The fundamental economics of the blood service industry in the United States: summarizing the structural design and market dynamics

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Abstract

Purpose – The purpose of this paper is to provide the foundational economics, both in theory and practice, to describe the current competitive and operational market dynamics of the blood service industry in the United States of America.

Design/methodology/approach – The paper applies the dominant firm-competitive fringe model to describe how pricing is determined within the blood service industry, with particular focus on the nonprofit business model. The research also describes the role of government as one of the major determinants of pricing through regulatory demands.

Findings – The longstanding, free-market based economic foundations of the blood service industry have proven to be adequate in meeting the blood needs of the United States (US). Though there are clear market inefficiencies associated with the dominant firm model, none of the proposed solutions target the contractual and resulting pricing inefficiencies that persist because of the market structure.

Originality/value – In order to add value to the blood industry professionals, it is imperative to provide the foundational economics driving the current macro-level blood industry of the US.

Keywords Economics, Blood and plasma industry, Dominant firm model, Healthcare economics

Paper type Research paper

Introduction

There is great complexity in the market for blood in the United States (US). Yet this intricate exchange is grounded in a basic yet important premise, only humans can manufacture blood. Individuals are the basis of the entire industry's supply base and are referred to simply as donors. These donors are typically individuals who donate whole blood or blood components after being screened, though not all donors of blood products are unpaid. In the plasma-derived medicinal products industry, the norm is for donors to be compensated, even though the World Health Organization (WHO) has taken a position of strong advocacy to the contrary (Grabowski & Manning, 2016). Additionally, each donor's blood is categorized based on the presence or absence of two antigens ("A" and "B") and an Rh factor protein ("+" or "−") for a total of eight different blood types (American Red Cross, 2019).

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Other participants in the blood supply industry are blood centers, equipment and expendables suppliers, hospitals, clinicians and payers (patients, insurance companies, etc.). The primary function of a blood center is to collect and supply blood to the community when and where it is needed. The term "blood center" is used to refer to an entire organization even if the organization has many physical locations, like the American Red Cross. Suppliers in this industry provide the equipment and expendable blood centers need to collect blood, like bags and needles, testing machines, etc., as well as services like blood testing and typing, inventory systems and logistics services. Hospitals and clinicians acquire, store, match and distribute blood to patients who are in need. The final actors are the payers. Patients, as well as government and private insurance groups, compensate hospitals for their services.

Additionally, federal governmental agencies participate in the blood supply system, primarily to ensure the safety of blood products and safety during the donation and transfusion process. The Food and Drug Administration, Centers for Disease Control and the National Institute of Health are just a few of the entities under the United States Department of Health and Human Services that have the authority to regulate and provide guidance. This industry also exhibits some self-regulation itself (Simon, 1996), in which organizations such as the American Association for the Advancement of Blood and Biotherapies have their own set of standards. Blood centers and hospitals can become members through an accreditation process. These various self-regulating entities also work to ensure the safety of all involved uniform standards of quality.

The payment system for blood products is also extraordinarily complex. As a simplified explanation, blood centers are paid by hospitals, which are then paid by patients and/or insurance companies. Insurance companies repay hospitals through a diagnosis-related group (DRGs) payment system in the inpatient setting (Mulcahy *et al.*, 2016). DRGs are assigned based on diagnosis and procedures, and then hospitals are paid a prospectively-determined, fixed payment for each DRG (Mulcahy *et al.*, 2016). This means that hospitals are paid a predetermined sum for every patient with the same DRG, regardless of the specifics of the case, such as how much blood was used. Outpatient procedures in which only small amounts of blood products are used are billed differently, with blood and blood products being reimbursed separately and not rolled into a procedure payment (Mulcahy *et al.*, 2016).

Hospitals have traditionally paid blood centers under a contract-based consignment model, meaning that the hospitals receive the blood but do not pay the blood center until the unit is used (Mulcahy *et al.*, 2016). Delivery frequency, payment mechanisms, disposition of unused products and the blood prices themselves are determined by long-term contracts between hospitals and blood centers (Mulcahy *et al.*, 2016; Slonim, Wang, & Garbarino, 2014). This means that prices can only change through contract renegotiation (Mulcahy *et al.*, 2016; Slonim *et al.*, 2014). Though a flexible market price may normally be most desirable to capture the most efficient prices based on current supply and demand forces, the purpose of long-term contracts in the blood market provides benefits to both blood centers and hospitals. For blood centers, there is consistency in a revenue source to cover fixed costs associated with staffing to maintain a healthy supply of volunteer donors. For hospitals, it is the premium paid for the assurance of consistent supply, quality and service. Within this long-term pricing relationship, there are numerous other functions, which include a reasonable inventory of blood to support unexpected demand requirements from the hospitals.

As previously mentioned, the blood centers have long-term, mostly three- and five-year contracts with hospitals that establish pricing and supply, among other specifics (Mulcahy *et al.*, 2016; Slonim *et al.*, 2014). In a normal contract situation, both parties in the deal have an incentive to make sure that the contract is written and enforced efficiently (Rubin, 1993). Sellers want to make sure that contracted prices cover their costs, and buyers want the contracted prices to be as low as possible. The existence of risk within the market adds another element that must be factored into contract negotiations with blood centers currently bearing

the risk. If there is an element of risk in a market, someone must bear it; thus, the blood centers do it. Bearing the risk acts as another cost under normal competitive circumstances, thus the bearer of risk is compensated for doing so. For efficient risk-bearing, it is imperative that a blood center carefully evaluates its costs to charge a higher price that covers both the costs related to collecting as well as the costs related to risk-bearing. The higher price for blood gives hospitals an incentive to consider if they should prefer to pay a lower price per unit of blood and bear the risk themselves. If the blood center bears the risk, then one can expect the price of blood to be higher and if the hospital bears the risk, then one should expect the price of blood to be lower. Under a consignment model, the price of blood per unit paid by the hospital should be higher to reflect the fact that the blood center bears the risk.

Though there is some capacity to accommodate unexpected demand, the blood market still experiences issues with supply and demand shocks. Supply shocks affect potential donors or collection sites, with the most common issue being pathogen-related threats that limit the ability of some people to donate blood (Slonim *et al.*, 2014). Anyone with a disease or that may have been exposed to a pathogen is ineligible to donate, which negatively affects the supply of blood. Natural disasters can also affect the supply side if blood centers or collection sites are damaged (Slonim *et al.*, 2014). Demand shocks would be anything that causes a surge of injuries, such as natural disasters or terrorist attacks. The blood system has historically been able to accommodate these shocks because the injury-causing event is often matched with a surge of blood donations from those not directly affected (Mulcahy *et al.*, 2016; Slonim *et al.*, 2014). Slonim *et al.* (2014) say that, along with shocks, there is often supply and demand imbalance in this market. As previously noted, donations spike after disasters to fulfill increased demand, but they often spike too high, resulting in hundreds of thousands of units that must be discarded because blood only lasts for 21 to 25 days (Mulcahy *et al.*, 2016; Slonim *et al.*, 2014). On the other hand, there are often shortages during the winter and holiday season when people are less interested in donating (Slonim *et al.*, 2014).

The dominant firm-competitive fringe model and the blood market

Though multifaceted, the blood market, in terms of its functionality and efficiency, has not been given much attention by economists. Though commonly referred to as the "gift of life" for its irreplaceability in its medical application, blood, from an economic standpoint, is a pharmaceutical product. Thus, it is an exchangeable good that, in theory, is distributed through a market and subject to the same economic forces as in all other markets. Yet, upon closer inspection of the blood market, it is clear that this interchange of buyers and sellers is quite unique with long-term and fixed-price contracts, limited buyers, limited blood sellers, a volunteer supply of the industry's raw material (blood), extensive government regulations, numerous supply chain and spatial constraints, limited product shelf life and many other exchange factors impacting the market.

The blood market essentially operates under the dominant firm-competitive fringe model used in several sub-sects of economics. This market dynamic has sometimes been referred to as an incomplete monopoly or imperfect competition (Schenzler, Siegfried, & Thweatt, 1992). For a market to fit this model, three assumptions must hold. First, there is one large firm with a lot of market power, referred to as the dominant firm (Kahai, Kaserman, & Mayo, 1996). In general, if a firm has market power, it means that the firm can manipulate the market price of a good through various actions. The second assumption is that the rest of the market is composed of smaller firms, the competitive fringe that take the dominant firm's price as given (Kahai *et al.*, 1996). Finally, the product is homogenous (Kahai *et al.*, 1996).

Taking a closer look at these assumptions, a firm is said to have a lot of market power if it supplies a large portion of the product and therefore has a lot of buyers. If a single firm supplies a large percentage of the buyers, especially relative to competing firms, then decisions that this firm makes affect the market as a whole. The firm with a lot of market power is the dominant

firm because its decisions affect the market as a whole; it can raise prices over marginal cost or artificially reduce supply, and the whole market is affected (Schenzler *et al.*, 1992). A dominant firm is the one that supplies a large percentage of the product.

The second assumption is that the competitive fringe will take the dominant firm's price as given. Though it sounds odd at first, it makes sense when you consider the three possible scenarios for the smaller firms. Small firms could set their prices higher than the dominant firm, but they would usually lose their buyers to the dominant firm. Alternatively, small firms could set their prices lower than the dominant firm. Even if this is an economically viable option, they have such small market shares that they will not steal away any significant number of buyers. The smaller firms' last option is to follow the pricing scheme of the dominant firm. The other two options are not economically rational, so this is the best choice for the smaller firms. Thus, the competitive fringe will follow the price of the dominant firm because, ultimately, they have no other options.

The World Health Organization (2019) reported that a total of 117.4m blood donations were collected annually by about 13,000 blood centers in 173 countries. Although the global blood bank market is projected to climb up to $40bn in 2024 (Market Study Report, 2019), the US blood bank outlook is unpromising. In fact, the US blood revenue dropped to $1.5bn in 2014 compared to $5bn before 2008 (Brown, 2017). The plunge continues as the number of US blood transfusions has dropped by 33% to 11m units over the past five years (Market Study Report, 2019).

In the US blood market, The American Red Cross (Red Cross) is the dominant firm, while smaller blood centers comprise the competitive fringe that follows the lead of the dominant firm. The Red Cross was founded in 1881 and is the largest relief agency in the US (American Red Cross, 2017). The organization established the first civilian blood service in the US after Second World War and remains the industry leader. Its biomedical services include activities associated with the collection, processing, testing and distribution of whole blood, blood components and tissue at 36 local blood service operations, national testing laboratories, a biomedical research facility and related national support functions. In fiscal 2018 (year-end June), the organization generated $3.7bn in revenue and gains, with its net assets totaling $1.6bn (American Red Cross, 2018a).

The Red Cross blood program began in 1940 and supplies an estimated 40% of the nation's blood supply (American Red Cross, 2018b). In 2018, the organization provided blood for patients in over 2,500 hospitals and transfusion centers throughout the US. The organization now works with more than 58,000 blood drive sponsors each year to hold over 145,000 blood drives, providing several locations for people to give blood, including mobile blood donation centers. In 2018, 2.7m people donated 4.7m units of blood, providing 6.5m blood products for patients requiring transfusions.

The remaining 60.0% of the blood supply in the US is provided through various independent blood centers, with these being nonprofit in terms of operational business structure. These independent operations form the membership of America's Blood Centers (ABC). Currently, ABC has 47 member organizations that vary in size and associated market share. The two largest nonprofit blood centers in ABC are Vitalant and OneBlood.

Vitalant was previously known as Blood Systems Inc. (BSI) and changed its name to Vitalant in 2018. Headquartered in Scottsdale, AZ, the Vitalant network includes 10 blood center brands, a research institute and a specialty laboratory that serves communities in 40 states. According to its website, the organization identifies with 127 donation centers and hosts around 30,000 mobile blood drives each year (Vitalant, 2019). During the current period, the organization has significantly expanded by adding new blood centers to increase its collection capabilities. In 2014, Vitalant (then BSI) added two new centers; Bonfils Blood Center in Denver and LifeStream in Los Angeles. In 2015, four additional blood centers joined the network: LifeShare in Ohio, Community Blood Services in New Jersey, Lifeblood in

Tennessee and BloodSource in California. In 2016, five more leading blood centers became a part of the organization. Through a series of small and large acquisitions, Vitalant has continued to grow into one of the largest blood service and transfusion providers in the country (Vitalant, 2019). According to the organization's latest available annual report (Vitalant, 2017), Vitalant led a number of different research projects funded by the National Institutes of Health, the US Department of Defense, the Bill and Melinda Gates Foundation and other private funding sources. Most notable research included a large-scale study on the Zika virus and the accrual of 14,000 donors to study the storage stability of red blood cell samples in 2016.

According to its website, OneBlood is a nonprofit organization servicing over 200 hospitals throughout Florida, Georgia, Alabama and South Carolina (OneBlood, 2019). This organization currently employs more than 2,000 individuals and operates over 200 buses to collect blood at various partnering institutions such as schools, corporations, and religious organizations. In total, the buses collect 80.0% of the organization's blood supply, with the remaining 20.0% collected at donor centers. OneBlood merged with the Blood Alliance in 2015. That year, it distributed over 1m blood products. In 2016, the organization launched its mobile application, Donor Space. IBISWorld forecasts that OneBlood will generate $339.7m in revenue in 2019, accounting for 2.9% of the industry's total yearly revenue.

Vitalant and OneBlood, who both have a large market share for the remaining independent blood centers, have partnered with the American Red Cross (the dominant firm) to form Creative Testing Solutions (CTS), which is the largest nonprofit blood donor testing laboratory organization in the US. According to their website, "in 2019, CTS will test over 10m donor samples, which is 75.0% of the US blood supply, in six high volume laboratory facilities located in Charlotte, Dallas, Phoenix, Portland, St. Louis and Tampa" (2019). The potential impact of CTS on the overall pricing of the blood market is worthy of closer examination in future research as testing is one of the required fixed costs associated with "manufacturing" each unit of blood. For example, economies of scale could be used to both lower the prices of testing for these owners, who collectively control well over 50% of the blood supply market, while simultaneously generating additional revenue from the testing services offered to other independent blood centers utilizing their services. With control of such a large market share of testing, this could potentially distort the foundations of fair competition under free-market functionality assumptions as testing is a required factor of blood production.

Conclusion

In summary, the longstanding free-market based economic foundations of blood service industry have proven to be adequate in meeting the needs of the US. Though there are clear market problems associated with the dominant firm model, there have been many proposed ways to address some of the inherent problems in the blood market. However, none of the proposed solutions target the contractual inefficiencies that stem from the market structure. Though some of these solutions are plausible and may correct some small problems, none help to re-establish the competitive and efficiency-driven incentives and most policy recommendations move the market even further away from the economic gains. For example, Mulcahy *et al.* (2016) propose four solutions that involve government subsidies. The first proposition is a blood technology supplement plan in which money is given out to hospitals to encourage blood-related technological improvements. The second plan only differs from the first in that the money is given to blood centers. A third possible solution suggests subsidies to hospitals that use a lot of blood products, such as those with trauma centers. Finally, one solution calls for grants that will go directly to blood centers. However, none of these plans address the problems identified in this section of the research paper, namely the distorted incentives between the blood centers and hospitals that result in less efficient, competitive

contractual outcomes. These plans are not ideal because they even further distort the monetary decisions between blood centers and hospitals. These solutions merely add funds that change the profit and loss and efficiency considerations and move them farther away from a free market.

From a firm/blood center level, the predominating nonprofit business structure has served the blood supply industry well for many decades. The blood service industry embraces the nonprofit mission and still holds closely its history of commitment to community service and providing "the gift of life" to those in need. Also, of importance at the firm level is the ability of blood centers to compete but doing so within an environment of cooperative, collaborative market driven system, which also reinforces the adequacy of the nonprofit industry structure.

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