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THESIS

**A COST ANALYSIS OF DIRECT CASH
COMPENSATION IN LIEU OF OPERATING MILITARY
COMMISSARY STORES**

by

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June 2016

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**A COST ANALYSIS OF DIRECT CASH COMPENSATION IN LIEU OF
OPERATING MILITARY COMMISSARY STORES**

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Submitted in partial fulfillment of the
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ABSTRACT

The Defense Commissary Agency (DeCA) provides groceries at cost (cost consists of the purchase price, a 1 percent markup on select grocery items to cover the cost of inventory loss during normal operations, and the cost of transportation to the store, not including overseas transportation) plus a 5 percent surcharge to military families worldwide. DeCA relies on appropriated funding to operate, and significant budget cuts by the Department of Defense threaten the current operation model.

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LIST OF ACRONYMS AND ABBREVIATIONS

BAH	Basic Allowance for Housing
COA	Course of Action
CONUS	Continental United States
DeCA	Defense Commissary Agency
DOD	Department of Defense
ODASD	Office of the Deputy Assistant Secretary of Defense
OMB	Office of Management and Budget
PP&E	Property, Plant, and Equipment

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I. INTRODUCTION

The purpose of this thesis is to analyze the cost effectiveness of direct cash compensation for military members in lieu of the Department of Defense (DOD) providing the commissary store benefit. With the ending of major personnel commitments in Afghanistan and Iraq, the DOD is entering a drawdown period, with a renewed focus on spending cuts. As Congress looks to cut the DOD's budget, programs such as the Defense Commissary Agency (DeCA) come under increased scrutiny. The annual commissary budget of \$1.3 billion has been under increasing scrutiny from defense officials, who have proposed cutting that budget in each of their last two annual budget requests (Jowers, 2015). Those proposed cuts were tabled by Congress, but the idea of DeCA spending cuts will inevitably pop up again.

DeCA operates 242 commissary stores in thirteen countries, selling groceries at an average 30 percent savings to authorized patrons (*DeCA Annual Financial Report*, 2014). In fiscal year 2014, DeCA received \$1.3 billion in appropriated funding, and the commissary stores handled over 89.7 million transactions worth \$5.6 billion in sales (*DeCA Annual Financial Report*, 2014). If appropriated funding were drastically cut by the DOD and Congress, store closures and increased prices could be the result. If the savings provided by the commissary stores to patrons were reduced, the benefit provided to service members would be reduced as well.

This thesis will evaluate whether direct cash compensation to service members would reduce costs to the DOD while still providing the current benefit that DeCA provides to service members. The evaluation conducted in this thesis found that it would be less expensive over time to continue operating the commissary system as is, rather than offer a direct cash compensation to military service members. Although the cash compensation offers the benefit of flexibility, it is more expensive over time for the first twenty years of the program. If DeCA can implement effective cost-savings initiatives to reduce the yearly cost growth of the commissary system, the status quo of providing commissary stores to service members will become even more favorable.

This thesis will examine two courses of action in regard to the commissary benefit. The benefit provided by DeCA is the savings that patrons garner by shopping in commissary stores. The first course of action that will be examined is the status quo. How much will it cost the DOD to continue operating the commissary system as is and still provide the same savings benefit?

The second course of action to be considered is the notion of providing direct cash compensation in the amount of the commissary benefit to military service members. Instead of operating commissary stores, money would be given directly to the military service members in the amount deemed equal to the benefit that commissary stores currently provide. Overseas commissaries would continue to be operated and the cost of those stores was also accounted for in the cash compensation plan. The reason overseas commissaries are kept in this study is because the value of the overseas commissaries is not easily monetized. In overseas locations, the savings are not the only consideration as many American products, or suitable substitutes, are not available from the local economy.

This thesis will answer the following questions:

- (1) What are the origins and history of the Defense Commissary System? Why does it exist?
- (2) What is the monetary value of the benefit provided by commissary stores to service members?
- (3) How much more valuable are commissary stores to service members in remote locations?
- (4) Is eliminating DeCA and paying service members cash compensation to cover the lost benefit of commissaries cost beneficial to the Department of Defense?

The recent release of the *Report of the Military Compensation and Retirement Modernization Commission* recommended several cost-savings techniques related to military compensation. One of the areas touched in the report was the Defense Commissary Agency. The idea in the report was to consolidate DeCA with the military exchange system; however, doing so would raise prices in commissary stores and reduce

the benefit provided to service members. The idea for the topic for this thesis came from the question of whether there was a way to still provide the full benefit while also saving costs. Operating grocery stores is not one of DOD's core functions. Therefore, eliminating the stores and providing a cash benefit seems logical.

Information on DeCA, to include financial and location information was gathered. In order to properly value the benefit, the value of the 30 percent savings provided by DeCA to service members was monetized, by gathering information on the typical grocery spending habits of individuals. The incomes of all paygrades of military service members were found using a military pay chart, then compared to income quintiles provided by the 2014 Consumer Expenditure survey. The Consumer Expenditure Survey found the estimated average percentage of income spent on groceries by each quintile. This percentage was applied to the military members' income to find the average amount spent on groceries by each paygrade. The 30 percent savings was then applied to the average amount spent by each paygrade to find the value of the commissary benefit for service members of each paygrade. Then, the number of service members in each paygrade was found and used to calculate the total yearly benefit of commissary stores.

The value of remote location commissaries were valued as well, by estimating the result on local prices if that remote commissary store were to be closed. For all bases more than seventy miles from a major metropolitan center, the percentage of the population within a twenty mile radius of the base that the military members and their dependents accounted for found. The percentage was used to show the rise in demand in the area, if the local commissary store was closed. The demand increase for each remote location was used along with the price elasticity of demand for groceries, provided by a study done by the *American Journal of Public Health*, to find the estimated price increase that would occur if the commissaries in these remote locations were closed. The resulting increases in price were averaged and added to the value of commissary stores for the military members stationed in remote locations. The value of the commissary benefit for one year, in remote locations and not in remote locations, was then calculated and found to be the cost of providing direct cash compensation and continuing to operate overseas

commissaries. The cost to implement the cash compensation plan and the cost to continue operating the commissary system were then compared.

This thesis is organized into five chapters. Chapter II presents a history of the commissary system, from its origins up until present day. It also presents a literature review of past theses that used the commissary system as their topic and a review of the 2015 Report of the Military Compensation and Retirement Modernization Commission.

Chapter III presents the courses of action along with the data sources and methodology used to populate and compare the courses of action.

Chapter IV presents the results of the data and methods used in Chapter III. Chapter IV includes findings on the value of the commissary benefit, the value of remote commissaries, the costs of operating the commissary system, and a comparison of the two COAs over time.

The final chapter, Chapter V, is a conclusion to the thesis. It also presents recommendations regarding DeCA based on the results presented in Chapter IV. Areas for further research are also provided in Chapter V.

II. BACKGROUND

A. OVERVIEW

This chapter provides brief histories and background of the defense commissary system. The intention is to show how the commissary has evolved over the years and the scrutiny it has received.

Although commissaries appear on the surface to be the same as commercial supermarkets, the commissary business model is much different from a commercial supermarket: “Commissaries sell grocery items at a price that will recoup the actual product cost of the item” (Armed Forces 10 U.S.C., 2010, section 2484). A surcharge, currently set at five percent, is added onto the sales prices for each item sold by commissary stores (Armed Forces 10 U.S.C., 2010, section 2484). Appropriated funds are “used to cover the expenses of operating commissary stores and central product processing facilities of the defense commissary system” (Armed Forces 10 U.S.C., 2010, section 2483).

Operating expenses include the following:

- Salaries and wages of employees of the United States, host nations, and contractors supporting commissary store operations
- Utilities
- Communications
- Operating supplies and services
- Second destination transportation costs within or outside the United States
- Any cost associated with above-store level management or other indirect support of a commissary store or a central product processing facility, including equipment maintenance and information technology costs. (Armed Forces 10 U.S.C., 2010, section 2483).

Commissaries have a strict allowable merchandise list, which most notably excludes alcoholic beverages and commissaries cannot change prices without written notification to congress (Armed Forces 10 U.S.C., 2010, section 2484).

As per the Armed Forces title 10, section 2481, the purpose of commissary stores is, “The defense commissary system is intended to enhance the quality of life of members of the uniformed services, retired members, and dependents of such members, and to support military readiness, recruitment, and retention.”

B. COMMISSARY HISTORY

The history of our nation’s military commissary system could be traced back through the entire history of America, even unto ancient times, when noncombatants sold food to hungry soldiers and sailors in forts, in the field or entering port (Skirbunt, 2008). The first commissary-general of store and provisions, Joseph Trumbull, was put in place by the Continental Army in 1775, though the commissary-general’s mission at that time was not to provide the sale of goods, but a daily ration of goods to Continental Soldiers (Skirbunt, 2008). Army officers were first allowed to make personal purchases in 1825 and could make commissary purchases for their immediate families by 1841 (“History of U.S. Military Commissaries,” 2015).

It took a civil war to bring about the next big change in commissary stores. Both Union and Confederate soldiers felt the pain of rations lacking in taste, nutrition and quantity: “Common sicknesses in both camps were scurvy, dysentery, malnutrition, and constipation all caused by faulty diet” (Skirbunt, 2008, p. 63). The Confederate soldiers fared the worst. A popular song among Rebel soldiers noted, “And as for food, we’ve not enough; the bread is stale, the meat is tough. But as for that, we won’t complain, in hopes we’ll get good food again” (Skirbunt, 2008, p. 54). The Union soldiers fared a little better, but as their campaigns moved south, the problem became getting the food to the soldiers on the march. The “last mile” of logistics, between the railroads and the armies in the field turned into a huge hindrance. One Union Army supply depot was described as having “not just an abundance, but an extravagance of food” (Skirbunt, 2008, p. 56). The Union could still produce food, it was getting it to the soldiers that was hard. With more Americans than ever before in uniform during the Civil War, just about every family had someone serving either in blue or grey, the letters home brought to light to concerned families the hardships that troops faced, including the rations, families who were angered

and determined to do something about it (Skirbunt, 2008). Two years after the Civil War, and faced with the prospects of the Plains Indian War, which would be an even greater logistical challenge, the army made a change. In 1867 the army opened the first commissary sales stores in the modern sense that officers and enlisted were eligible to purchase goods directly from the Subsistence Department at cost (Skirbunt, 2008). This allowed enlisted soldiers for the first time to supplement their daily rations with provisions supplied by the army at cost.

The next big change came in the way funds generated by the commissaries were handled: “In 1874, Secretary of War William W. Belknap suggested allowing the proceeds of commissary sales to be applied to the purchase of new commissary supplies during the same fiscal year and Congress agreed” (Skirbunt, 2008, p. 76). That made it possible for the funds to be used by the commissaries immediately instead of being sent back to the Treasury.

As the Army grew in the years that followed, so did the army’s commissaries. The Navy, however, had not yet adopted the commissary system. On May 13, 1908, following the Navy’s successes in the Spanish-American War and the sailing of the Great White Fleet, the Naval Appropriations act authorized the sale of subsistence items in on-shore stores, first called “subsistence stores” and later “ships stores ashore” (Skirbunt, 2008). These ships stores ashore would be the forefather of both the Navy Commissaries and the Navy Exchanges. These stores were officially designated as Navy Commissaries in 1950 (Skirbunt, 2008). The early Army and Navy commissaries were separate entities and not always equal. Prices for the same items may be higher in one than the other, “so in 1914 and again in 1916, Congress guaranteed that enlisted men, regardless of service affiliation, would be charged the same prices at any military commissary store” (Skirbunt, 2008, p. 112).

As the commissaries spread, the authorized patron list grew. In 1911, Congress extended the commissary privilege to officials of the federal government (Skirbunt, 2008). Commissary sales were made available to retired enlisted personnel for the first time in 1916 while retired officers had been granted that privilege for almost forty years (Skirbunt, 2008). Although spouses had been a staunch commissary supporters ever since

Libbie Custer's vegetable garden was destroyed by an "army of grasshoppers," and admission of spouses had been a common practice throughout, spouses were officially granted access in 1943 (Skirbunt, 2008).

After World War II, U.S. service members were stationed around the world as never before, and this time they were bringing their families with them. Naturally, the commissaries followed, opening wherever an appreciable military presence was found overseas in over twenty countries (Skirbunt, 2008). At home, however, the commissaries were under fire. Private sector grocery chains began complaining that commissaries were "unnecessary" and a source of "unfair government competition" (Skirbunt, 2008). The chain stores complained that commissaries were taking customers that were rightfully theirs: "In reality, commissaries posed little actual competition, because they could not steal civilian customers, and in fact had a hard time maintaining loyalty among military customers" (Skirbunt, 2008, p. 182). Still, the commissary benefit would become a target for elimination. From 1947 through 1948, the Advisory Commission on Service Pay, more commonly known as the Hook Commission, examined the logic behind all types of military pay and compensation (Skirbunt, 2008). The commission gave commissaries a favorable review, stating that commissary benefits were accounted for when military pay levels were set, and if commissaries were eliminated, military pay would have to be increased (Skirbunt, 2008).

The Philbin Report two years later produced by the Philbin subcommittee was not so generous: "It found that many commissaries were needlessly operating in close proximity to commercial facilities that were adequate, conveniently available and reasonably priced" (Skirbunt, 2008, p. 192). Although the report did not lead to the elimination of commissaries in the continental United States (CONUS), it did lead to the Armed Services Commissary Regulation, which standardized the commissary stock list and patron qualifications (Skirbunt, 2008). As part of an effort to make the commissaries self-sustaining, the report also led to the requirement of a surcharge beginning in January 1, 1952 (Skirbunt, 2008): "While the price of the merchandise that the customer paid covered the purchase price of the item plus transportation, the surcharge was used to pay for operating equipment, supplies, utilities, and merchandise losses and spoilage"

(Skirbunt, 2008, p. 193). Political attacks on the commissaries would continue throughout the 50s and 60s, but the commissaries not only survived, but continued to grow.

The Navy had been centrally running its commissaries since 1946, under the control of the Navy Ship's Store Office (Skirbunt, 2008). Army and Air Force commissaries however, were run by base commanders with no centralization. Each store was the responsibility of the base commander, with the operation of the stores conducted by the commissary officer, who worked for the base commander (Skirbunt, 2008). In 1975, under prompting from the Office of Management and Budget to conduct an all-service study on the best approach for future commissary operations, Army Brigadier General Emmet Bowers lead a study that would come to be known as the Bowers Commission, which recommended centralization of Army and Air Force commissary systems (Skirbunt, 2008). Consequently, the Army Troop Support Agency became the central agency for managing Army commissaries and the Air Force gave the duty to its newly formed Air Force Commissary Service, both completing centralization by October of 1976 (Skirbunt, 2008). This practice of each service operating its own commissaries would continue until 1991.

When the Cold War ended and Congress began looking for military spending cuts, the commissaries again became a point of scrutiny. The Jones Commission of 1989, headed by Army Lieutenant General Donald W. Jones, took a critical look at how the commissary benefit was being delivered and how it could be improved and recommended two options: keep the status quo, or completely consolidate all DOD commissaries (Skirbunt, 2008). Both Congress and the DOD bought into the concept of a single agency and on September 30, 1991 the Defense Commissary Agency (DeCA) came into existence (Skirbunt, 2008). Headquartered at Fort Lee, Virginia, DeCA continues to lead operations of defense commissaries worldwide.

Under DeCA guidance, commissaries have become more business-like, by cutting costs and boasting average annual savings by patrons of more than 30 percent on grocery bills ("History of U.S. Military Commissaries," 2015). "That level of savings, verified by the agency's Price Comparison Study, amounts to approximately \$4,500 per year for a family of four that regularly shops in a commissary" ("History of U.S. Military

Commissaries,” 2015). Despite its success the commissary continues to come under fire whenever military budget cuts are mentioned.

As the commissaries have grown, the list of authorized patrons has also grown. Currently those authorized to shop at the defense commissaries per DOD instruction 1330.17 (2014) include:

- Members of the uniformed services
- Members of the Reserve Components
- Cadets and midshipmen of the Military Service academies
- ships officers and members of the crews of vessels of NOAA
- Retired Personnel
- Medal of Honor recipients,
- 100 percent disabled veterans
- authorized family members
- DOD Civilian Employees Stationed Outside the United States and Outside the U.S. Territories and Possessions
- Official DOD and Military Services Organizations and Activities
- Involuntarily Separated Uniformed Personnel- separated under other than adverse
- Conditions

C. LITERATURE REVIEW

In researching this thesis, three previous theses completed by students at Naval Postgraduate School on similar topics were reviewed. In addition to the three theses, the *Report of the Military Compensation and Retirement Modernization Commission*, published in early 2015, was also reviewed.

1. Eric Folkers, Alfonso Francisco, and Joel Frey Thesis (2014)

The first and most recent thesis, completed in December of 2014 by Eric Folkers, Alfonso Francisco and Joel Frey, is titled *Walmart Supercenters a Suitable Alternative to Shopping at the Commissary for Eligible Military Patrons*.

This thesis begins with a history of the Defense Commissary system followed by brief history of the Walmart Stores Inc. The approach of the thesis began by determining the locations of all CONUS Defense Commissaries, all Walmart Supercenters, all CONUS military bases and metropolitan areas to determine the availability of Walmart Supercenters to both active duty military and retired veterans. The thesis used a ratio based on the numbers of active military and retired veterans in each state, versus the number of Defense Commissaries in that state and the number of Walmart Supercenters in that state and the distance between military bases, commissaries and Walmart Supercenters (Folkers, 2014). Based on these ratios the thesis found that Walmart Supercenters are on average more accessible than Defense Commissaries (Folkers, 2014).

Next, shelf prices were compared to determine actual savings realized by Fort Ord commissary shoppers versus the Marina, California, Walmart Supercenter in the geographic location serving military members stationed at the Naval Postgraduate School and Defense Language Institute in Monterey, California (Folkers, 2014). This thesis determined the actual cost savings of the Fort Ord Commissary versus the Marina Walmart Supercenter to military members based on a 122-item market basket composed of meat, produce, dairy, grocery and frozen products containing exact name brand items (Folkers, 2014). Then the study compared the prices of the same items from the commissary to a market basket containing Walmart's Great Value generic brand version of those items (Folkers, 2014). The price comparison found a total savings of \$53.64, or 16.80 percent, by purchasing the 122 items at the Fort Ord Commissary prior to any sales tax or commissary surcharge (Folkers, 2014). By substituting Walmart's Great Value brands for the name brands, the savings were completely reduced and the shopper saved \$5.75 or 2.21 percent (Folkers, 2014).

Although this thesis suggests that Walmart's Great Value brand provides shoppers with almost identical savings as Defense Commissaries, this is not an exact comparison and the Great Value brand does not provide fresh produce. By purchasing the Great Value brand shoppers are receiving a similar, but not an exact item. One category of item the thesis did not compare is health and beauty items. It would be interesting to see the comparison with the Defense Commissary and Walmart on these items.

2. Martin Alcott Thesis (1994)

The next thesis reviewed is titled *An Evaluation of Direct Cash Compensation in Lieu of Military Commissary Privileges* by Martin Alcott, written in 1994. Alcott's thesis analyzes "the privatization alternative of direct cash payments in lieu of commissary privileges" (p. 1). He begins by presenting the history and background of the Defense Commissary system and its intended purpose. He then examines the question of "whether commissary beneficiaries have a legal right to those benefits" (p. 6). Following that, Alcott attempts to put a value on the commissary benefit, and then asks the question of "can this benefit be provided more efficiently through direct cash compensation or other means?" (p. 6).

Alcott concludes that the commissary is not an entitlement because it is compensatory whereas entitlements are non-compensatory. He also determines that the commissary benefit is not a fringe benefit, because it is not guaranteed to all employees (Alcott, 1994). Military members stationed in areas without commissaries, such as recruiting duty far from military bases, may be too far from a commissary to take advantage of it, but those members are not compensated for this lack of commissary (Alcott, 1994). The commissary benefits also extend to dependents, who are not employees of the Department of Defense, which means that commissaries must be classified as a privilege with no legal claim (Alcott, 1994).

Alcott (1994) determined based on the amount of appropriated funds used to fund commissary operations divided by fiscal year 1995's authorized DOD force level that the average monthly value of the commissary system per member of DOD was \$66.67. This value is the value to the employer, in this case the DOD (Alcott, 1994). Finding the value

to the employees was more difficult and was found to be different for different employees based on rank, years of service, family size and spending patterns (Alcott, 1994). He determined that if the DOD made monthly direct cash payments of \$66.67 to every service member instead of using appropriated funding to operate the commissary system, paygrades E-1 through E-7, W-1 and O-1 to O-2 would be satisfied, while the rest would not.

Alcott (1994) found that if direct cash payments were given to CONUS service members instead of commissary benefits, the cost savings to DOD would exceed \$90 million per year. Alcott's calculations were interesting and well done; however, he ignored one of the biggest groups of commissary beneficiaries, retired veterans. All of his calculations to find the value of the commissary benefit and the value of direct cash payments only took into account active duty military members. He did not add retired veterans or other beneficiaries into his calculations.

3. Christopher de Wilde Thesis (1998)

The third thesis researched is one written by Christopher de Wilde in 1998 titled, *Evaluation of Directly Subsidizing Commercial Supermarket Discounts as an Alternative to Providing CONUS Commissaries*. This thesis explores the idea of eliminating commissaries and providing discounts to commercial supermarkets instead.

De Wilde begins the thesis with a history of the Defense Commissary System. He follows this with a background of the Supermarket industry. He also details a one year pilot program that took place in 1997 near Naval Station Pascagoula, Mississippi. The closest commissary to Naval Station Pascagoula is thirty miles away at Kessler Air Force Base (de Wilde, 1998). In an effort to give service members stationed in Pascagoula access to commissary benefits, Navy Officials met with the Jackson County Chamber of Commerce and local retailers to find out which retailers would be entering a program with the Navy offering service members discounts on grocery items (de Wilde, 1998). Two retailers decided to participate in the program, Food World Supermarket and Family Frozen Foods, and offered service members and their dependents 5 and 6 percent discounts respectively, far less than DeCA's touted 20 percent savings (de Wilde, 1998).

The thesis then begins to examine the feasibility and cost of the DOD providing supermarkets with subsidies so that service members could receive 20 percent savings. In order to find the cost of this, de Wilde first calculates the per CONUS service member commissary expenditure amount, which based on the number of CONUS service members and the percentage of total CONUS commissary sales was found to be \$1270 per service member or \$106 per month (de Wilde, 1998). That amount is then adjusted for the 20 percent commissary savings and the reported percentage of groceries purchased at the commissary- 60 percent, to come to the amount of \$220 spent per month per service member (de Wilde, 1998). Based on these numbers it is determined that it would cost the government \$304 million for a 10 percent subsidy and \$608.5 million for a 20 percent subsidy (de Wilde, 1998). The thesis then uses USDA estimates to find how much an average family spends on groceries and finds that in a best case scenario, assuming all active duty families include only one person, and a worst case scenario, assuming that all active duty families consist of six people, to determine that even at the best case scenario the cost to the government would be \$314 million, greater than the \$225 million of commissary spending attributed to active duty personnel (de Wilde, 1998). The thesis concludes that funding a twenty or even a 10 percent subsidy would not be feasible and that to maintain the \$225 million cost, only a 5 percent subsidy could be granted.

This thesis goes into great detail in its cost benefit analysis, however, much like other theses reviewed it focuses only on active duty military and ignores retired veterans who in a Congressional Budget Office report cited by this thesis estimated that retirees make up 48 percent of commissary patrons and 54 percent of sales (Congressional Budget Office, 1997).

4. *Report of the Military Compensation and Retirement Modernization Commission (2015)*

The *Report of the Military Compensation and Retirement Modernization Commission* that was published on January 29, 2015, was also reviewed while researching this thesis. The report reviewed all components of the military compensation and retirement package currently applied to military members to include pensions, health

care and quality of life. The portion of the report that is relevant to this thesis is recommendation nine which calls for “protection of both access to and savings at Department of Defense commissaries and exchanges by consolidating these activities into a single defense resale organization” (p. 141). The Commission found that these two activities “perform similar missions, for similar patrons, with similar staff, using similar processes” (p. 145). The Commission recommends that because of the similarities between DeCA and the military exchanges, the two should be consolidated into one organization.

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III. COURSES OF ACTION

A. OVERVIEW

This chapter will examine the costs and benefits of the Defense Commissary system. In order to decide whether the commissary system should be abolished or replaced with cash compensation, the benefit will have to be valued. The difficulty in this lies in the fact that the benefit has a different value to different beneficiaries.

B. ASSUMPTIONS

For the purpose of this thesis, several assumptions were made regarding service members, commissaries and service member's use of commissaries were made. First, it was assumed that DeCA's advertised savings average of 30 percent was correct. Several past theses have conducted their own market basket surveys and came to similar results as the advertised savings. Second, in calculating the value of the benefit, it was assumed that service members buy all of their groceries from the commissary. This is obviously not true, as service members may choose to purchase groceries at local stores for reasons not related to price such as convenience or item availability. The use rate of commissaries by service members as compared to their use rate of other stores would be difficult to calculate and a thesis unto itself. This thesis is aimed at calculating the potential benefit of the commissary.

The costs and benefits calculated in this thesis only apply to service members stationed in the United States. Commissaries located overseas are in unique situations as American products are not always readily available off base in overseas locations. Furthermore, prices of grocery items vary greatly from country to country more so than they do from different locations within the United States. When placed together with numbers from stateside locations, the overseas locations will greatly skew the benefits and costs of commissaries in the United States.

This thesis does not calculate the benefits of the commissaries to retired veterans. Even though they make up a large portion of the commissary's customer base, the income data veterans is not available, as many entered careers after the military.

C. CALCULATING COSTS

The cost to the Department of Defense of operating the Defense Commissary System is made public annually and is published in a variety of sources. In fiscal year 2014 the Defense Commissary Agency received \$1.3 billion in appropriated funding from the Department of Defense (Defense Commissary Agency, 2015a). This amount is used to fund operating costs of the commissary system. The commissary's inventory is purchased with the revenue from the stores, which in fiscal year 2014 was \$5.9 billion (Defense Commissary Agency, 2015b). This money is in a revolving working capital fund that is only used to purchase new inventory and should not be considered as a cost to the Department of Defense. The \$1.3 billion in appropriated funding is the amount that represents the cost to the government.

The sales and expenses of each commissary store were provided by the Defense Commissary Agency Freedom of Information Act Office. Expenses represent appropriated funding allotted to each store which is used for operating costs. Because commissaries sale merchandise at cost, the cost of goods sold is the sales revenue minus the 5 percent surcharge.

The expenses for the overseas commissaries were subtracted from the total to get the expenses for only U.S. commissaries.

D. CALCULATING BENEFITS

Calculating the benefit provided to commissary patrons by the commissary is a bit more difficult than calculating the costs to the DOD. The difficulty is that the commissary benefit is valued differently by different people. Several factors weigh on a person's valuation of this benefit, most notably the amount spent by the patron's household on groceries and availability of other grocery options.

1. Income

The 2014 Consumer Expenditure Report states that the amount a household spends on groceries is directly related to the income of that household. This relationship was use to find how much service members spend on groceries per year.

The military pay chart was used to find the annual salary for each rank (ODASD, 2014). The pay chart only shows base pay, therefore the rate for basic allowance for subsistence, which is one rate for all enlisted and one rate for all officers was added. The basic allowance for housing (BAH) is also an important source of income for service members. BAH varies by location, rank, and whether or not the service member has dependents. The location of the service member is the greatest variable for the difference in BAH within a rank. For the sake of this thesis, the average BAH with dependents for each rank was taken from every possible BAH in the United States and applied to the salary (“2014 BAH rates with dependents,” n.d.). Not all service members receive BAH. Those who live on naval ships or barracks provided by the military do not receive BAH; however the majority of service members do, so it was applied to all service members for the sake of this thesis.

Using these numbers to find the yearly salary of every rank at different milestones in career progression, the ranks were then assigned to an income quintile as defined by the 2014 Consumer Expenditure survey. The quintiles are the incomes of all Americans divided into pay zones that each represents 20 percent of the population. Service members fell into the top three quintiles. The percentage of income spent on groceries, or food at home, was found by the Consumer Expenditure Survey for each quintile. The service members’ pays were assigned to quintiles then multiplied by the percentage of income found by the Consumer Expenditure Survey to be the average spent on groceries for that quintile, to estimate the amount spent on groceries per year for each rank. This number was then multiplied by the 30 percent savings the service member receives from shopping at the commissary to find the average annual savings for each rank. The average savings was used as the amount of the benefit each service member receives from shopping at the commissary and the amount that would need to be compensated if the commissaries were closed.

2. Remote Locations

In remote locations where the commissary is one of few options for groceries, the benefit will be valued more than in other areas. In metropolitan areas, if the commissaries

were eliminated the shift in demand for groceries from commercial sources would be relatively small and lead only to a very small increase in prices on the open market or even no increase in prices at all. On the other hand, in a remote location, where the commissary is one of few suppliers of groceries and the military population makes up the bulk of the overall population, the relative demand increase on commercial sources will be felt more intensely and the prices will be driven up significantly.

Data found in Department of Defense's 2014 Military Demographic report provided the distances of all military bases in the United States, from the nearest metropolitan center. Metropolitan centers are defined as cities with a population of at least 50,000. The data also gave the population of the bases, which is the number of service members stationed at a particular base along with the number of dependents stationed at that particular base. The populations of the most remote bases, for this thesis that is defined as those seventy miles or more from a metropolitan center, were taken and added to Table 2.

Then, the zip codes of the bases, also provided by the DOD's demographic report, were entered into an online mapping tool found at <https://www.freemaptools.com/find-zip-codes-inside-radius.htm>. The online map tool was used to draw a twenty mile radius around each base. Then, all the zip codes in the twenty mile radius were recorded and the populations of those zip codes were looked up in the Census Bureau's 2010 (US Census Bureau, 2013). The populations of the twenty mile radius were used to find what percentage the military (service members and dependents) made up of the total population. This was done by dividing the population of the base by the total population. The Census Bureau (2016) states

In the 2010 Census, residency in housing units is determined using the concept of "usual residence." Usual residence is defined as the place where a person lives and sleeps most of the time. This place is not necessarily the same as the person's voting residence or legal residence. If someone in a household, such as a spouse, adult child, or a roommate, is living away from home at the time of the census because they are in the military (either stateside or overseas) they are not to be included on the census form. They are counted using other census operations. Members of the military receive a census form at their military installation or on a military ship.

This means that the service members and their families are counted at the place they are stationed. Therefore, the census populations for the area include the military members stationed at that base.

The percentage of military and dependents in the area was used to estimate increase in demand for groceries from commercial sources if the commissaries in those areas were closed. This assumes that the service members and their families previously purchased all their groceries from the local commissary.

The estimated price increase of local area groceries from commercial sources if the commissary closed was produced by first finding the demand elasticity of groceries. The price of elasticity of individual grocery items varies greatly from one item to the next, and from one brand name to the next, with some items being elastic and others inelastic. In 2010, the American Journal of Public Health published a report that showed the price elasticity of groceries by product classification. The classifications were soft drinks, juice, beef, pork, fruit, poultry, dairy, cereals, milk, vegetables, fish, fats/oils, cheese, sweets/sugars, and eggs. For the purpose of this thesis the price elasticities of all of those items were averaged and the average was found to be -.59.

The traditional formula for finding elasticity is the percent change in price divided by the percent change in quantity demanded. For this thesis, the percent change in price is the unknown, and was found by using -.59 as the elasticity and the percent change in demand as the service member and dependents' percentage of the total population as the percent change in quantity demanded. Various price increases were found for the remote locations with the average price increase of 40.48 percent, however, this number was skewed by very large price increases in areas that would be felt by very few people. Adjusting the price increase average by the number of people that felt each price increase an average price increase of 20.43 percent was found.

This means that service members in remote areas actually see 50 percent savings by shopping at the commissary. Using 50 percent savings for remote commissaries, the amount of pay needed to compensate those service members for the loss of the commissary benefit was calculated as it was for 30 percent savings.

The demographic report gave the total number of service members at the remote bases but not the rank of those members. The rank was estimated using the percentage of the total force that each particular rank represented. For example E5s represent 17.10 percent of the total force, therefore it is estimated that E5s represent 17.10 percent of the remotely based force. This was used in the calculation of the total remote commissary compensation pay, which was then added to the regular commissary compensation pay for the total commissary compensation pay needed for one year.

IV. FINDINGS

A. OVERVIEW

This chapter will present and analyze data found using the methods and resources described in the previous chapter to determine whether it is more cost efficient for DOD to provide cash compensation or continue to operate the defense commissary system in the United States as it is currently run. The monetary value of the commissary benefit from the military service members will be presented based on income and remoteness of location. The costs to DOD to offer a cash compensation to meet the loss of this benefit along and the operating costs DOD incurs to operate commissaries will be compared.

B. VALUING THE BENEFIT

In order to find the value of the commissary benefit from the service member's point of view several variables were considered and it was decided the chief variables for service members were income and duty station, particularly whether or not there were many or few grocery options in that duty station area

1. Value Based on Income

DeCA advertises an average of 30 percent savings for customers of the commissary. This gives an idea of the potential value of the commissary to service members. Table 1 shows the yearly amount needed to compensate all military personnel with cash for the loss of commissary privileges. The amount that a service member could potentially save at the commissary depends on how much that service member spends at the commissary. The average amount that a service member spends at the commissary is influenced by the income of that service member.

Table 1. Cash Value of the Commissary Benefit. Adapted from Office of the Deputy Assistant Secretary of Defense [ODASD] (2014).

Pay Grade	Number of personnel in rank	Subtracting remote pay recipients	% of total force	Average monthly commissary compensation needed per person	Total payment needed monthly	Total yearly payment needed
E1	40,333	38,861	3.50%	\$77.38	\$3,007,144.63	\$36,085,735.57
E2	57,619	55,516	5.00%	\$81.88	\$4,545,494.65	\$54,545,935.84
E3	165,943	159,887	14.40%	\$86.81	\$13,879,731.62	\$166,556,779.41
E4	233,933	225,396	20.30%	\$96.57	\$21,765,634.62	\$261,187,615.45
E5	197,057	189,866	17.10%	\$114.76	\$21,788,225.06	\$261,458,700.75
E6	138,286	133,239	12.00%	\$122.43	\$16,312,034.82	\$195,744,417.79
E7	81,819	78,833	7.10%	\$137.10	\$10,808,161.30	\$129,697,935.57
E8	24,200	23,317	2.10%	\$155.05	\$3,615,232.20	\$43,382,786.41
E9	9,219	8,883	0.80%	\$169.40	\$1,504,720.47	\$18,056,645.67
Total Enlisted	948,409		82.30%			
W1	2,305	2,221	0.20%	\$137.86	\$306,133.20	\$3,673,598.41
W2	6,914	6,662	0.60%	\$154.48	\$1,029,119.24	\$12,349,430.85
W3	4,610	4,441	0.40%	\$174.00	\$772,788.69	\$9,273,464.31
W4	2,305	2,221	0.20%	\$164.92	\$366,234.24	\$4,394,810.93
W5	1,152	1,110	0.10%	\$178.68	\$198,394.61	\$2,380,735.34
Total W1-W5	17,286		1.50%			
O1	20,743	19,986	1.80%	\$128.66	\$2,571,462.25	\$30,857,546.94
O2	26,505	25,538	2.30%	\$146.56	\$3,742,894.77	\$44,914,737.29
O3	66,838	64,399	5.80%	\$166.75	\$10,738,413.14	\$128,860,957.62
O4	39,181	37,751	3.40%	\$160.94	\$6,075,821.20	\$72,909,854.41
O5	24,200	23,317	2.10%	\$187.43	\$4,370,376.01	\$52,444,512.11
O6	10,371	9,993	0.90%	\$219.97	\$2,198,187.82	\$26,378,253.85
O7	429	429	0.00%	\$259.57	\$111,356.88	\$1,336,282.52
O8	306	306	0.00%	\$293.59	\$89,838.58	\$1,078,062.99
O9	145	145	0.00%	\$307.27	\$44,553.65	\$534,643.78
O10	38	38	0.00%	\$307.27	\$11,676.13	\$140,113.54

Service members' yearly salaries were calculated and grouped into income quintiles. All service members fell into the top three quintiles. The average percentage of income that is spent on food was calculated by the 2014 Consumer Expenditure Report. As income goes up, the percentage of income spent on food goes down; however, the dollar amount spent on food goes up. Service members in pay grades E-1 through E-5, and O-1, were in the third highest quintile, which spends an average of 8.1 percent of income on food eaten at home, or groceries. Service members in pay grades E-6 through E-9 (with less than twenty six years of service), W-1 through W-4 (with less than twenty years of service), and O-2 through O3 were in the fourth highest quintile which spends an average of 7.5 percent of income on food eaten at home. In the highest quintile were E-9s with more than twenty six years of service, W-4s with more than twenty years of service,

W-5s, O-4s through O-10s, spending an average of 5.8 percent of income on food eaten at home.

Using these percentages against the yearly salaries, the average yearly amount spent on food at home is found for each pay grade. If the service member purchased all of his or her groceries for the year from the commissary, the amount saved on average would be 30 percent of the total. For example, an E-5 with more than eight years of service spends an average of \$4,556.21 yearly on groceries, but if that quantity of groceries were purchased at the commissary the service member would save 30 percent, or in this case \$1,366.86 per year. Therefore, \$1,366.86 per year should be the amount that an E-5 with more than eight years of service values the commissary benefit. If the DOD were to close all the commissaries in the US, but wanted to keep providing the same amount of benefit, it would have to pay that E-5 \$1,366.86 per year in addition to what the E-5 already makes. The monthly payment is found by simply dividing the yearly payment by twelve. The monetary value of the commissary for all paygrades is shown in Table 1.

To find out how much providing cash compensation in lieu of commissaries for every service member in the United States would cost the DOD, the total amount of service members stationed in the United States was found by paygrade. Service members in the same paygrade may make different salaries due to time in service. Lacking reliable numbers on the amount of service members at each time in service milestone for each paygrade, the average pay for each pay grade was calculated. Since all but the most senior military paygrades have high year tenure, which is a set time in service that if the service member has not been promoted is separated from the military, the averages were based on a small range of salaries. The average monthly and yearly compensations for the entire military were found by multiplying the average payment by the total number of service members in the United States in that particular paygrade and then adding the paygrade totals. The total yearly amount found to be needed to provide compensation for the commissary benefit based on income is \$1,558,243,557.

2. Value of Remote Commissary Locations

Income of the service member does not tell the whole story when it comes to valuing the commissary. Service members stationed in a remote location where there are few if any commercial options are often cited as justification for the commissary benefit. Despite this justification, most of the commissaries in the United States are in urban areas. It could be argued that large military bases create urban areas; however, there are still remote bases in the United States. There were thirteen bases in the United States found to be seventy or more miles from a metropolitan center with a population of 50,000 or more, see Table 2. When investigating bases closer than seventy miles it was found that although those bases were still distant from a single city with a population of 50,000 or more, the overall populations of the twenty mile radiuses surrounding the bases were substantial. Only two of the bases that were seventy miles or more from a metropolitan center with a population of 50,000 or more had twenty mile radius populations of more than 100,000, Whidbey Island Naval Air Station, and Gulfport Naval Construction Battalion Center, while most of the bases closer than seventy miles had twenty mile radius populations of over 100,000.

For the rest of this thesis remote areas are defined as bases that are seventy miles or more from a metropolitan center with a population of 50,000 or more. In these remote areas, service members and their dependents made up a substantial portion of the twenty mile radius population, with the average service member and dependent population being 18.51 percent of the overall twenty mile radius population. Assuming that these service members and their dependents buy all of their groceries at the local commissary, eliminating that commissary would create a substantial increase in demand on the local commercial grocery providers. In less remote areas, the percentage of the population that service members and their families represent is much less and the number of commercial options is much more, meaning a demand increase in these areas due to closing the commissary would have little if any impact on commercial grocery prices. In remote areas an 18.51 percent increase in demand would have a significant impact on the price of local commercial grocery providers.

Table 2. Remote Base Populations. Adapted from ODASD (2014).

Base	Service Branch	Zip Code	Nearest Metro City (NMC)*	Miles to NMC	Total Sponsors	Total Dependents	Total Personnel	Population of 20 Mile Radius of Base Zip Code	Military percentage of total local pop
Key West NAS	Navy	33040	Miami	150	711	1,043	1,754	32,891	5.33%
China Lake NAVWEAPCEN	Navy	93555	Los Angeles	140	597	905	1,502	34,567	4.35%
Altus AFB	Air Force	73523	Oklahoma City	120	1,265	1,769	3,034	29,220	10.38%
USMC Mountain Warfare Training	USMC	93517	Sacramento	100	219	376	595	2,388	24.92%
Edwards AFB	Air Force	93524	Los Angeles	95	1,992	2,916	4,908	18,910	25.95%
Fort Sill	Army	73503	Oklahoma City	90	11,073	14,592	25,665	76,864	33.39%
Vance AFB	Air Force	73705	Oklahoma City	90	1,240	1,213	2,453	60,305	4.07%
Fort Leonard Wood	Army	65473	Springfield	85	9,737	13,391	23,128	71,990	32.13%
Whidbey Island NAS	Navy	98278	Seattle	80	4,923	6,471	11,394	159,488	7.14%
Fort Huachuca	Army	85613	Tucson	75	4,143	6,135	10,278	72,995	14.08%
Fort Irwin	Army	92310	San Bernardino	70	4,114	6,985	11,099	19,944	55.65%
Gulftport NCBC	Navy	39501	New Orleans	70	1,240	1,844	3,084	247,749	1.24%
Fallon NAS	Navy	89496	Reno	70	799	1,046	1,845	8,390	21.99%
Totals					42,053	58,686	100,739	835,701	12.05%

Using the *American Journal of Health's* estimates of the price elasticity of groceries, an estimate of the increase in price that results from these increases in demand was found. The *American Journal of Health* estimated price elasticities of groceries based on item categories, such as produce, dairy, meat, etc. The average of all of these price elasticities was -.59. The formula used to find price elasticity is Price Elasticity of Demand = % Change in Quantity Demanded / % Change in Price (Investopedia, 2003). This means that for a 1 percent increase in price there will be a .59 percent decrease in demand. In the case of the remote commissaries, the price elasticity of demand is known, it is the percent change in price that is the unknown, so the formula is rewritten to solve for the percent change in price. The formula used for estimating price increases that would result from closing commissaries in remote locations is

$$(\text{Military Percentage of population})/-.59 = \text{Percentage of Price increase.}$$

The "Military Percentage of Population" represents the percent change in demand. Dividing the service member and dependent population percentage by the absolute value of the price elasticity of -.59, the estimated price increases for all of the

remote locations were found. The average of all of these price increases was 20.43 percent, meaning prices are expected to rise in remote locations by 20.43 percent if the commissaries in these areas are eliminated. Table 3 shows the estimated price increase for the thirteen remote areas if the commissaries were removed. The price elasticity provided by the *American Journal of Health* is an overall estimate for the entire country; however, price elasticities could vary from market to market. Because of this, price changes for both a ten point higher and lower elasticity were calculated along with the estimated price changes for the most elastic item on estimated by the *American Journal of Health*, soda at -.79 and the least elastic item, eggs at -.27. The higher the elasticity used, the lower the increase in price and the lower the elasticity, the higher the increase in price.

Table 3. Estimated Local Price Increases in Remote Areas
if Commissaries Closed

Base	Expected local price increase from closing commissary based on .59 price elasticity for groceries	Expected local price increase from closing commissary based on .49 price elasticity for groceries	Expected local price increase from closing commissary based on .69 price elasticity for groceries	Expected local price increase from closing commissary based on .27 price elasticity for groceries	Expected local price increase from closing commissary based on .79 price elasticity for groceries
Key West NAS	9.04%	10.88%	7.73%	19.75%	6.75%
China Lake NAVWEAPCEN	7.36%	8.87%	6.30%	16.09%	5.50%
Altus AFB	17.60%	21.19%	15.05%	38.46%	13.14%
USMC Mountain Warfare Training	42.23%	50.85%	36.11%	92.28%	31.54%
Edwards AFB	43.99%	52.97%	37.62%	96.13%	32.85%
Fort Sill	56.59%	68.14%	48.39%	123.67%	42.27%
Vance AFB	6.89%	8.30%	5.90%	15.07%	5.15%
Fort Leonard Wood	54.45%	65.56%	46.56%	118.99%	40.67%
Whidbey Island NAS	12.11%	14.58%	10.35%	26.46%	9.04%
Fort Huachuca	23.87%	28.74%	20.41%	52.15%	17.82%
Fort Irwin	94.32%	113.57%	80.65%	206.11%	70.44%
Gulfport NCBC	2.11%	2.54%	1.80%	4.61%	1.58%
Fallon NAS	37.27%	44.88%	31.87%	81.45%	27.84%
Totals	20.43%	24.60%	17.47%	44.65%	15.26%

If removing commissaries causes a price increase at commercial supermarkets, then the value of the benefit of United States commissaries goes beyond the 30 percent savings. For service members in remote areas the actual savings are closer to 50 percent. Taking this into account, the commissary benefit in remote areas was calculated.

After calculating the value of the benefit in remote areas for every paygrade, then applying that to the numbers of each paygrade stationed at remote locations, the total yearly amount needed to compensate those service members in remote locations for the benefit of the commissary was found to be \$98,169,605.67 for one year. The cash compensation for the elimination of remote commissaries for each paygrade is shown in Table 4.

Table 4. Cash Value of Remote Commissaries. Adapted from ODASD (2014).

Pay Grade	Number of remote area commissary compensation recipients	Average monthly commissary compensation needed per person	Total payment needed montly	Total yearly payment needed
E1	1472	\$128.97	\$189,826.93	\$2,277,923.21
E2	2103	\$136.46	\$286,935.76	\$3,443,229.06
E3	6056	\$144.69	\$876,162.35	\$10,513,948.19
E4	8537	\$160.95	\$1,373,962.41	\$16,487,548.96
E5	7191	\$191.26	\$1,375,388.44	\$16,504,661.31
E6	5046	\$204.05	\$1,029,702.24	\$12,356,426.88
E7	2986	\$228.51	\$682,268.52	\$8,187,222.28
E8	883	\$258.42	\$228,212.65	\$2,738,551.80
E9	336	\$282.34	\$94,985.94	\$1,139,831.34
Total Enlisted				
W1	84	\$229.77	\$19,324.75	\$231,897.03
W2	252	\$257.47	\$64,963.47	\$779,561.64
W3	168	\$290.01	\$48,782.53	\$585,390.30
W4	84	\$274.88	\$23,118.65	\$277,423.80
W5	42	\$297.81	\$12,523.72	\$150,284.65
Total W1-W5				
O1	757	\$214.44	\$162,324.35	\$1,947,892.19
O2	967	\$244.28	\$236,271.39	\$2,835,256.68
O3	2439	\$277.92	\$677,865.65	\$8,134,387.78
O4	1430	\$268.25	\$383,538.09	\$4,602,457.10
O5	883	\$312.40	\$275,881.34	\$3,310,576.04
O6	378	\$366.63	\$138,761.29	\$1,665,135.43
O7	0	\$432.63	\$0.00	\$0.00
O8	0	\$489.33	\$0.00	\$0.00
O9	0	\$512.12	\$0.00	\$0.00
O10	0	\$512.12	\$0.00	\$0.00

3. Overall Value of Commissary to Service Members

The overall value of the commissary to service members is the amount the DOD would have to provide in a cash compensation to provide the same benefit that DOD members have the potential to receive from the commissary. As seen in Table 5, by adding the amounts needed to compensate the benefit for service members in remote locations and service members not in remote locations, we have a total value of \$1,656,413,163 needed to compensate all service members stationed in the United States with cash in lieu of providing the commissary benefit for one year.

Table 5. Cash Value of Commissary Benefit

Total Yearly Benefit Non Remote Members	\$1,558,243,557.35
Total Yearly Benefit Remote Members	\$98,169,605.67
Total Overall Value of Benefit	\$1,656,413,163.02

C. COSTS OF THE BENEFIT TO DOD

The costs to the DOD for providing the commissary and for providing cash compensation will now be evaluated. As seen in Table 6, in 2014, the DOD spent \$1.3 billion in appropriated funding to operate all commissaries. Of that total \$131,468,345 was spent on the operation of overseas commissaries. Focusing only on stateside commissaries the DOD spent \$750,211,022. These numbers only encompass the appropriated funding spent directly on operating the stores, which is why they do not total \$1.3 billion. The difference is spent on transportation, regional headquarters, distribution centers, etc. Stateside stores currently make up 75 percent of all commissaries, so for the purpose of this thesis we will estimate that 75 percent of the central costs can be attributed to stateside commissaries, in 2014 this number was \$313,740,475.75, for a total cost of operating stateside commissaries of \$1,063,951,496.75.

Table 6. Costs of Operating Commissaries

Expenses of Stateside Commissaries in 2014	\$750,211,022
Central Costs Allotted to Stateside Commissaries	\$313,740,475
Total Stateside Expenses	\$1,063,951,497
Expenses of Overseas Commissaries in 2014	\$131,468,345
Central Costs Allotted to Overseas	\$104,580,158
Total Overseas Expenses	\$236,048,503
Total FY 2014 Commissary Appropriation	\$1,300,000,000

The fiscal year 2015 total appropriated funding for the commissary as published in DeCA's fiscal year 2015 Annual Financial Report is \$1.408 billion, and the estimate stated in the President's fiscal year 2016 budget is \$1.412 billion, this can be seen in Table 7. These price growths average a 4.3 percent increase in expenses per year. Given the political pressure to decrease military spending, it is unlikely that DeCA's budget will be allowed to increase by more than percentage in the future, if it is allowed any growth at all.

Table 7. Commissary Cost Growth

2014 Commissary Appropriation	\$1,300,000,000
2015 Commissary appropriation	\$1,408,000,000
2016 Commissary appropriation	\$1,412,000,000

Table 8 shows the cost to the DOD of providing cash compensation in lieu of the commissary benefit along with continuing to operate overseas commissaries. The cost to the DOD to provide cash compensation to service members in the United States that meets the potential of the benefit as already calculated for one year is \$1,656,413,163. The DOD would also incur the cost of keeping the overseas commissaries operating, which is \$131,468,345 plus a percentage of the central costs. Sixty commissaries are currently located in foreign countries, about 25 percent of the 241 total commissaries, so a reasonable estimate of the central costs that should be attributed to the overseas

commissaries would be 25 percent of the total central costs (\$418,320,633) which is \$104,580,158, for a total cost of overseas commissaries of \$236,048,503.25. Meaning the one year total for providing cash compensation is \$1,892,461,666.25.

Table 8. Cost to DOD of Providing Cash Compensation and Operating Overseas Commissaries

Total Yearly Benefit Non Remote Members	\$1,558,243,557
Total Yearly Benefit Remote Members	\$98,169,606
Total Overall Value of Benefit	\$1,656,413,163
Cost of Operating Overseas Commissaries	\$236,048,503
Total Cost to DOD for Cash Compensation and Overseas Commissaries for One Year	\$1,892,461,666

If the DOD did shutdown all commissaries in the United States, it can be assumed that the property, stores, and equipment would be sold. The one time revenue from selling these items would offset the cost to provide cash compensation. Table 9 shows what the first year cost to the DOD of providing cash compensation would be with the sale of PP&E factored in. The value of PP&E listed on DeCA's 2014 Annual Financial Report is \$844,330,000. Using the same logic that was used to distribute central costs, the PP&E that would be sold would be 75 percent of the total, \$633,247,500. The market values of PP&E are most likely much higher than book values, but the conservative approach is to assume the PP&E can be sold for book value. Assuming the PP&E could be sold for book value, the cash compensation for the first year would be offset by \$633,247,500 making the total cost of providing cash compensation in year one \$1.259 billion.

Table 9. First-Year Cost to DOD of Providing Cash Compensation and Operating Overseas Commissaries

Total Cost to DOD for Cash Compensation and Overseas Commissaries	\$1,892,461,666
Sell of PP&E	\$633,247,500
First Year Cost to DOD for Cash Compensation	\$1,259,214,166

D. COMPARING COAS

The costs of the two COAs, the status quo of continuing to operate the commissary system as is and replacing stateside commissaries with cash compensation to service members will now be compared. As shown in the last section the status quo costs \$1.3 billion in fiscal year 2014, and the cost to provide the cash compensation and continuing to operate the overseas commissaries is \$1.89 billion for the first year. When subtracting the revenue made through the sale of PP&E the first year cost of providing cash compensation is only \$1.259 billion slightly less than operating the commissaries for one year. Since the PP&E can only be sold once, the revenue from the sale is not present in year two or any year thereafter making the status quo the less expensive of the two options.

To calculate the costs of both COAs over time, discount rates published in OMB Circular No. A-94 were used. Table 10 shows the cumulative cost of each COA over time. The formula used to calculate the cost of COA 1 is the annuity with growth formula $\frac{P}{r-g} [1 - ((1 + g)/(1 + r))^n]$ where P equals the amount of the first year's cost, r is the discount rate provided by OMB, g equals the growth rate, 4.3 percent, and n equals the number of years. The formula used to calculate the cost of COA 2 is the present value of a normal annuity formula $P * ((1 - (1 + r)^{-n})/r)$ where P equals the amount of the first year's cost, r equals the discount rate provided by OMB, and n equals the number of years. As can be seen in Table 10, the status quo of continuing to operate the commissaries as is, is the less expensive option from year two through year twenty. Due to the cost growth of operating the commissaries of 4.3 percent the cost the status quo

eventually grows to be more than the cost of cash compensation. By the twenty-year mark, the difference in costs of the two COAs is relatively small by DOD standards at only \$20.9 million. By the next year and for every year after that, cash compensation is less expensive than the status quo. Figure 1 is a graphical representation of the cost of the two COAs over time.

Table 10. Comparison of COAs

COA	Year 1	Year 5	Year 10	Year 15	Year 20	Year 25
Status Quo	\$1,300,000,000	\$6,954,316,424	\$14,938,444,282	\$24,207,186,180	\$34,740,185,660	\$46,221,282,030
Cash Compensation	\$1,259,214,166	\$8,764,538,805	\$17,767,605,544	\$26,123,611,402	\$34,972,201,320	\$42,707,910,448

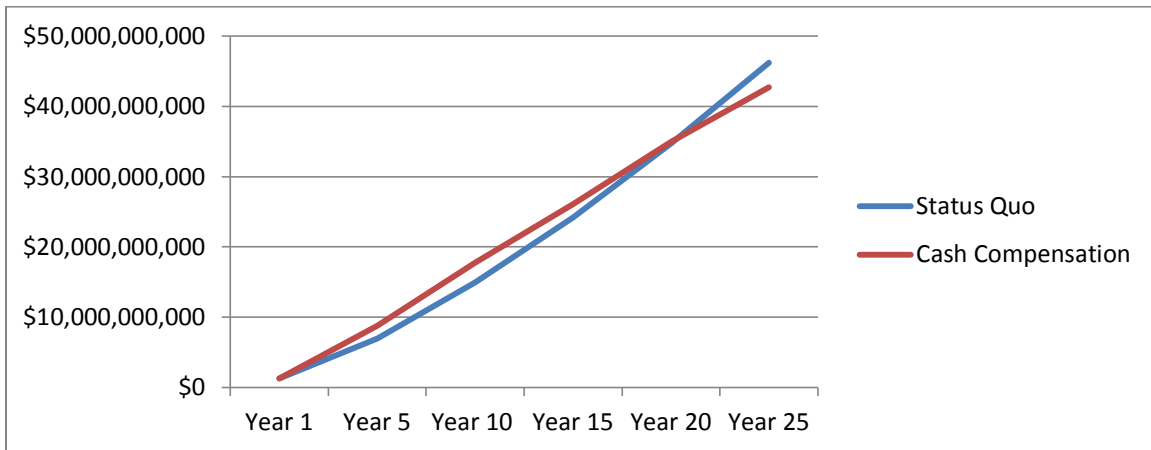


Figure 1. Cost of COAs over Time

The question of which COA is the least expensive to DOD depends on the time horizon. In the short to medium run, status quo is less expensive, while in the long run, cash compensation is less expensive.

If DeCA could lower the cost growth of the commissary system to the level of inflation or less, the status quo would be the less expensive option throughout. A change in force size would also affect the cost of the two COAs. Adding manpower to the

military would raise the cost of the cash compensation, and could, depending on the size of the manpower hike, also raise the cost of the status quo. The reverse is also true, with a reduction of military manpower would lower the cost of the cash compensation. A reduction in force could also lower the cost of the status quo; past reductions in force size have led to store closures. In both cases, of force additions and reductions, the status quo is less flexible than the cash compensation. It takes time to build and even to close stores and once the addition or closure is made it is difficult to reverse.

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V. SUMMARY

A. OVERVIEW

This thesis conducted a cost analysis on whether it would be cost effective for the DOD to continue operating the defense commissary system or to close all commissaries in the United States and offer cash compensation to meet the value of the lost benefit. The thesis began by examining the history of the commissary system. The first commissaries were established to provide rations to troops in the field far from civilian trading posts. As the military expanded, so did the commissaries. By the end of World War II, commissaries, like United States service members, had spread around the globe. Numerous studies and commissions have questioned the validity of the commissary benefit over the years, but the commissary system has survived them all and commissaries have come to be thought of as a critical benefit to service members.

This thesis examined the possibility of providing direct cash compensation at the value of the commissary benefit to the service member instead of operating the commissary system. Income levels and whether or not the service members were stationed in remote locations were examined to value the benefit. Both courses of action were examined to see which was less expensive, while still providing the same benefit, over time.

B. CONCLUSION

In the current DOD fiscal environment, cutting costs is an utmost priority. Although DeCA accounts for less than 1 percent of the overall DOD budget, everything is under scrutiny. At the same time any reduction in benefits to military service members would be met with scathing criticism. In order to both reduce the budget and supply the same benefits the DOD needs to explore every option.

In this thesis's exploration of the commissary benefit, the status quo COA of operating the commissary system as is was found to be the preferable option. The status quo was found to be less expensive over the next twenty years than to provide cash compensation. Direct compensation in lieu of the commissary benefit is expected to

become less expensive after year twenty, due to the annual cost growth of operating the commissary system, but the long time frame needed to achieve savings from cash compensation make it less desirable. If a way could be found to reduce the cost of the cash compensation, like for example if part of the benefit were conceded, cash compensation would become the preferable COA.

The difference in cost of the two COAs is relatively small throughout the twenty year time period and for many years beyond that, because unforeseen or radical changes in variables such as force size, inflation, transportation costs, energy costs, or commercial competition could alter the results of the cost model significantly. One benefit of COA 2, the cash compensation, is that it would be more flexible to changes. It would be easier and less permanent to add or subtract money from the cash compensation in response to changes, than to build new commissaries or close old ones.

It could be argued that since not all DOD members have access to a commissary, such as those on recruiting duty in a location far from a military base, the cash compensation provides a greater benefit to service members, because every service member would receive it. The cash compensation would also be more flexible in response to changes in the military force size.

On the other hand, the cash compensation calculated in this thesis only takes into account military service members, while the commissary stores are accessible to a long list of beneficiaries, most notably retired veterans. If retired veterans were added to the cash compensation plan, the cost of the plan would increase significantly. If the retired veterans were not compensated, the cash compensation plan would not provide the same benefit as the commissary system. Like with the commissary system, how many veterans lost benefits because of the closure of commissaries would depend on how many veterans actually live close enough to commissaries to take advantage of commissaries.

C. RECOMMENDATIONS

The first recommendation based on the data gathered and comparison of the two COAs is to continue with the status quo, COA1, of operating the commissaries. Continuing commissary operations is the less expensive of the two COAs for the first

twenty years. Although COA2 becomes less expensive after that, twenty years is too long of a time period to wait for these savings. Furthermore, too much can change or happen in those twenty years to alter the COA estimations. Spending on commissaries increases with an increase in force size, however an increase in force size would raise the amount of cash compensation by more. An upward shift in inflation could also degrade the benefit of COA2, or increase the cost. The status quo is the steady safe option.

The second recommendation is for DeCA to investigate and implement cost savings. If DeCA through these actions or others can reduce or eliminate the cost growth, the commissary system will continue to be the better choice of the two COAs. DeCA has already begun installing energy efficient freezers, coolers and lighting as part of its “going green” initiative (Defense Commissary Agency, n.d.). These efforts should continue and other ways to decrease the annual cost growth of DeCA should be explored. A reduction in commissary manning through an increase in self check outs is another possible source of cost savings. Allowing more local sourcing for produce could be a way to reduce transportation costs, particularly for overseas commissaries.

D. AREAS FOR FURTHER RESEARCH

Areas for further research include other possible replacements for the commissary benefit instead of cash compensation. One such proposal has been the merging of DeCA and the three military exchange systems, Army Airforce Exchange, Navy Exchange, and Marine Corps Exchange. Many of the practices of all four entities overlap, such as transportation and warehousing; savings could be generated if these functions were consolidated. However, since the military exchanges do not use appropriated funding, such a merger would mean moving DeCA off of appropriated funding. This would bring great savings to DOD, but would the benefit to service members remain the same?

Another area for further research is to examine commissaries individually and determine a way to measure which commissaries were the most efficient, and which ones do or do not provide a worthwhile benefit. This data could be used to develop a list of best practices for commissaries. This information could be very helpful to store managers in reducing costs and providing greater benefits to customers. It could also be used to

determine which commissaries, if any, do not provide enough benefit to justify remaining open.

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