the Netherlands. Plasma alone can also be retrieved from the body by plasma apheresis, also referred to as plasmapheresis. Since the body needs less time to produce new plasma, donors can give plasma more often. The blood bank freezes the plasma meant for transfusion usually

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5 Sanquin: van bloed tot geneesmiddel, p. 77.
directly after collection. This ‘fresh frozen plasma’ is then stored for six months for safety reasons and afterwards also referred to as ‘quarantine plasma’.

2.4 Products and value chain
Sanquin sells all short-lasting blood products solely to Dutch hospitals. Plasma, however, is also internally sold to the PDR. This is illustrated in Figure 2.3. The erythrocytes are meant for patients with severe bleedings and mainly used with operations and after accidents. This product represents the blood bank’s driver for whole blood donations. Thrombocytes are mainly given to patient with a thrombocyte-deficiency but are also used for its coagulation factors. Finally, plasma from whole blood is based on its different proteins, used to produce medicine. Since this quantity is usually not enough, it is complemented by plasma from apheresis. Note that quarantine plasma, which is sold to hospitals, also comes from plasmapheresis. Of the total quantity collected plasma, 75% is destined for the production of plasma products (medicine) and the remaining 25% is sold to hospitals as quarantine plasma.

2.5 Blood Bank vs. PDR
In the Netherlands, a monopolistic blood bank produces (i.e. extract from the body, test and distribute) short-lasting products, whereas the PDR actually functions in a competitive environment, illustrated by Figure 2.4. The PDR is restrained by the market mechanism to unlimitedly increase prices, but the Blood Bank can only find that discipline through other external factors, such as government control. These disciplines have already been outlined in section 1.5. The potential effects of this internal duality on the price of erythrocytes will be examined in chapter 6. The main drivers for the demand of whole blood donations are erythrocytes, implying that plasma is a by-product of erythrocytes. This assumption is important for the scope of this thesis, as it will focus on the price of erythrocytes. The scope will be extended to the PDR where it can explain the high prices of erythrocytes, given the fact that erythrocytes cannot be extracted from the body by the Blood Bank without also retrieving plasma. Remember that 75% of the total donated plasma is destined for the PDR. Note that the data used in this thesis give prices charged by blood banks to hospitals (the upward facing arrows in Figure 2.3) and not to plasma processing organisations (downward), unless otherwise stated.


**Chapter 3 – The market without government intervention**

This section provides a theoretical framework to study how, and to what extent, the market can satisfy public interests. Government intervention may be justified if the market fails, depending on the accompanied costs compared to gain in efficiency. First, an outline will be provided of public interests. This is followed by a description of the blood market and its determinants, which is used to apply the justification of government intervention on this market.

### 3.1 Public interest and market failure

Under strong assumptions, a full competitive equilibrium can be Pareto efficient: no position of a market actor can be improved without worsening the position of another. The public interests regarding blood supply are then satisfied: i) guaranteed security of supply, ii) fair prices and iii) optimal quality. If the required assumptions do not hold and if it is unable to realize these interests, we say that the market fails. According to Megginson and Netter this occurs through the following violations of the necessary assumptions (2001, p. 329):

1. **Lack of competition**

   If positive scale effects exist in the market, then competition can be seriously threatened. A natural monopoly would then be the market outcome creating a dominant market position for this one firm. The firm will use that position to increase price over the competitive equilibrium to generate high profits. This occurs at the expense of sufficient security of supply, good quality, efficiency and innovation. Government intervention in this case would consist of monopoly regulation.

2. **Information asymmetry and transaction costs**

   In the case when consumers cannot assess quality properly, then suppliers will be limited in the incentive to offer an optimal price-quality ratio. Under certain conditions, poor-quality providers will price good-quality providers out of the market. Without government intervention, this results in an increasing price-quality spiral.

3. **External effects**

   With the production or consumption of a good, some negative or positive effects may arise which do not have a full price. Therefore, these external effects are not taken into account by the consumer or producer. Overproduction (in case of a negative effect) or underproduction (in case of positive one) might be the result.

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7 The assumptions come from the theorem of Welfare Economics and they include the requirements in the market such as no externalities for producers and consumers, low information costs, no monopolistic market structure and no public good. (Megginson & Netter, p. 329).
4. Public Good

A public good is defined by ‘non-rivalry’ and ‘non-exclusiveness’. Respectively, this means that the consumption of one person is not at the expense of another and that no one can be excluded from consuming this good. Consumers are unwilling to pay for these goods on an individual basis and, because of this free-rider problem\(^8\), the good will not, or far too little of it, be provided without government intervention.

Now that the description of the general market failures has been given, this analysis will continue with an outline of the blood market. It will be analysed whether the market can satisfy the public interests. The table below gives an outline of this chapter.

<table>
<thead>
<tr>
<th>Market failure</th>
<th>Public Interest</th>
<th>Section(s)</th>
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<tbody>
<tr>
<td>1. Lack of competition</td>
<td>Affordable prices &amp; security of supply</td>
<td>3.3, 3.4, 3.5.2</td>
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<td>2. Information asymmetry &amp; transaction costs</td>
<td>Sufficient quality</td>
<td>3.3</td>
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<td>3. External effects</td>
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<td>3.5.3</td>
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<td>4. Public good</td>
<td>The provision of the good</td>
<td>3.3</td>
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<td>Summary</td>
<td>All</td>
<td>3.6</td>
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3.2 Good-and market characteristics

At first sight, blood may not seem like a good. However, in economic terms, a good can be defined as such when it is both scarce and a price can be realized because of that.

“When, as economists, we say that a good is scarce, we imply that it possesses inherently desirable or satisfying properties, but that there happens not to be enough of it readily available so that no sacrifice need be forthcoming to enjoy it.” (Robinson, 1961, p. 386)

According to Robinson’s definition, blood is, indeed, scarce. Since it takes the sacrifice of another good to produce (i.e. extract from the body, test and distribute) blood and there are parties who demand this blood, a price arises. By establishing that blood is an economic good, economic theory can be used for its analysis. Two markets can be distinguished with respect to blood, illustrated in Figure 3.1. In the first one the donor represents the supply side of the market and the blood bank on the demand side (1). In the second market the blood bank stands on the supply side and hospitals on the demand side. The first market covers more ethical economic issues, such as voluntary

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\(^8\) A free-rider is someone who enjoys the benefits of a good without paying for it. The free-rider problem is defined by the minimization of free-riding.
versus commercial donations. The decision at what level to price the blood is taken in the second market (2) and makes this the relevant market from the perspective of my research question.

Blood is an economic good, as we have seen above, and has a heterogeneous nature due to the elaborate processing of blood, followed by the three final products, which all differ in blood groups. Plasma can even be processed further into different plasma medicine. As described in chapter 2, the complex nature of the blood distribution and its different products makes the market structure non-transparent. Theoretically, this can result in high prices because the equilibrium price cannot be observed until after the market has cleared (Madhaven, 1990, p.16). A monopolist would set its price above the equilibrium price, since consumers do not observe costs and/or positive margins. Since the blood provision may affect human lives, the monitoring of media disciplines the market players: the market for blood is a reputation market. The potential loss in reputation can be detrimental for blood banks, for no hospital would want to buy the product and no donor wants to give blood after a blood scandal.

3.3 Demand
The demand side is represented by the hospitals. Final consumers are the patients, but clinicians decide on behalf of the patients what amount of blood to use. Although they can be seen as the patient’s agents, the clinicians effectively determine the demand of blood (Cooper and Cuyler, 1968, p. 19). It can be assumed that the hospitals have the knowledge to distinguish good quality blood from bad quality blood. It follows that this market is not subject to information asymmetry. However, it would be very expensive and inefficient if hospitals have to check every load of blood they purchase. Because of this transaction cost argument, a role for the government arises to guarantee the hospitals of safe blood, in-time deliveries and security of sufficient supply, by setting a quality standard.

Demand for blood may vary unpredictably and supply has to come forth shortly after such a fluctuation in demand, for life is at stake. In the Netherlands the hospitals do not directly pay their own costs, as costs are billed to health insurers. However, hospitals are given a yearly budget by the Dutch Health Authority (NZA), urging the hospitals to spend this budget wisely. As hospitals face a budget constraint, it follows that price elasticity of demand of blood is negative\(^9\). In the presence of negative price elasticity, charging a positive price facilitates the appropriate allocation of the good. This holds for individual consumption of blood, but the infrastructure in the blood market is subject to the free-rider problem. A public good is characterized by the impossibility to exclude any consumer from consumption and the fact that the consumption of another person does not go at the expense of another. Marginal costs of an extra consumer are zero, meaning that no consumer is willing to pay for this infrastructure.

\(^9\) Demand elasticity: \( \eta = \frac{P}{Q} \times \frac{dQ}{dP} \).
The position a free-rider adopts is “waiting for the other person to pay” (Nicholson, 2005, p. 368). Without a government enforcing all consumers to contribute, the provision of the infrastructure would find difficulties, if provided at all.

### 3.4 Supply

The supply side in this market is represented by the blood banks. In the Netherlands, it is charged with the supply of the Dutch demand for blood products and all its by-products. The resource is blood from donors, who are requested to come in and donate depending on expected demand of erythrocytes, the donation drivers. Blood is best before a maximum of five weeks, implying that supply must closely follow up demand. This prevents blood banks from growing large stocks and implies that supply must closely follow up demand. Moreover, a minimum stock of blood must always be readily available, in case a calamity would occur. This oversupply can be seen as some sort of a risk-premium the society is willing to pay for the guarantee of security of supply. In chapter 4, this will be discussed in detail. In order to focus on the market from blood bank to hospitals, it is assumed in this thesis that enough donated blood is available.

### 3.5 Equilibrium

A fully contestable market would attract new entrants, as long as rent in that market is positive. Assuming fixed demand, quantity supplied increases with the number of entrants, market price falls and individual profits decrease. This continues until producer surplus is zero. That is, price (p_e) equals costs, and demand and supply intersect. The number of firms is completely determined by market demand and by the output level that minimizes average cost (Q_e), as in Figure 3.2. The resulting situation is Pareto optimal. As mentioned in 3.1, this situation only holds under strong assumptions. As these do not realize in reality, the expected equilibrium in the blood market gives a different outcome.
3.5.1 Number of suppliers

The minimum efficient scale ("MES") is used to denote the smallest output a firm can produce, such that its long run average costs are minimized (Nicholson, 2005, p. 429). What does this mean in terms of the number of blood suppliers? In the market for blood, the MES is high due to the costly affair of testing the blood, building laboratories and fractionation plants, and knowledge infrastructure. If demand for blood is large enough compared to this minimum efficient scale, then more than one supplier can profitably be active in the market. However, in the blood market the expected MES is high, such that the market only fits a maximum of a few suppliers. A competitive equilibrium is most likely not achievable in this market. Despite the lack of data to determine the maximum number of suppliers in this market, two potential scenarios unfold:

1. If one supplier indeed satisfies all demand for blood, then a natural monopoly would be the result.
2. If however, despite the costly entry barriers, demand in the market is high enough to profitably host more than one supplier, then it is likely to face an oligopoly.

In both scenarios (together illustrated in Figure 3.3), each firm has some market power and will be able to set a price at any \( p_m > p_e \) such that firms have positive profits (grey area in the figure).

3.5.2 Total quantity supplied

Proceeding from both above-mentioned scenarios, it can be seen in Figure 3.3 that it is profitable to supply \( Q_m < Q_e \), for it gives a positive profit. In the market for blood, undersupply, as well as the security of supply, is unacceptable since human lives are at stake. The risk for society is too high if the market for blood would be fully liberalized without government intervention.

3.5.3 Quality

In any market with incentives for cost efficiencies, unprized externalities will not be taken into account in the production decisions of blood. The quality of blood is an externality in the blood market. The blood banks are simply not directly confronted with the quality level of blood and insecure supply. Because the consequences of providing bad quality, delayed deliveries and insufficient supply does not impose costs on the blood. They will not be taken into account by a cost efficient blood bank. These externalities will therefore lead to a decrease in overall quality. Cost reductions might result in cheaper but potentially infected blood. Difficulties in observing the proper price-quality ratio arise since the blood quality is difficult to measure without proper expertise. In the case of more than one supplier, the good quality providers are ex ante hard to distinguish from the bad ones.
3.5.4 Deadweight loss

Furthermore, if the MES is high, as expected in the blood market, then it is considered a loss in efficiency for society, to have multiple firms pay that fixed cost. Keeping the effect of the elasticity of demand on fixed, the loss is increasing in the number of firms. Hence, if MES indeed is higher than the Dutch market size, it is more efficient to assign one firm as blood supplier.

3.6 Does the market satisfy public interests?

The market does not provide a remedy for all economic problems: it can fail to satisfy public interest in four ways, as described in 3.1.

1. Lack of competition

It is unclear what the MES is in the Dutch market for blood, but we do know that fixed costs are high. This means there is only room for one or a few suppliers in this market. If indeed the MES were higher than demand, a natural monopoly would be the result. Government regulation on that monopoly is then justified, in order to prevent abuse of dominance. But also in an oligopoly this intervention is validated because of limited competitive behaviour and of the threat of a monopolist arising as a result of a merger.

2. Information asymmetry and transaction costs

As the blood is purchased by the hospitals, it can be assumed that the consumer possesses the expertise to properly assess the blood quality. Hence, no information asymmetry exists in this market. It would, however, be very costly and inefficient for the hospitals to check each load of blood. Because of this argument on transaction costs, the government could intervene by setting a minimum quality. This way, hospitals are efficiently guaranteed of safe blood.

3. External effects

In the blood market external effects would manifest themselves by poor blood quality and insecurity of supply, that is, delayed deliveries and shortages. The blood bank is not directly confronted with the consequences of bad quality, such as transfusion diseases or even death. Hence, a competitive blood bank would sufficiently internalise these effects if they would have a price. As they are not fully prices, a government could set a minimum quality or safety standard to force blood banks to take these effects into account.

4. Public good

The infrastructure and network that a blood bank needs are very costly, but it is not likely that many consumers would want to pay for this. Yes, for individual consumption of blood, consumers are willing to pay a price, but the high fixed costs in the blood market are subject to the free-rider problem. A role for government would lay in providing subsidies to pay for this infrastructure. The
government could also choose for an indirect subsidy, in the form of providing an incontestable market position.

Summarizing, lack of competition is the result of a high MES, or high entry barriers. A non-transparent market and heterogeneous product do not contribute to competition and an optimal price-quality ratio. There are indications of market failure as well as external effects, the existence of a public good and high transaction costs. The three public interests proceed from this failure: i) guaranteed security of supply, ii) affordable prices and iii) good quality. On economic grounds, a government intervention is justified where the market fails to do so. In the following chapter it will be evaluated whether this government in fact manages to effectively safeguard those interests by interfering in the market.
Chapter 4 – Government involvement and regulation

The market fails to satisfy public interests and therefore a government must intervene to do so. Ideally, a government should interfere there – and only there - where the market fails to fulfil these interests. In the Netherlands, the 'Wet Inzake Bloedvoorziening' (Law regarding Blood Transfusion) came into effect in January 1998. It specifies regulation in the Netherlands and differs from other European countries. Hence, it might explain the differences in blood prices. By examining the effect of specifics of the law, the level of subsidy and the governmental monitoring of Sanquin, the following question can be answered:

*How does regulation and government involvement affect the price of erythrocytes?* A comparison will be drawn between the different European countries. Moreover, it will be evaluated whether the law and regulation indeed manage to satisfy public welfare, where the market cannot.

4.1 Wet Inzake Bloedvoorziening (“WIB”)

From 1988 onwards, blood supply in the Netherlands has changed rapidly. The 22 regional blood banks, each performing the same set of tasks Sanquin has today, merged with the CLB, centralizing the supply of blood. Because of this sudden change in the structure of blood provision, the regulation in the Netherlands asked for a reform: the WIB of 1988 was revised in 1998. The Ministry of Health ('Ministerie van VWS') entrusted one legal entity to provide blood in the Netherlands on a not-for-profit, voluntary and non-remunerated basis (WIB, Article 3.2b). The following sections will analyse the effect on price of the different features of this law. The main sections will begin with a conclusion.

4.2 Monopoly

*Sanquin’s monopoly in the blood market enables Sanquin to exercise market power and increase prices.*

The Dutch government has chosen for a monopolist to supply blood in the Netherlands. It therefore assumes that the MES is too high for the market to efficiently host more than one supplier. If this assumption is true, no efficiency loss occurs on the account of the high costs of blood provision. The government has chosen to have blood provided through one source. The reasoning behind this is that it makes blood easily traceable back to the donor. In addition, regulatory quality requirements apply to one organisation only, which simplifies the monitoring process of these requirements by the government.

From economic theory we know that prices are increasing with market power (Nicholson, p. 389). In empirical literature we find that monopolists raise prices to above the competitive equilibrium (Panzar, p. 448). The effect the monopolistic position has on the price in the blood market will be analysed in two ways: with the possibility of import and without, such as currently in the Netherlands. First, we need to establish what incentives a not-for-profit organisation has, when it comes to price setting.
4.2.1 Why not-for-profit organisations may have incentives to increase prices

A non-profit organisation easily benefits from an image of an organisation that ‘only does well for society’ and has no real incentives to increase prices. Take for example the fact that Sanquin is not allowed to pay dividends to shareholders and surplus is recycled back into the organisation, one can argue that it does not really profit from positive margins.\(^{10}\) These surpluses are partially used for scientific research and stored under equity as a buffer.\(^{11}\) It is essential to know that this picture can be misleading for several reasons. Firstly, as will be shown in chapter 6 of this thesis, Sanquin is very likely to cross subsidize its competitively operating divisions and commercial products. This is especially likely for an organisation, which also has a non-competitive division. Secondly, in a not-for-profit monopoly, due to a diminished lack of the necessity to be cost efficient compared to a competitive market, both employees of Sanquin and Board of Directors can be scaled up higher in the organisation’s CLA.\(^{12}\) The earnings of Board of Directors seem rather high, compared to other not-for-profit boards\(^{13}\). These earnings have been a point of discussion in media and parliament before.\(^{14}\) But as Sanquin states, these rewards should be best compared to boards of academic hospitals\(^{15}\). It is debatable whether this is the correct peer group, since the responsibilities of academic hospitals are more diverse and complex. Of course, other company expenses are not covered by the CLA, such as buildings and company trips. More incentives arise to increase costs. Indeed, the Plexus report concludes that indirect costs, including housing, lay 44% above the benchmark (Plexus, p. 40). Moreover, salaries in the CLA are not binding and can be supplemented by fringe benefits, as outlined on Sanquin’s CLA. The important idea here is that, just like other not-for-profit organisations, Sanquin and its employees benefit from higher costs, like salaries, fringe benefits, payment of Board of Directors, housing, schooling, company excursions etc. Higher costs can be absorbed by a potential positive margin or can be covered by a higher price.

4.2.2 Without imports

Now that we have established that Sanquin has incentives to increase costs, we proceed by analysing the effect of a monopoly position on the price, starting by assuming a ban on imports. If the import of blood is not allowed, Sanquin has an incontestable market position. This position can also be seen as the ‘subsidization’ of the

\(^{10}\) Since Sanquin operates on a not-for-profits basis, this thesis will refer to ‘profit’ by ‘margin’ or ‘surplus’.

\(^{11}\) Solvency ratio Sanquin 2010 equals 72%.

\(^{12}\) Collective Labour Agreement.

\(^{13}\) Wet Openbaarmaking Publieke Taken, 2011.

\(^{14}\) Kamervragen beloningen bestuur Sanquin, September 6th 2011.; Volkskrant- Duur betaald bloed, August 28th 2011.

\(^{15}\) www.sanquin.nl
government in this market. The monopoly position may render the supplier 'lazy', which leads to diminished incentives to innovate, specialize, produce more efficiently and lower costs. Hospitals are faced with one supplier of blood, offering the product at a higher price than in a competitive equilibrium, but at a lower quality level. As discussed above, in general the semi-public sector is more prone to have high costs due to a lack of the urge to compete. The market power of a monopolist can be used to charge a price above the competitive level in order to maximize profits. This can also be seen in a European comparison (Figure 4.1 and Table 4.1). The Dutch and French blood prices are among the highest in Europe. In line with expectations, it can be found that this blood is both produced by monopolist in countries where it is not allowed to import blood.

<table>
<thead>
<tr>
<th>Table 4.1: European Blood Market - Prices in € charged to hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price erythrocytes (unit)</td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>Germany</td>
</tr>
<tr>
<td>Belgium</td>
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<tr>
<td>Spain (region 2)</td>
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<td>Finland</td>
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<tr>
<td>Spain (region 1)</td>
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<tr>
<td>Italy (supplier 1)</td>
</tr>
<tr>
<td>United Kingdom</td>
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<tr>
<td>France</td>
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<tr>
<td>Netherlands</td>
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<tr>
<td>Italy (supplier 2)</td>
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<tr>
<td>Average</td>
</tr>
<tr>
<td>NL above average</td>
</tr>
</tbody>
</table>

* Spanish transfusion centres are incorporated in hospitals. Their costs are 100% covered by the Public Health System (part of Spanish central government).

4.2.3 With imports

The above-described situation does not occur in the case when a monopolist is challenged by potential imports. Its position is then no longer incontestable, since the alternatives for consumers have increased. In such a case, the incentives of a monopolist to become more cost-efficient have grown. As a result, prices will decrease due to cost reductions. In Finland and Belgium the described situation can be found: a monopolist facing competition through imports. These countries belong to the cheaper spectrum of the European blood supply.

4.2.4 Competitive markets

Germany, as the cheapest provider, has two main blood banks and in 2000 a few commercial blood banks have opened. These commercial blood banks occupy 5% of the total market in 2008. The nineteen
blood banks in Spain from Table 4.1 refer to autonomous regional blood banks, rather than nineteen
organisations operating in the national blood market. Two different prices apply, depending on the
region of the supply. Interregional trade, however, is possible, so the number of suppliers per region
exceeds one. Consequently, the Spanish market is competitive. In line with theory, this appears to result
in lower blood prices.

4.2.5 Does Sanquin’s monopoly position have a increasing effect on prices?
Competition has a downward effect on prices, which means that when a monopolist operates in a market
where imports are not allowed, prices are expected to be higher than in a market where consumers have
at least one more alternative for buying the good or service. Indeed, in the Dutch market, due to a lack of
imports, the dominant market position of Sanquin seems to increase prices. On the other hand, Table 4.1
does not provide any information on the quality of blood and security of supply, potentially justifying a
high price. However, we do know that all European countries supply blood according to a minimum
safety standard. The Dutch government, though, has chosen for a regulated monopoly to provide blood
for safety reasons. Other countries decided otherwise. The important idea here is the guarantee of safe
blood, for life is at stake (also discussed in chapter 5). Cheap blood, which is contaminated or a shortage
of supply, definitely does not improve public well-being.

4.3 Import (Article 15)
Assuming a monopoly position, the ban on imports of potential cheaper blood strengthens Sanquin’s market
position and may lead to a higher price.

Article 15 of the WIB forbids the import of blood products from abroad without permission of
the Secretary. The underlying reasoning is that security standards differ in the Netherlands from other
European countries. This would cause problems if blood would be internationally traded. Baarsma et al.
discuss that the privatization of a public task alone does not have this effect; the existence of competition
is essential (2010, p. 58). The import of potential cheaper blood products increases supply and creates
competition by contesting the monopoly position of Sanquin. It will force Sanquin to become more cost
efficient. Intensifying competition increases effectiveness of an organisation. However, in a competitive
market, an import ban would have little to no effect on the price, assuming that the imported quality
equals the quality provided in the importing country.

In the European Directive on Blood it is stated that each member state may introduce national
regulation on imports and exports, as long as the imported product is tested according to a European
security standard and the blood is traceable back to the donor.\textsuperscript{16} However, the European Directive on
Blood stimulates national self-sufficiency, implying that import is unnecessary. In Germany, for example,

imports are allowed and 40% of its plasma comes from the cheaper market in the United States.\textsuperscript{17} Subsequently, by looking at Table 4.1, it is not surprising that Germany manages to provide the cheapest blood products in Europe. In addition, the only two European countries that do not allow import of blood products, France and the Netherlands, offer the most expensive blood, except for Italy. The difference in the Italian blood prices cannot be explained due to a lack of information on the Italian blood market.

Sanquin is not allowed to sell its products abroad, described in Article 16 on export ban. This is in line with the objective of Sanquin to satisfy only Dutch demand (WIB, Article 2). To put this in economic light, if the MES is too high for the Dutch market alone, it will never become profitable to host multiple suppliers. Hence, if the entire Dutch market is already served and export is not allowed, economies of scale cannot be further achieved. By lifting the export ban, the market can be expanded and efficiency could be improved.

4.4 Self sufficiency of the Netherlands by Sanquin (Article 2)

The fact that Sanquin is obliged to provide all of the needed blood products, costs for recruitment and wastage of blood are high.

As sole supplier of blood in the Netherlands, Sanquin is obliged by law to provide all needed blood products (WIB, Article 2). No public information is available if the other European blood suppliers have this obligation as well. This self-sufficiency might result in the collection of more blood by Sanquin than it would in a strict commercial setting. If the increase in cost for collecting and storing the blood is larger than the amount received from hospitals, then blood is economically wasted. Of course, we have to take the required additional stock by the blood banks into account, needed for a radical rise in demand. This extra supply is not classified as economic wastage, since it can be considered a risk premium the society is willing to pay for.

Self-sufficiency does not concern the sole quantity of blood but also all its different (by)-products, such as rare blood groups for short lasting blood products. In addition, plasma after fractioning gives many end products, based on all the different proteins in the plasma. Each of these proteins can be processed into different medicine. Given that other suppliers provide the common share of different plasma products (immunoglobulin, coagulation factors, albumin, protease blockers), Sanquin’s most important social function is to provide the orphan medicine.\textsuperscript{18} Since only a small percentage of the population is in need of them, it is not profitable for commercial parties to supply these medicines. The blood wastage in this niche-market is high, as whole blood is donated, of which only a small component is extracted. The wastage of oversupply comes at a cost, let alone the increase in recruitment costs for the search of these rare donors. Accordingly, the negative margins on plasma products may be

\textsuperscript{17} Plasma Procurement and Self Sufficiency, 2004, p. 10.
\textsuperscript{18} Orphan medicines serve patients with very rare- usually genetic- diseases.
contributed to the self-sufficiency task, as also concluded by the Conquaestor report (p. 10). This ‘wastage’ cost can partially be assigned directly to plasma but for the allocation of indirect costs (recruitment etc.), erythrocytes are, as donation drivers, a very acceptable objective. The self-sufficiency of the Netherlands may therefore be an important factor in explaining high prices of erythrocytes.

4.5 Subsidies throughout Europe

In the Netherlands, the price of blood products might be higher in the presence of a subsidy.

The subsidy level for blood transfusion organisations differs throughout European countries as shown in Table 4.1. These subsidies usually function to support the costly infrastructure needed for blood transfusion. Apparently some governments consider that the infrastructure is considered a public good and assume that no consumer is willing to pay for it on an individual basis. This free-rider problem could be, amongst other market failures, a justification for government interference. Subsidies can work two ways concerning the effect on output prices. A governmental subsidy can indeed be seen as a donation, which is used to pay for this infrastructure. In that case, the subsidy can push prices downwards, keeping margins constant. On the other hand, a subsidy is a ‘free’ income, which reduces incentives to be cost efficient, and therefore creating a ‘lazy’ organisation: assuming fixed margins, prices will then increase due to a less efficient (i.e. more costly) production. Which effect a subsidy has on the blood market, will be analysed in both a monopolistic and competitive setting.

4.5.1. Subsidy for competitive firm

We start by examining the competitive player, who is driven to be cost efficient and to keep his price low in order to be able to compete in the market. Such a firm will use that subsidy to reduce costs. Strategically the firm would lower its price somewhat to increase its market position but benefits from the decrease in cost with a higher margin. A comparable situation can be found in Germany, where the main blood bank, the Red Cross, receives subsidies from federal government, European Union and other instances. Its annual report, which also covers other support programs of the German Red Cross, shows that approximately 25% of total income is externally funded. Germany offers the cheapest erythrocytes, while receiving most subsidies. Also, the regional transfusion centres in Spain, competing on interregional level, have their costs 100% covered by the Public Health System. Again, Spain belongs to the cheapest half of Europe’s blood suppliers.

4.5.2. Subsidy for a contestable monopolist

Subsidies would have the same effect as described above, if the presence of some sort of rivalry drives the monopolist to be cost efficient. For example, the Belgian Red Cross gets some of its income from

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19 Deutsches Rotes Kreuz, Jahrbuch 2011, p. 61
structural federal subsidies (3% of total income), but has to compete with imports. It is, therefore, no surprise that, despite its monopoly position, it offers the second cheapest blood on the European blood market. In line with expectations, in Finland the fourth cheapest blood in Europe is offered: its blood supply is subsidized, while the supplier faces competition through imports. On the contrary, in the United Kingdom subsidies take up to 13% of total income of the NHSBT, whereas its price of erythrocytes is ranked fourth most expensive in Europe. On regional scale, the four British blood banks have a monopoly position, but imports are allowed, which means that imports do not seem to have enough decreasing effect on price.

4.5.3. Subsidy for an incontestable monopolist
With a lack of such an incentive, a subsidy indeed would make the monopolist inefficient for it gets a ‘free’ income, which provokes laziness when it comes to cost efficiencies. Sanquin, a monopolist in the Dutch market where no import is possible and its position is therefore uncontested, receives no subsidies. In France we find the same situation. Both the Netherlands and France belong to the most expensive blood suppliers in Europe. Hence, it is expected to find a higher price in these countries in the presence of subsidy, for it makes these types of organisations more indifferent towards cost efficiency. Another perspective on this is that the Dutch and French governments have facilitated an incontestable market position for the blood bank, which can also be considered as a form of a subsidy. If the government provides these organisations with a financial subsidy as well, a double contribution would be given.

4.5.4. Is the price of blood in the Netherlands higher due to a lack of subsidy?
No. On the contrary, given an undoubted monopoly position, the lack of a subsidy, prevents the monopolist from becoming lazy. The prices are expected to be higher in the presence of a subsidy, rather than lower. We have seen above that, as subsidies do not only function as a cost reduction, but also cause a decrease in the incentives for cost efficiencies, this can result in a higher price, compared to a subsidy-free organisation. Any competitive firm will use a subsidy to lower its price. Subsidies may result in higher margins for firms without efficiency incentives.

Another important issue results from the cost to society of a subsidy. When we look at the effect of subsidies on prices for consumers, the source of these subsidies must not be ignored. Final consumers, namely, pay taxes which (through governments) underlie these subsidies. Furthermore, taxes and subsidies cause a distorting effect in the market, creating a deadweight loss. This loss is defensible if it

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20 Finnish Red Cross, Annual report 2010, p. 31.
21 National Health Service Blood and Transplant Department.
22 National Blood Service, Annual report 2010, p. 34.
concerns a public good and provision of the good would not exists without the enforcement of a government by taxes and subsidies. Since the infrastructure of blood provision can be defined as such a good, some sort of subsidy is appropriate. However, as the Dutch government already facilitates in providing an incontestable market position for Sanquin, an indirect subsidy, a supplement of a financial subsidy is considered costly and unnecessary.

4.6 Government’s involvement in Sanquin’s budget

In practice, the government does not exercise power on the prices of Sanquin’s short lasting blood products, since next year’s budget is calculated based on the expected cost increase by Sanquin.

The Ministry has appointed one supplier of blood. Such a monopolist needs a regulator to prevent it from abusing its dominance. In chapter 1, we have seen that an organisation is disciplined through four factors, of which the law eliminates the market factors. That leaves the Ministry, Supervisory Board and media to control Sanquin. Article 7 states that the Ministry has to approve Sanquin’s next year’s budget in advance. This happens by calculating the increase of each product according to new policy. Last year’s costs and prices are multiplied by a fixed percentage (3.2%) and taken into the budget. In 2002 this percentage has been set and since then not been adjusted. The Ministry can, in fact, make no real demands on next year’s costs. Only with the introduction of a new policy, buildings, testing etc., the Ministry effectively questions the accompanied change in costs. In chapter 6 an elaboration can be found on how prices and costs are determined. The government can be critical but can exercise no real influence on Sanquin’s prices of blood products (Conquaestor, p. 8). However, in the aftermath of the Plexus report in 2009, concluding that plasma was under-priced, the Ministry asked Sanquin to increase prices by 12% to a market conform level. Anno 2012, a correction of 6% has been realized. At the end of writing this thesis, the Ministry declared another future correction on internal plasma prices (Schippers, p. 5). In practice, the Ministry can make some demands on price, but still leaves room for Sanquin to endorse high prices since the Ministry is the only impediment on price increases.

4.7 Other disciplinary factors

Although the media functions well as a monitoring institution, the power of the Supervisory Board is unclear in disciplining Sanquin in practice.

As stated in Sanquin’s annual reports, the organisation’s Supervisory Board discusses the prices of the products. To what extend the Supervisory Board also acts upon their correcting function is

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24 In the interview with Marlies Vos and Frank van Linden, ‘Ministerie van VWS’, we discussed the monitoring of the Ministry on Sanquin. It remains unclear to what extent the Ministry acts upon its monitoring function. Most of the information regarding this I got from the Conquaestor report, which is publicly available and therefore approved of by the Ministry.

25 Sanquin Annual report 2010 and 2011 – Notes Supervisory Board.
unclear. The Ministry does not correspond with the Board regarding the price regulation of Sanquin, although they both partially serve the same purpose.\textsuperscript{26} It might be interesting to further look into the influence of the Board, but no public information is available.

Finally, the media also have proven to discipline Sanquin.\textsuperscript{27} As the blood market characterizes itself as a reputation market, due to the risk of blood transfusion and voluntary donations, Sanquin’s policy is criticised regularly in the Dutch media. This prevents the organisation to unlimitedly increase costs and reduce the quality level, as the media functions as a tracking device for governmental assessment.

4.7 How does government regulation and involvement affect the price of erythrocytes?

Government involvement should serve the purpose of fulfilling public interests, there where the market mechanism is dissatisfying. Governmental regulation can be executed through three channels: i) the law through monopoly, imports and self-sufficiency, ii) level of subsidy and iii) monitoring or enforcement of the law.

Firstly, the government has assigned one blood supplier with the argument of safety and the small market size. The, accompanied law, the WIB, is constructed such that hospitals have no other choice than to buy blood from Sanquin. This means that Sanquin legally benefits from an incontestable market position and could use the accompanied market power to increase prices, if not corrected for. Although we can reason that the MES is high, potential efficiency gain in this market indicates the need for a more in-depth investigation on the market size. In the case of a higher MES than Dutch demand, the export ban impedes improvement of efficiencies in the blood market and should therefore be reversed. On the contrary, if the MES is smaller than Dutch demand, a potential second domestic supplier or imports can increase competition.

Secondly, the Dutch blood bank receives no government subsidy unlike other countries. We have seen that an incontestable monopolist is tempted to become lazy in pursuing cost efficiencies if given a subsidy. Hence, the fact that Sanquin does not receive a subsidy serves the purpose of a reasonable blood price. The Dutch government meets Sanquin by providing the organisation with an incontestable position in the market. It is considered unnecessary to supplement that by giving a financial subsidy as well.

Finally, the strong monopoly position of Sanquin should be corrected for by the monitoring of the Ministry, Supervisory Board and media on Sanquin’s budget and policy. In the market for plasma

\textsuperscript{26} Meeting Ministry of VWS, 5\textsuperscript{th} July 2012.

\textsuperscript{27} In 2011, the Dutch documentary ‘de Rekenkamer’ investigated the source of the price of blood and found the Dutch price to exceed the Belgian and German price. This led to questioning of the VWS in the Dutch parliament. Furthermore, new policy on homosexual donors caused in April 2011 commotion in Dutch media. Finally, in July 2011, the salaries of the Board of Directors have been enquired in the media and Dutch parliament.
products, a firm’s desire to increase prices is constraint by the market mechanism. However, the only limitation Sanquin finds in raising the price is through external disciplines. The risk of regulatory capture, meaning the unduly advocating of the interests of the regulated party by the government, arises if a firm is controlled from a distance. The reason is an information asymmetry, that a regulating organisation will always face with respect to the regulated firm. Hence, it is crucial for the regulator to be actively involved in the firm that is regulated in order to correct for this risk (Baarsma, p. 64). In practice, the Dutch Ministry does not make real demands on Sanquin’s next year’s costs, although it has the possibility to do so. Sanquin is by law not allowed to charge a price above production costs for each product, but when Sanquin can make cost increases over the years, prices can increase legitimately by the same proportion. The role and influence of the Supervisory Board is unclear. The media functions as a monitor, but can make in fact no demands on Sanquin’s policy.

In conclusion, for the Netherlands, the Wet Inzake Bloedvoorziening 1998 and the monitoring of the Ministry are important factors in explaining the higher prices of erythrocytes. It is difficult to say which of the regulation factors takes the bigger part in explaining the price. Import, governmental subsidies and competition are all related. The data available are limited and therefore, further research is necessary to fully analyse the separate effects of the regulation. A higher price is justified, though, if it manages to provide safer, more adequate and enough blood at the best price-quality ratio. If these interests are satisfied at an affordable price, then government involvement has served its purpose. Regulation goes too far if the government sets standards that are too expensive compared to the social benefits and if it interferes in fields where the market does manage to satisfy public welfare. Where the threshold of price-quality ratio lies exactly is impossible to determine without cost data.
Chapter 5 – Safety

A careful screening process guarantees the selection of healthy donors, in order to prevent transfusion of infected blood. In the late 1980’s France was hit by a blood scandal where dozens of people where infected with HIV due to failure of the screening process of blood. A more elaborate process of screening and testing does not only increase the quality of blood but also the costs. Hence, can differences in security standards in Europe explain differences in price of erythrocytes?

5.1 The procedure

The selection of donors is given by process step 1 and 2, as described in Figure 5.1, and is based on two pillars. The first concerns the exposed risk to the donor by donating and secondly the risks run by a receiver as a cause of infected donor blood. In order to exclude both risks, each donation is preceded by a consult with a physician or nurse. This is important to interpret and complement future laboratory results. If no serious issues occur, the blood bank proceeds to step 3 and 4, the processing and storage of the already donated blood. In the last step 5, blood is tested in the laboratory. How extensively this is done, differs throughout Europe, although a European security standard for blood transfusion is described in the Directive for Blood Transfusion.

The period when a virus is already active in the human body, but cannot be traced by tests yet, is usually referred to as the ‘window period’. It is therefore crucial for the donor to be truthful in the consult. When an infection or virus is still in its window period, laboratory test will show negative results, while the chance exists that the blood indeed is infected. A so-called ‘blood scandal’ occurs when such infected blood is transferred to a patient. This is one of the main reasons why almost all European countries do not remunerate blood donation. Paying for donations can give the wrong incentive to donors and might stimulate being fraudulent about health issues. It thus endangers the transfusion.

5.2 Testing of different components

The three blood products carry different levels of possible infections. Sanquin uses most tests for plasma. Moreover, Sanquin stores plasma for six months until the donor is tested again and infections can be ruled out. For the other products this is not obtainable, since erythrocytes and thrombocytes cannot be stored for more than five weeks respectively five days. White blood cells are filtered from the blood products (leucocyte depletion) and this can be done in different degrees. Sanquin, as in most countries, fully depletes the blood (100%). In addition, viruses are detected in blood by tests of which the most
sensitive and expensive test is the NAT.\textsuperscript{28} This test has highly shortened the window period of for example HIV and hepatitis C, since it searches for the DNA of a virus itself and not for its antibodies (serological), like other tests.

\textbf{5.3 Sanquin's policy}

Over the years, the valuation of health policies has become more subject to economic arguments. The Dutch Council of Health remarks in a report on efficiency in the health sector that if an intervention is more expensive, it should only be implemented when the health benefits weigh up against the accompanied costs (Raad voor de Volksgezondheid en Zorg, p. 56). In this market where human lives play a role, the benefits are not easy to measure. Assessment of the cost-benefit ratio is difficult without quantification of these benefits. Blood banks try to put this into practice when balancing the depth of testing. They multiply the chance of a blood scandal to occur times the costs when it would occur. 'Optimal security' is usually referred to when blood banks choose the number of tests in such a way that its costs do not exceed these costs of a blood scandal. A policy of preventing blood scandals against all cost is called 'maximum security'. Already in 2000, the Dutch Ministry has stated that optimal security is sufficient to guarantee the safety of Dutch blood. In practice, it is impossible to achieve maximum security; no matter how marginal the additional benefit, it would have to take all possible security measures (Borst-Eilers, p. 3). Nonetheless, Sanquin claims to have always pursued maximum security.\textsuperscript{29}

Although this is difficult to measure, this higher standard becomes clear when one compares the Netherlands to France, Ireland, Finland and Belgium. The Dutch blood bank uses the highest total number of tests per donation and three times as much NAT’s. Accordingly, testing costs per donation are the highest of this pool, which can be seen in Figure 5.2 (Plexus, p. 60).

Although in the Netherlands the law does not specify the degree of testing, the Ministry does claim to prefer optimal security.\textsuperscript{30} If the Ministry would approve each new set of tests and uses advise of the Health Council ('Gezondheidsraad'), it should be able to lead Sanquin to a lower security standard. On the contrary, the testing procedure has not been revised in the past, implying a cumulative increase in tests. As described earlier in chapter 4, the Ministry’s influence on Sanquin’s

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{Figure_5.2_Direct_costs_per_process_step.png}
\caption{Direct costs per process step}
\end{figure}

\textsuperscript{28} "Nucleic acid Amplification Test", Sanquin: van Bloed tot Geneesmiddel, 2007, p. 57.
\textsuperscript{29} This was stated in meetings with Sanquin and confirmed in the interview with the Ministry of VWS.
\textsuperscript{30} On 5th of July 2012 I met with the Ministry VWS. The preference for optimal security and the difficulty to enforce Sanquin to revise the earlier approved tests was discussed.
budget seems to be only limited. Another example of a lack of influence has manifested itself here, where the Ministry’s demands on security standards have not been enforced in practice in previous years. However, in a recent statement of the Ministry in July 2012, Sanquin is dictated to lower the number of tests in the future, but is not given a measurable new standard (Schippers, p. 9). How and to what extend the current policy demands will be implemented and how it will affect the blood price is unclear at the time of writing this thesis.

5.4 Can differences in security standards in Europe explain differences in price of erythrocytes?

*Prices of erythrocytes are higher in the Netherlands because security standards on blood are higher than the European average.*

It seems to be the case that Sanquin pursues a high level of security. The fact that the Council of Europe has appointed Sanquin to store Europe’s most rare blood products, might illustrate this. Another example of a higher security standard manifests itself by the double testing of each new donor in the Netherlands, compared to one single test in other European countries (Plexus, p. 60). The costs incurred by testing of blood, in order to obtain this standard, can partially be assigned directly to the different blood products. It seems reasonable that prices of erythrocytes are higher than the European average due to higher security standards, given the costly nature of these tests. This view is supported by the Plexus report, claiming that total testing costs per donation in the Netherlands lie 15% above average of the other four European countries investigated in the report.\(^{31}\) Sanquin has a diminished incentive for cost efficiency compared to its competitive counterparts, contributing to preserving the costly high security standard. In conclusion, higher costs may be supported by higher prices. Therefore we can establish that the costly high security standard Sanquin obtains, contributes to the high Dutch blood prices. It is in the interest of the public to have sufficient safe blood at a reasonable price. Since neighbouring countries manage to provide blood of no inferior quality\(^ {32}\), it is debatable whether the level of testing costs contributes to an optimal price-quality ratio. The public might be better off with blood that fits the minimum safety requirements at a lower price than with very safe blood at a high price. This particular aspect of quality is very difficult to measure, because of a lack of data on costs and benefits. Moreover, there is an ethical component because such calculations concern human lives. It asks for an in-depth quantitative investigation on how many years on average are gained with every additional test performed on blood.

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\(^{31}\) Dutch testing costs per donation are €5.6 higher than the average of €37. Plexus, 2009, p. 60.

\(^{32}\) According to Frank van Linden (VWS) no such thing exists as European blood of inferior quality compared to the Netherlands (5th July 2012).
Chapter 6 – Cross subsidy

As described in chapter 2, Sanquin does not only provide blood, but also research, laboratory services, storage of rare European blood and so on. One of its divisions, the Blood Bank, operates as a legal monopolist whereas the other divisions operate in a competitive market. What does the segmentation of competitive and monopolistic elements mean for the pricing of the short-lasting blood products?

This chapter will describe the effect the provision of plasma products has on the prices of erythrocytes. Such an effect could come forth as the cross-subsidization of Sanquin’s products. Cross subsidies are not necessarily welfare decreasing. It might in fact increase welfare if such a price structure enables the provision of a good which otherwise could not be provided. However, a price structure, which is cross subsidy free, simply ensures the consumer of erythrocytes to be at least as well off if plasma products would not have been offered. A closer look makes it therefore relevant for this research.

Note: In this chapter, ‘plasma price’ refers to the price Sanquin Blood Bank internally charges the PDR, marked by the blue arrows in Figure 6.1. Hence, this is not the price for quarantine plasma to hospitals.

6.1 Why suspect cross subsidy?

Since the goal of this thesis is to explain the high prices of erythrocytes, an explanation could be found in the supply of plasma products. The process of whole blood donations creates a situation in which we cannot extract erythrocytes from the body without also retrieving plasma. Besides the already existing indirect costs, such as housing and recruitment, a debate arises on how to allocate these accompanied costs and therefore on our valuation of the price of the products. Are the prices of erythrocytes rightfully high and equal to its costs?

According to Faulhaber, cross subsidization occurs when “a proposed price structure for the multi-commodity enterprise “unduly” favours the consumers of one commodity at the expense of the purchasers of another commodity” (1975, p. 966). Sanquin is structured such that it is possible to cross-subsidize plasma and erythrocytes: the organisation sells erythrocytes on a non-competitive market and plasma products on a competitive market. Furthermore, both the divisions fall under the same budget.
and legal entity, the foundation Sanquin. The PDR (Plasma Products, Diagnostics and Research) represents Sanquin’s competitive section: they offer plasma products on a market where multiple players are active. The PDR therefore has an incentive to be cost efficient. Keeping production costs low results in a strengthening of its market position. The Blood Bank, Sanquin’s monopolistic part, is less prone to be cost efficient, due of a lack of competition.

A cross subsidy can manifest itself in higher prices of one good, to compensate, for example, the negative margin on another good. The incentive to cross subsidy naturally starts at the division operating in the competitive market: PDR. All the other market players in the plasma-pharmaceutical market need to find the plasma on the international market, but the PDR gets its plasma directly from the Blood Bank of Sanquin. Moreover, Sanquin is allowed to only sell its plasma to the PDR, implying an exclusive contract between the two, shown in Figure 6.2. If the price charged for that supply of plasma is relatively lower than the average price in the market for plasma, then the PDR has a competitive advantage to its market players. This might be due to the fact that Sanquin fulfils a public task and certain advantages it enjoys from that task. Think of the solid reputation it has as a blood bank and benefitting from that reputation in selling plasma products to hospitals. Remarkably, in 2010 the internal plasma price of Sanquin was increased by an intervention of the Ministry, after the Plexus report concluded that the plasma price was too low. Today, only half of the that correction has been realized. Again, since both the Blood Bank and the PDR are covered by the same budget, this already implies the need to look further into Sanquin’s price structure.

6.2 How can one establish cross subsidization?
A regulator often requires a regulated enterprise to price a good such that it equals production costs. In order to apply cross subsidization, the presence of a common or indirect cost is needed and the provision of multiple goods or services (Faulhaber, p. 959). An organisation therefore has a grey area to assign these indirect costs to the different products – or even direct costs in case of a complex production,

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33 The Plexus report in 2009 finds that prices of plasma delivered to the division Plasma Products by Sanquin are 12% below average of the benchmark. The Blood Bank makes a negative margin on plasma delivered to Sanquin Plasma Products.
process. So, 1) multi-commodity, 2) common costs and 3) profit-regulation are the three characteristics, which are necessary for the possibility of cross subsidies at all. In addition, if elasticity of demand of the different goods differ, then an organization is more likely to cross subsidize these products, assuming fixed demand. Namely, if elasticities in question would be the same, prices should be set equal to its marginal costs (Baumol and Bradford, p. 270)\textsuperscript{34}.

A price structure is considered cross subsidy-free when “the provision of any commodity (or group of commodities) by a multi-commodity enterprise, subject to a profit constraint, leads to prices for the other commodities no higher than they would pay by themselves.” (Faulhaber, p. 967). If we apply this to Sanquin, its price structure would be subsidy free if the provision of plasma gave no higher price of erythrocytes then would be charged in the absence of the plasma provision.

6.3 Given the information available, is it likely that Sanquin uses cross subsidy?

Above, the existence of three factors is described that might facilitate cross subsidies. Sanquin is a not-for-profit organisation, which supplies multiple goods and has high indirect costs (see Figure 6.3). As concluded by the Plexus report, indirect costs of Sanquin are high in buildings, research and ICT (Plexus, p. 18). Moreover, when extracting erythrocytes from the body, it is unavoidable to collect plasma as well (and thrombocytes) and the other way around. So we have ambiguous direct costs and indirect costs, which can be assigned in different ways to the products, leading to very different conclusions.

Assuming that erythrocytes are the donation drivers, does that make plasma a by-product? If so, then it is sensible from an economic point of view to spare plasma in assigning these ambiguous costs and use only the short-lasting products to carry these costs. After all, Sanquin then only uses the by-product wisely by producing medicine, which would otherwise be wasted. Though, over the years there has been a switch of donation drivers from erythrocytes to plasma, for the needed immunoglobulins are extracted from that plasma (Bloedbeeld, p. 5). If indeed plasma becomes a donation driver, then the costs allocated to plasma should be higher since all costs are to be equally divided amongst all final products. The situation, in which plasma is unrightfully spared in costs assignment, only implies cross subsidy if the other consumer (erythrocytes) “suffers” from the provision

\[ \frac{p_i - MC_i}{p_i} = \frac{1}{\lambda E_i} \]

\textsuperscript{34}
of plasma. And indeed, the purpose of this thesis is to explain why the Dutch price for the short lasting products, erythrocytes in particular, exceed the average by 32%.

Furthermore, the Blood Bank operates in a health-sector, where elasticity of demand is much lower than in the competitive plasma market. For the hospitals in the blood market, it can be argued that elasticity is practically zero. After all, the hospitals need the blood, almost regardless of price, for life is at stake. Moreover, these costs are fully passed on through hospitals to insurers and the government and finally transferred to consumers via insurance premiums and taxes. Although it is very hard to be more precise on exact numbers, demand is much more sensitive to price change in the plasma market, given the presence of other suppliers, relative to the market of the blood bank. It seems economically plausible to charge a higher price in a market where demand is less elastic (the blood bank) and therefore profitable to cross subsidize products with different elasticity of demand.

Interestingly, although I have not seen the budget of Sanquin, the Conquaestor report did use the budgets from 2006 to 2009 to evaluate the prices of short-lasting blood products. They conclude that some products are produced at negative margins. Since in all of these four observed budgets the costs are fully covered by the revenues, it might be an indication that the products with a negative margin give an upward push on the prices of the products without a negative margin, such as erythrocytes.

Contributing to this effect, each year’s prices are established according to the budgeted prices. These are not corrected for based on actual results at the end of the year: the prices are simply multiplied each year by a fixed percentage. The system therefore leaves room for calculation differences at the end of each year, which can positively or negatively add up to Sanquin’s equity. In case of under- or over-budgeted quantity and differences in fixed costs, Sanquin’s equity is used to finance that difference. This is not transferred to next year’s prices. As the organisation’s net results have been positive in 2006 to 2009, the financial structure has allowed Sanquin’s equity to slowly build-up (Conquaestor, p. 37). Anno 2011, Sanquin has a solvency ratio of 72%, which can be considered high for a not-for-profit organisation. It is therefore not surprising that the Ministry in the future will implement a norm on Sanquin’s equity (Schippers, p. 6).

Again, it is not said that welfare is maximized in a subsidy-free price structure, nor that either price structure is socially superior to the other. Moreover, cross subsidization is not necessarily bad for society, since the supply of a commodity would maybe not have been possible without the subsidy of another product. However, without cross subsidies in the blood market, consumers are ensured that the

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35 Thrombocytes and plasma prices even exceed this percentage, but are, however, more difficult to compare due to the complex nature of deliveries in the different European countries and are for that reason left outside the scope of this thesis.
production and sale of each product makes them at least as well off as they would otherwise be. Hence, the consumer pays solely for the product it consumes, not more.

Furthermore, welfare unambiguously decreases if competition is constrained in the market of the subsidized good (think of price wars and so on). Here, this would mean that the competition in the international market for plasma medicine would be endangered, due to the low price the PDR can charge. Note that Sanquin is allowed to exclusively use Dutch plasma as input, but sells the resulting plasma products on the international market. This market for plasma is very concentrated with five major players and Sanquin’s share is very small (Conquaeestor, p. 49). It seems unlikely that the cross subsidy of Sanquin has a direct negative effect on competition in that market. From this point of view, a welfare decrease as a result of endangered competition can be ruled out.
Chapter 7 – Scientific research

Besides the production of blood-and plasma products, Sanquin is also active in the field of scientific research regarding blood transfusion, safety, efficient usage of blood and so on. These studies as well as education and trainings are also brought under the division Research. In 2011 alone the division published 170 papers in scientific journals. The funding structure of this division might be an important factor for prices of short-lasting products, since a fixed percentage of that price is destined for this division. The Plexus report already notes that the cost on research as a share of total indirect costs is higher than the benchmark. Does the involvement of Sanquin in scientific research affect the price of erythrocytes?

7.1 The division

The division Research falls under the competitive part of Sanquin, the PDR. Its studies, in principle, have to service the short-lasting products, but can cover any topic related to blood and transfusion. An independent commission evaluates each study beforehand, creating an intellectual competition amongst the separate studies. Important for the blood bank, for example, are studies done on efficient usage of the different blood products, by which clinicians can limit the amount of blood needed for the same treatment. This division can be seen as a social function of Sanquin. Commercial parties do not offer this research function. It therefore has a function in the field of knowledge infrastructure. Most organisations have an Research & Development (“R&D”) division to guarantee innovation and quality, but it is the participation in scientific research that distinguishes Sanquin from other blood banks. The Ministry does not, however, require the blood transfusion service to realise such a task.

7.2 The funding

The division is financed through the PPOC, an independent fund, which can be used by both the divisions Blood Bank as Research for applied studies. A fixed percentage of the price of short-lasting blood products supports this fund (Conquaestor, p. 30). In 2011 this percentage was 4.5%. Figure 7.1 marks these relations. The income of the PPOC is meant to cover the costs for research, but does not have to be equal to the true costs made. The difference in revenue and cost is corrected for by potential end-of-the-year surplus of the organisation.
7.3 Does the involvement of Sanquin in research affect the price of erythrocytes?

According to the Plexus report, total indirect costs of Sanquin lay 44% above the benchmark. By looking at Figure 7.2 it can be seen that the R&D takes a big share in explaining that difference: the Dutch costs on research exceed the average by 21%. Note that these R&D costs also include a minimum of costs each organisation needs to innovate and develop, but it is the comparison with the benchmark that indicates that Sanquin makes costs above that minimum. Sanquin's financial structure creates a possibility for the funding of research through prices of the blood products, resulting in high indirect costs. It makes it very plausible to state that the involvement of Sanquin in research has an upward effect on prices of short-lasting blood products. Due to the fixed percentage reserved in the price of short-lasting blood products, the separation of the division Research from the rest of Sanquin can decrease that price with 4.5%.

Another question is whether the research by blood banks is necessary. As mentioned earlier, the Ministry does not require these undertakings by the blood bank. For a division, which is not mandatory by law, it takes up a relatively big share of the indirect costs of the organisation, whereas other countries (Figure 7.2) do not even participate on this field. Without drawing any direct conclusions, countries A and B are found as cheapest suppliers of erythrocytes in the pool and their R&D is lowest (in total and as a percentage of total indirect costs). Of course, every organisation needs R&D in order to guarantee innovation and preserve a certain quality of the product. Some of the studies also cover the field of efficient use of blood and its products and can therefore pay off in the long run as a reduction in costs for society: hospitals will need less blood. But it is not necessary for Sanquin to facilitate this. Research can also be done by academic hospitals, which are specialised in scientific research. In this way, its independency is institutionalised and the knowledge is publicly available.
Chapter 8 – Conclusion

Under ideal conditions, the market serves public interests. However, the market is not an answer to all economic problems, for these conditions do not always realize in reality. A Dutch blood price is observed that exceeds the European average by 32%. This thesis has been a study on the justification of that price. Is the price of blood in the Netherlands too high? If the market does not satisfy public interests, government intervention is needed where the market fails. This thesis concludes that public interests can be satisfied at a lower price, due to market failure and the ineffective government intervention. With room for improvement of efficiency, it follows that the current blood price is too high. The following table gives an overview of the factors that might explain the high price, followed by an evaluation whether efficiency can be improved through these factors.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Section</th>
<th>Explains high price?</th>
<th>Room for improvement?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. National monopoly</td>
<td>4.2</td>
<td>Yes</td>
<td>Potential second domestic supplier</td>
</tr>
<tr>
<td>2. No imports</td>
<td>4.3</td>
<td>Yes</td>
<td>Allow imports from one country</td>
</tr>
<tr>
<td>3. No subsidy</td>
<td>4.5</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td>4. High quality standard</td>
<td>5</td>
<td>Yes</td>
<td>Lower amount of tests</td>
</tr>
<tr>
<td>5. Cross subsidy</td>
<td>6</td>
<td>Yes</td>
<td>Separate competitive and monopolistic divisions</td>
</tr>
<tr>
<td>6. Scientific research</td>
<td>7</td>
<td>Yes</td>
<td>Leave scientific research to academic hospitals</td>
</tr>
<tr>
<td>7. Lack of supervision</td>
<td>4.6, 4.7, 5.3, 6.3, 7.3</td>
<td>Yes</td>
<td>Active monitoring of Ministry: clearly defining expectations and quantifying demands. Increase influence of Supervisory Board</td>
</tr>
</tbody>
</table>

An image of shortages, delayed deliveries and poor quality at a low price is the result of an analysis on the blood market without regulation. This market failure is the result of the lack of competition, external effects, high transaction costs and the provision of a public good. The government, therefore, clearly has a role in the blood market. Its regulation is needed where the market does not achieve satisfying public interests by setting quality standards, controlling prices and guaranteeing security of supply. The resulting Dutch law with regard to how the blood should be provided is constructed in such a way that it pushes up the price of red blood cells. The quality standard set by the government is the supply through one source, that is, through a monopoly, and the ban on imports. The strong market position of Sanquin should be corrected for through the approval of Sanquin’s budget and policy. In this way, the Ministry could indeed guarantee the consumer a fair price-quality ratio, but in practice fails to do so. The Ministry has chosen not to subsidize Sanquin directly but instead has provided the organisation with an incontestable market position, which serves as an indirect subsidy. Since subsidizing a monopolist provokes laziness on cost efficiency, as seen in a European comparison, the price-quality ratio could have been even higher.
Sanquin has been given the liberty to implement its own policy as well, whereas the law does not define every aspect of the blood provision. Firstly, the security standard is not explicitly set and therefore Sanquin pursues a higher and more costly security standard than in other countries. Public interest with regard to safety can also be satisfied with a minimum quality standard at a lower price. Furthermore, as the organisation operates in both non-competitive and competitive markets, the opportunity emerges to cross-subsidize the different blood products. Consumers of erythrocytes might therefore pay for the provision of plasma products. Finally, the active involvement of Sanquin in scientific research is not required by law, but takes up a large share in total indirect costs. All of these three phenomena have an upward push on the price, but could be well regulated if the Ministry outlines its expectations of the blood bank more clearly.

As the government has provided Sanquin with a monopoly position and a ban on imports, Sanquin is not disciplined through competition. This means that the Supervisory Board, the Ministry and the media should stimulate Sanquin to satisfy public interests. The influence of the Supervisory Board on the blood price is unclear. The media looks out for sufficient quality and limited cost increases: it questions Sanquin’s policy and therefore has a controlling function. However, it cannot force Sanquin to change its pricing policy. The government therefore has an important task as to regulate Sanquin in providing the optimal price-quality ratio. As the regulating organ will always face an information asymmetry, the government should enforce its demand stronger. After all, it is the government that functions as an advocate for the public where the market fails to do so.

In conclusion, the current blood price is a result of a combination of market and government failure. Sanquin takes advantage of the room the government has left the organisation to operate autonomously. A government intervention exists by the virtue of market failure. The Dutch government, however, does not effectively and efficiently intervene to correct for these market failures. It follows that the Dutch blood price is too high. This thesis shows that there is room for efficiency improvement in the market for blood. That is, there are indications that the price can decrease without affecting public interests. In fact, public interests can be more appropriately satisfied by the following recommendations.

8.1 Recommendations
The government has created a monopoly position of the Dutch donor service, but should continuously monitor and navigate the organisation towards an optimal price-quality ratio. However, the quality in this market is difficult to measure. Therefore, a better insight on this can be given after an investigation on the value of tests Sanquin uses compared to the social benefits. This can for example be done by a more elaborate European comparison than in this review. If a government does not clearly define its
expectations of Sanquin, it obviously leaves room for own interpretation by that organisation. So, the Ministry should, on behalf of the public, be more explicit on its demands towards Sanquin (i.e. number of tests, price ceiling, quality definition etc.).

When it comes to the provision of plasma, a clearer legal and administrative division between the blood bank and plasma products is needed in order to prevent consumers of erythrocytes to pay for production of plasma products. Think of two separate budgets, both to be approved of by the Ministry. Moreover, an expected price decrease of 4.5% results from separating the research department from the rest of Sanquin. Scientific research can also be done by academic hospitals and would then even be publically available.

In addition, an in-depth cost-benefit analysis is necessary to review the ban on imports and the monopoly position of Sanquin. These factors might increase the pressure of disciplining Sanquin, since the market mechanism then also functions as a price barrier. From this angle, it is important factor to give Sanquin an incentive to be more cost efficient; think of limited import of blood from just one country in order to keep blood easily traceable, or a potential second domestic supplier. Imports can complement Dutch blood and therefore also contribute to sufficient supply of blood in the Netherlands. For a potential second domestic supplier, efficiency of imports or exports, the Ministry first has to investigate if the market is large enough (i.e. determine the minimum efficient scale of production). If so, Dutch blood provision can benefit from the efficiency gain.

Efficiency can also be achieved through internal supervision: The Supervisory Board can clearly contribute to the regulation on Sanquin. Given the unclear influence the Supervisory Board has, it is up to the Ministry to outline the role of the Board and potentially provide it with more responsibilities.

8.2 Statement Ministry of VWS

Shortly before the end of writing this thesis, on July 13th 2012, the Ministry made a public statement about the Conquaestor report. Some of the measures the Ministry wishes to make are in line with the above-mentioned recommendations, such as an administrative and legal separation between the PDR and blood bank. Moreover, an increase of the internal plasma price and a norm on Sanquin's equity will be enforced. She pleads for the decrease in the number of tests on blood and finishes by an overall decrease of Sanquin’s budget. Furthermore, the Dutch blood provision remains unsubsidized, as this thesis agrees with upon economic grounds. All of these factors are expected to have a reducing effect on the price while preserving the quality, but are yet to be implemented. Furthermore, some of the demands are not explicitly defined, such as the reduction in tests, and may therefore be difficult to install. The future will tell how and to what extent these policy changes will alter the price of erythrocytes.
8.3 Further research

For a more in-depth evaluation of the differences in European blood supply and its effect on price, full data on quantity demanded are necessary. The demand in relation to the minimum efficient scale gives an insight into the market size with respect to the optimal number of suppliers. It might be concluded that more domestic suppliers could be active, that imports should be allowed or that the market should be expanded by eliminating the export ban. In addition, for answering this research question, a larger data set with more countries can result in a valid regression and, hence, provide a better understanding on the effects of blood policy. Besides, through a regression it can be explained more clearly which of the regulating factors (imports, monopoly and so on) have the stronger effects on the price. These findings may contribute to the implementation of a more optimal price-quality ratio. This broadening can also be done on a national basis, in a comparison of Sanquin to other organisation getting their resources from donations, either voluntarily or commercially. Sperm donations in hospitals or ‘Moeders voor Moeders’ are examples of such organisations. How are these organisations regulated, if at all? Is it a common phenomenon for donation organisations to use cross-subsidization, have a dominant market position and a large share of research costs? Furthermore, other disciplines might be able to give a better insight on the additional social benefits with each new test performed on blood. This way, a quantitative measure can be given to the quality of blood and an appropriate price for that quality. Furthermore, since the Ministry has just announced its policy changes on the blood provision, the implementations and its effects on price will become clear in the near future. It might therefore be useful to have this study repeated in a few years from now. Will the government manage to satisfy public interests more effectively by then? Will the price of blood still be too high?
Appendices:

I. Bibliography:


II. Interviews:

Sanquin: Dr. P. Strengers, Medical Director Plasma Products Sanquin, 10th April 2012 and 1st May 2012.

III. Source figures and tables:

Figure 1.1 - Data from The Marketing Research Bureau ‘Blood Collections & Transfusion in Europe & Africa’, 2008.
Figure 1.2 - Conquaestor, 2011, p. 70.
Figure 2.1 - Homepage www.sanquin.nl.
Figure 2.3 – Conquaestor, 2011, p. 23.

Figure 4.1 - Data from The Marketing Research Bureau ‘Blood Collections & Transfusion in Europe & Africa’, 2008.

Figure 5.2 – Plexus, 2009, p. 60.

Figure 6.1 - Conquaestor, 2011, p. 23.

Figure 6.3 – Plexus, 2009, p. 18.

Figure 7.1 – Conquaestor, 2011, p. 31.

Figure 7.2 – Plexus, 2009, p. 39.

Table 1.1 - Data from The Marketing Research Bureau ‘Blood Collections & Transfusion in Europe & Africa’, 2008.

Table 4.1 - Data from The Marketing Research Bureau ‘Blood Collections & Transfusion in Europe & Africa’, 2008.

**IV. List of terminology and abbreviations:**

CLA – Collective labour agreement

CLB – Centraal Laboratorium van de Bloedtransfusiedienst, laboratory division of the Dutch Red Cross.

Erythrocytes – Red blood cells.

MES – Minimum efficient scale, the smallest output that a firm can produce, such that its long run average costs are minimized.


NAT – Nucleic Acid Amplification Test.

NZA – Nederlandse Zorgautoriteit, Dutch Health Authority.

PDR – Plasma, Diagnostics and Research divisions of Sanquin.

Plasmapheresis – Plasma from apheresis, a donation method by which only plasma is extracted from the body.

Quarantine plasma – Fresh frozen plasma after six months of storage; sold to hospitals.

Short-lasting blood products – Erythrocytes, thrombocytes and plasma; the three end products filtered from whole blood.

Thrombocytes – Blood platelets.