

MICHAEL VASSEUR, ELLEN M. PINT, LAURA H. BALDWIN, MAX STEINER, LIAM REGAN, LIAM MCLANE

Implementing Variable Cost Pricing in the Transportation Working Capital Fund

During 2020–2021, RAND researchers performed an independent review of the Transportation Working Capital Fund (TWCF) to meet the requirements of Section 1716 of the National Defense Authorization Act for Fiscal Year 2020 (Vasseur et al., 2021). They recommended that the U.S. Transportation Command (USTRANSCOM) implement Variable Cost Pricing for several business lines that are financed by the TWCF.

The business and economics literature emphasizes Variable Cost Pricing as the best way to guide customer decisionmaking to support enterprise objectives. In the Variable Cost Pricing model, customers pay for the costs to the Defense Transportation System (DTS) associated with their requirements (variable costs); other costs should be recovered separately through appropriations or service-level bills.¹ However, the report to Congress did not address how such a cost-recovery scheme would be implemented (Vasseur et al., 2021).

This companion report identifies next steps toward implementing Variable Cost Pricing for the TWCF should the U.S. Department of Defense (DoD) wish to move in this direction. Specifically, it provides a guide to answering the following three questions:

KEY FINDINGS

- Conditions for implementing variable cost pricing are favorable for the Air Mobility Command (AMC) Channel Cargo and Channel Passenger and U.S. Military Surface Deployment and Distribution Command (SDDC) Liner Operations business lines.
- Conditions are unclear and additional information would be required to assess the Special Assignment Airlift Mission/Contingency, Joint Exercise Training Program, and Port Operations business lines.
- Activity is driven by requirements that are not fully price sensitive for the Military Sealift Command's Army and Air Force Prepositioned Ships business line.

1. Are TWCF prices expected to influence customer decisions?
2. Can fixed and variable costs be distinguished?
3. Are the benefits of Variable Cost Pricing greater than the cost of implementation?

This report also highlights further work necessary to reach definitive answers to these questions.

Defense Working Capital Funds (DWCFs) are modeled after commercial approaches to transfer pricing. In the commercial setting, transfer prices are used to guide decentralized decisionmaking toward outcomes that are optimal for the enterprise as a whole. For example, they could be used to choose an internal or external provider of goods or services that meets requirements at the lowest cost. However, adapting this commercial model to the DoD context is not straightforward. USTRANSCOM is not a for-profit business. Instead, it is driven by its wartime and peacetime missions, and policy and other constraints affect decisions about the use of DoD or non-DoD providers. Nonetheless, the DoD would like to motivate cost-efficient decisions within the range of allowable options that meet mission requirements.

The recommended approach of charging customers variable costs and recovering fixed costs separately

from prices is not the typical approach used within DWCFs, and there are significant potential challenges to this approach. Defense business systems are not necessarily postured to provide the information needed to structure prices for cost recovery in this way, and factors other than prices may have more influence on customer decisions. These factors raise the important question of whether the potential benefits of implementing such a pricing structure within the DWCF context are worth the implementation costs.

In this report, we discuss key considerations for implementing Variable Cost Pricing in the context of selected TWCF business lines. These business lines include AMC’s Channel Cargo, Channel Passenger, Special Assignment Airlift Mission (SAAM)/Contingency, and Joint Exercise Training Program (JETP) business lines; SDDC’s Liner Operations and Port Operations business lines; and Military Sealift Command’s (MSC’s) Army and Air Force Prepositioned Ships business lines. The objective is to inform decisions about whether it makes sense to implement Variable Cost Pricing for these business lines.

Each of the following three key considerations must be answered affirmatively before implementing Variable Cost Pricing:

1. Do TWCF prices influence customer decisions about movements (e.g., amount moved, how quickly, the chosen transportation provider)? If yes, then improving the pricing approach can lead to customer decisions that better support USTRANSCOM and DoD objectives. If no, then improvements to prices will not lead to more cost-efficient decisions, and any implementation costs would be greater than benefits.
2. Can DoD data systems distinguish fixed from variable costs? If yes, the cost of implementing improved pricing approaches might be quite low. If no, then implementation might be quite costly.²
3. Are the benefits of Variable Cost Pricing greater than the cost of implementation? How large might benefits be, given characteristics of the business line? How do they compare to the expected costs of implementation?

Table 1 briefly highlights our answers to these questions by business line. Further detail for each

Abbreviations

AMC	Air Mobility Command
ARA	Airlift Readiness Account
DLR	depot-level repairable
DoD	U.S. Department of Defense
DTS	Defense Transportation System
DWCF	Defense Working Capital Fund
FY	fiscal year
JETP	Joint Exercise Training Program
MSC	Military Sealift Command
NOR	Net Operating Result
SAAM	Special Assignment Airlift Mission
SDDC	U.S. Military Surface Deployment and Distribution Command
SLB	service-level bill
TWCF	Transportation Working Capital Fund
USTRANSCOM	U.S. Transportation Command

TABLE 1

Summary by Business Line

Business Line	Do Transportation Working Capital Fund Prices Influence Customer Decisions?	Can Fixed and Variable Costs Be Distinguished?	Are the Benefits of Variable Cost Pricing Greater than the Cost of Implementation?
AMC Channel Cargo and Channel Passenger	Yes; customers have control over how much and how quickly they ship material	Yes	Yes; implementation costs should be low given current pricing structure
AMC SAAM/Contingency and JETP	Somewhat; customers are price sensitive within operational or exercise budgets	Yes	Possibly, depending upon the price sensitivity of customer demands
SDDC Liner Operations	Yes; customers have control over how much and how quickly they ship material	Yes	Yes; implementation costs should be low given a lack of organic assets in this business line
SDDC Port Operations	Possibly; unclear how price sensitive customers are	Possibly; however, present systems do not allow a clear separation of fixed and variable costs	Possibly, depending on customer price sensitivity and ability to distinguish fixed costs
MSC Army and Air Force Prepositioned Ships	No; activity is driven by requirements that are not fully price sensitive	Yes	Unclear given the limited price sensitivity of requirements

question and business line is presented in the remainder of the report.

In the following sections, we briefly document evidence from previous research about the influence of working capital funds on customer and supplier behavior. We examine how DoD customers react to changes in prices and if working capital funds have been demonstrated to be successful at reducing costs among supplier organizations. Afterward, we more fully explore each of our three questions in the context of the specific TWCF business lines.

Do Working Capital Funds Affect Customer and Supplier Behavior?

Definitely answering the question of whether TWCF prices affect customer behavior is beyond the scope of this analysis. However, several studies of DWCFs have revealed that prices do influence customer behavior, particularly when customers have options to seek alternative suppliers or otherwise avoid transacting with the DWCF. For example, when stock funding of depot-level reparables (DLRs) was introduced in the Air Force and the Army in the early 1990s, Air Force customers began repairing more of the items they were staffed and equipped to repair locally instead of obtaining a replacement

item through the Air Force Working Capital Fund. They also returned more of their unserviceable DLRs for credit when purchasing serviceable ones, which reduced required purchases of replacement items. However, because prices were typically much higher than the variable cost of depot repair, customers also had incentives to repair more DLRs locally (using their own organic or contractor sources of repair) and return unserviceable DLRs in worse condition, such as by cannibalizing them to consolidate broken subcomponents into a smaller number of DLRs, even if these activities did not reduce costs for the Air Force as a whole (Baldwin and Gotz, 1998).

Similarly, the Army's initial price and credit policies for DLRs had three major features that caused customers to take actions that were cost-effective for them but not necessarily for the Army as a whole. First, the credit rates for unserviceable DLRs were based on average repair costs across a broad range of items, which created a financial incentive for customers to repair items with below-average repair costs locally and send items with above-average repair costs back to the depots. Second, if an item was in excess supply, the Army reduced the credit to zero, which increased customers' incentives to repair unserviceable items locally instead of drawing down surplus inventories. Third, the Army used a surcharge on DLR prices to recover fixed costs, which

created financial incentives for customers to go outside the Army Working Capital Fund when they could find alternative sources of supply, repair, or redistribution at a lower cost (Pint et al., 2002). U.S. Army Forces Command set up an intracommand redistribution and repair system to reduce costs relative to returning the items to depots and purchasing replacements from the wholesale supply system (Brauner et al., 2000).

Working capital funds have been relatively less successful at putting pressure on supplier organizations to reduce costs, particularly when customers do not have access to alternative sources. However, there is some evidence that, even in cases where customers do not have alternative options, such as the Defense Finance and Accounting Service, offering price discounts helped induce customers to move toward more automated payment systems for vendors and personnel. In addition, from 2000 to 2014, Defense Finance and Accounting Service costs fell by 58 percent in real terms and its civilian end strength was reduced by 30 percent, perhaps due to a combination of customer and DoD oversight, as well as the intrinsic motivation of Defense Finance and Accounting Service leaders (Keating et al., 2015).

Researchers have recommended that working capital funds adopt a Variable Cost Pricing approach to give customers the correct financial incentives to reduce costs (fixed costs would be funded through appropriations). According to National Defense Research Institute researchers, this could be combined with greater oversight and a process improvement approach to reduce fixed costs. In practice, however, DoD organizations have tended to put greater restrictions on customers, such as limiting repair options or moving the point of sale closer to customers, rather than implementing Variable Cost Pricing.

In comparison with other working capital funds, the TWCF has perhaps gone the furthest in removing fixed costs from customer rates and funding them through service-level bills (SLBs) and the Airlift Readiness Account (ARA). For example, SDDC's Traffic Management business line is fully funded by SLBs, and about half of the Port Operations business line is funded through SLBs. AMC's Channel Cargo and Channel Passenger business lines set prices based on commercial benchmarking; the remainder of their

costs are recovered through the ARA, in implicit recognition that customers might go outside the DTS if commercial providers were less expensive (Connor, Vasseur, and Baldwin, 2019; Vasseur et al., 2021). Nevertheless, there may still be benefits from moving more fully toward a Variable Cost Pricing approach.

Summary of U.S. Transportation Command Business Lines

Before describing implementation of our recommendations for select USTRANSCOM business lines, this section provides a brief background on all USTRANSCOM business lines. For further information, see Vasseur et. al, 2021. Table 2 describes all business lines and outlines their current cost recovery model.

Table 3 provides further information by business line, including average revenue, how that revenue is recovered, and how much of the costs are thought to be variable costs—an important distinction for Variable Cost Pricing.

Air Mobility Command Channel Business Lines

The AMC Channel Cargo and Channel Passenger business lines consist of regularly scheduled flights that customers in the military services can use to airlift cargo or people to set locations around the world (see Figure 1 for budget information for the Channel Cargo business line and Figure 2 for budget information on Channel Passenger business line). In these channel business lines, the customer pays for the number of people or amount of cargo being moved across established routes. The current cost recovery approach for Channel Passenger is based on a commercial benchmark; customers pay a benchmarked commercial rate for each passenger and all costs beyond this rate are recovered through the ARA. This cost recovery scheme is designed to keep movements in the DTS to promote readiness. Almost all Channel Passenger movements are provided through commercial carriers. Similarly, for Channel Cargo, customers pay a rate per pound that is based on commercial rates, and any additional costs above this

TABLE 2

Description of U.S. Transportation Command Business Lines

Business Line	Description	Current Cost Recovery
AMC		
Channel Passenger	Regularly scheduled passenger routes	Commercial Benchmark and ARA
Channel Cargo	Regularly scheduled cargo routes	Commercial Benchmark and ARA
SAAM/Contingency and JETP	Whole aircraft charters	Cost minus ARA
SDDC		
Port Operations	Port liaison and stevedore services	Cost plus/Port Readiness SLB
Liner Operations	Less than whole shipload cargo	Cost plus
Traffic Management	Maintain contracts for U.S. road and rail shipments	SLB
Global POV/DP3	Transport personally owned vehicles overseas	Cost plus
MSC		
Cargo (Charter/Activation)	Whole ship charters	Cost plus
Surge/Reduced Operating Status	Maintain/exercise reserve fleet	Cost plus
Army/Air Force Prepositioned Ships	Operate ships holding equipment and supplies	Cost plus
Petroleum, Oil, and Lubricants	Whole ship charters (Defense Logistics Agency Energy)	Cost plus

TABLE 3

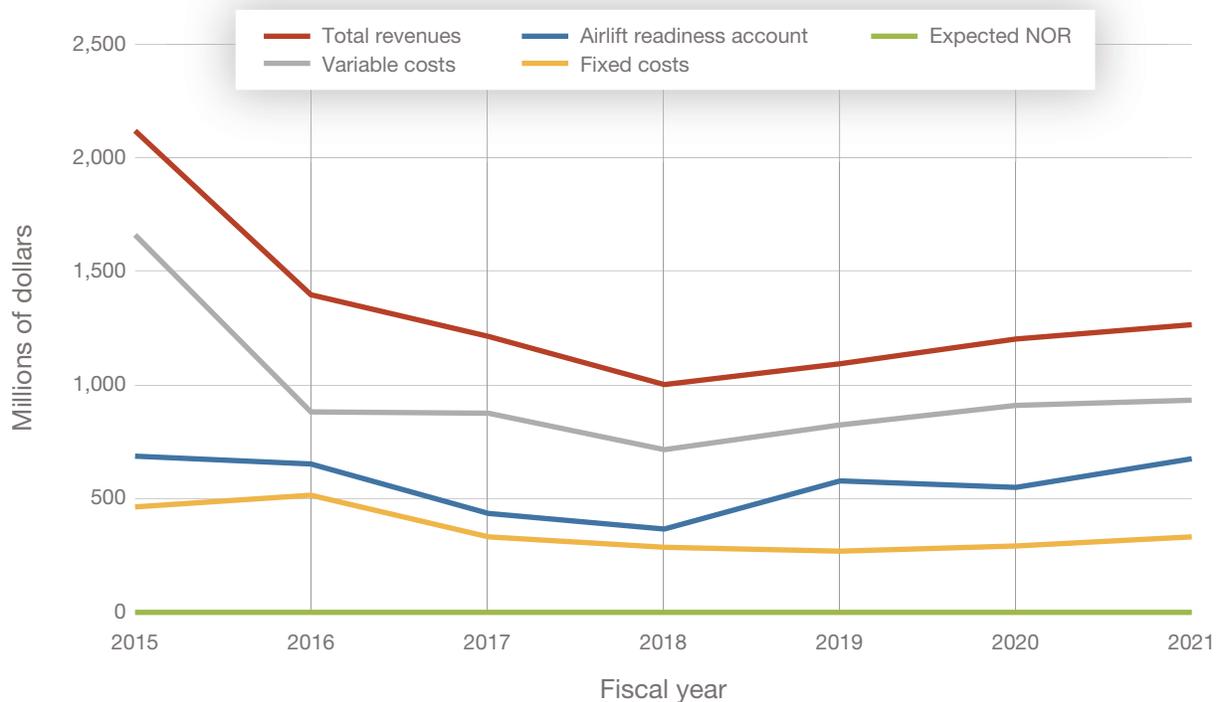
Source of Revenue, U.S. Transportation Command Business Lines

Business Line	Revenues (\$ millions)	Percentage of Revenue Recovered From Customers	Percentage of Revenue Recovered via Service- Level Bill/Airlift Readiness Account	Variable Costs as Percentage of Total ^a	Commercial as Percentage of Variable
AMC					
Channel Passenger	300	72	28	81	86
Channel Cargo	1,326	58	42	73	31
SAAM/Contingency	2,671	93	7	78	32
JETP	108	94	6	83	46
SDDC					
Port Operations	216	51	49	42	80
Liner Operations	850	100	0	84	98
Traffic Management	36	0	100	0	0
Global POV/DP3	229	97	3	75	98
MSC					
Cargo (Charter/Activation)	81	100	0	89	76
Surge/Reduced Operating Status	178	100	0	48	78
Army Prepositioned Ships	210	100	0	66	55
Air Force Prepositioned Ships	29	100	0	85	64
Petroleum, Oil, and Lubricants	196	100	0	86	76

NOTES: These calculations are based on an average of fiscal year (FY) 2015–FY 2021 budgets from IF-12 exhibits provided by USTRANSCOM.

^a Variable costs estimated based on subject-matter expert input.

FIGURE 1
Budgeted Financial Data for Channel Cargo



SOURCE: IF-12 exhibits provided by USTRANSCOM.
NOTE: NOR = Net Operating Result.

rate are recovered through the ARA. However, commercial contracts only account for about 30 percent of variable costs; the remainder are associated with military aircraft manned by active or reserve component aircrews.³

Are Prices Expected to Influence Customer Decisions?

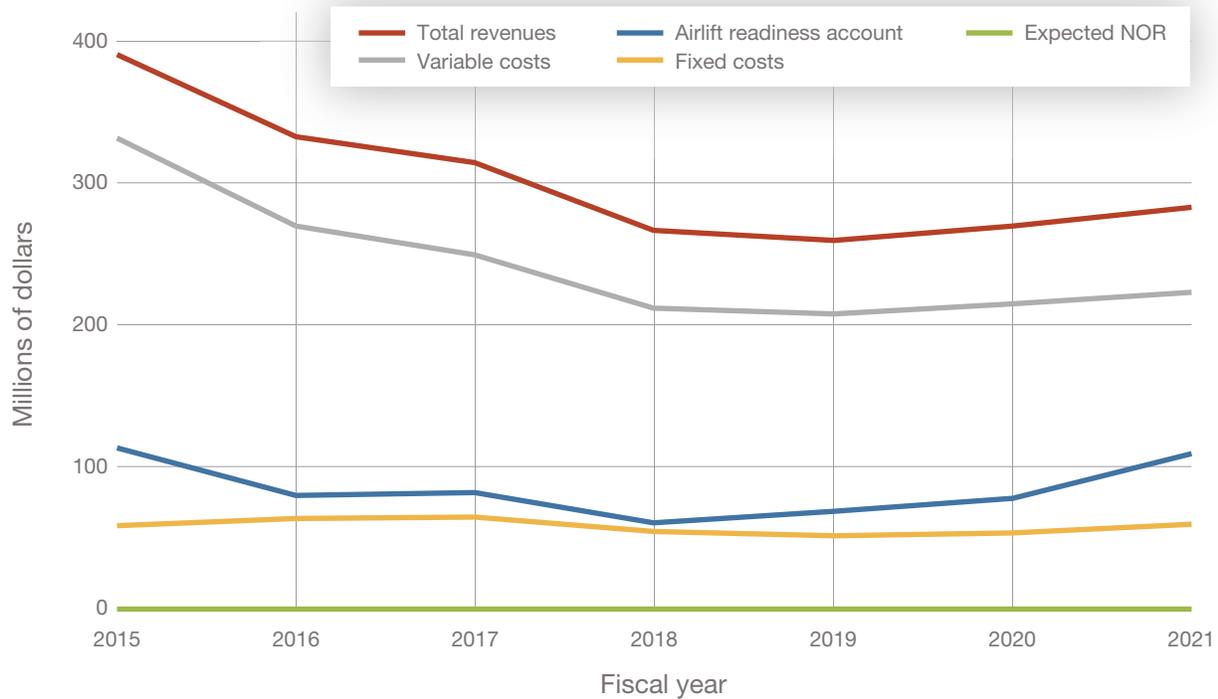
To answer this question, we must understand the influence that customers have on movement requirements—and customers’ ability to meet those requirements outside the DTS. Customers have a degree of influence over requirements in the channel business lines. These customer requirements are small package shipments and passenger travel. Some packages may be able to be moved through slower, less expensive means with advance planning. Some personnel travel decisions may be discretionary.

These movements do not necessarily require DTS use and could be provided from outside the

system. Some cargo, such as munitions or other hazardous material must be shipped through the DTS. It is unclear how much movement involves transport of such material. Defense Transportation Regulations also require that DoD customers use the DTS for other movements if USTRANSCOM can meet their requirements (DoD Directive 4500.9-R, 2020a, 2020b). However, in some cases, customers can create requirements that allow them to go outside the DTS. For example, a customer could require a timeline or route that is shorter than existing channel schedules. Passenger movement could occur through passenger airlines if channel timelines do not meet requirements or other locations are needed. If customers were not required to use the DTS, multiple small package shippers or commercial airlines could provide services to most channel locations.

We also need to know whether decisionmakers for movement requirements and transportation sourcing understand costs far enough in advance to factor them into decisionmaking. This is unclear for the channel

FIGURE 2
Budgeted Financial Data for Channel Passenger



SOURCE: IF-12s exhibits provided by USTRANSCOM.

business lines. If decisionmakers for requirements do not currently see these costs, rate and budget information could be provided to them in advance of any movement requirements being submitted.

Can Fixed Costs Be Distinguished from Variable Costs?

In AMC’s channel business lines, variable costs are those costs that would not be incurred in the absence of the movements. For DTS movements through commercial providers, variable costs are based on contract prices and are easy to estimate. Discerning the variable costs for organic movements that are relevant for prices is more nuanced. If movement by organic assets is chosen to meet a readiness requirement that would need to be met anyway, the customer’s decisionmaking did not drive the additional cost of using the organic assets. The relevant cost from a customer decisionmaking perspective is the commercial rate because that is what would have been chosen

in the absence of readiness considerations.⁴ However, if organic movement is chosen because of the nature of the workload (e.g., hazardous materiel), then organic variable costs are relevant to customer decisionmaking. Organic variable costs are more difficult to estimate, but could be based on budgeted costs per flying hour by aircraft type.

Fixed costs are those that the DTS would incur regardless of customer movements. These include overhead, baseline costs of maintaining port capabilities when they are not in use, and similar costs. In these business lines, direct fixed costs are primarily the cost of executing the charter contracts and running the channel programs. There are also broader DTS fixed costs.

Data systems and analysts should be able to distinguish charter costs and costs per flying hour from other costs of the channel programs. Since actual costs (charter costs and organic costs per flying hour) are known in advance, cost estimating based on the average cost of past movements is not required.

Are the Benefits of Variable Cost Pricing Greater Than the Cost of Implementation?

USTRANSCOM has already implemented commercial benchmark pricing for this business line and recovers additional costs separately from prices through the ARA. Because variable costs for channel lines are mostly driven by commercial costs, we would expect Variable Cost Pricing to essentially mirror these commercial benchmark prices. However, our analysis of USTRANSCOM budget data shows that for channel passenger (which is almost all commercial) revenue from the ARA exceeds our estimate of fixed costs by an average of \$25 million per year, suggesting that variable costs incurred for commercial passenger travel are higher than the commercial benchmark prices. Implementing true Variable Cost Pricing in this context would yield prices that are higher than commercial benchmark prices, which may lead to some workload that USTRANSCOM wants to retain leaving the DTS. This suggests that opportunities may exist to reduce channel passenger costs.

For channel cargo, revenue from the ARA exceeds estimated fixed costs by an average of \$200 million per year, indicating that actual variable costs are higher than commercial benchmark prices. However, organic movement costs incurred for readiness are included in these variable costs, so we can't assess how close charter costs actually are to commercial benchmarks. Additional analysis could identify whether variable costs are higher than commercial benchmarks and steps to reduce these costs.

Special Assignment Airlift Mission/Contingency and Joint Exercise Transportation Program

When customers charter an entire aircraft to move personnel, materiel, or both, this workload is allocated to the Special Assignment Airlift Mission or the Joint Exercise Transportation Program lines of business (see Figure 3 for budget information).⁵ The aircraft may be an organic aircraft owned by the Air Force or a commercial aircraft chartered by

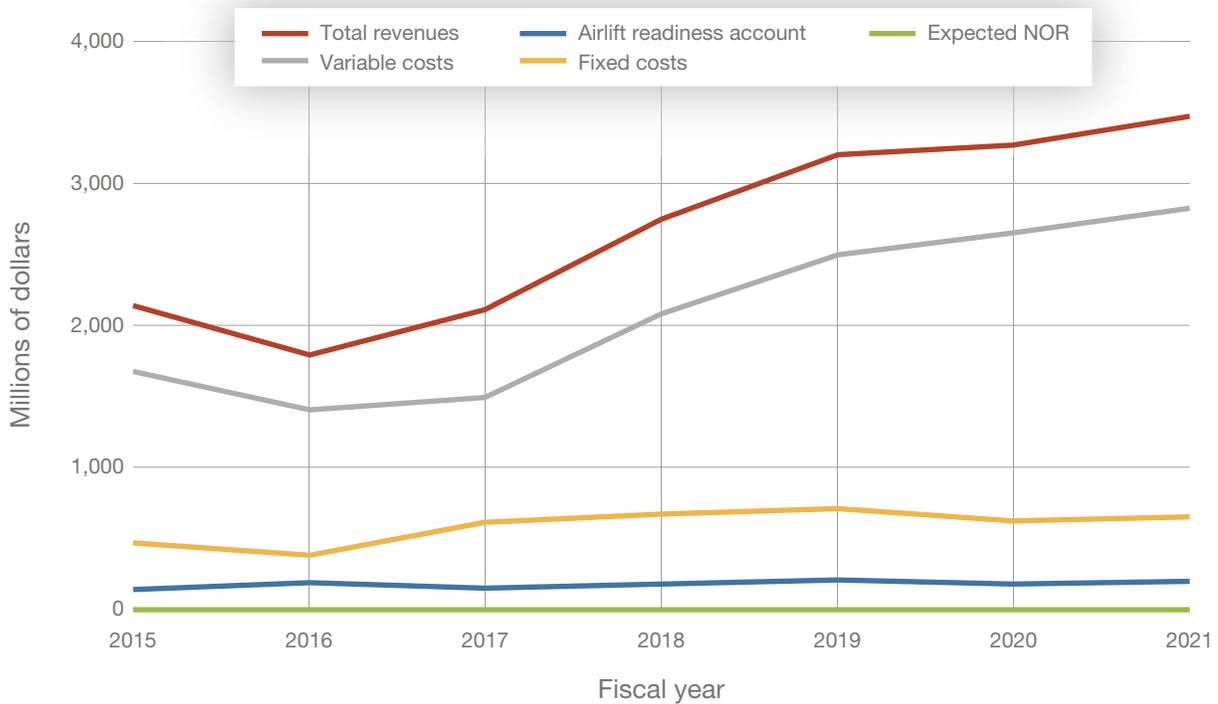
USTRANSCOM, depending on factors such as the type of cargo and the locations of the movement. Before requesting a movement, customers make choices about how much materiel or how many people to move and the schedule for the move.

When chartering an organic aircraft, customers pay a rate per flying hour that is benchmarked to recover approximately 91 percent of the costs, including flying hours required to position or deposition the aircraft. The remainder is recovered through the ARA. When a commercial aircraft is chartered, cost recovery is through a Cost Plus structure. The customer pays the actual cost of the charter plus a 10-percent fee to cover overhead costs. The customer receives a 10-percent discount on organic or commercial airlift if the service is booked at least 30 days in advance and there are no significant user changes during the 30 days prior to the original requested operating date (USTRANSCOM AMC, 2020). Contracts with commercial carriers account for about 30 percent of SAAM/Contingency variable costs and 45 percent of JETP variable costs.

Are Prices Expected to Influence Customer Decisions?

SAAM and JETP customers are typically unit move customers—they are moving an entire unit's worth of equipment and personnel for a contingency operation or for an exercise with another country or with other military services. Since exercises and rotational deployments are typically scheduled far in advance, customers likely can choose not only how much materiel they need to move, but also how much of it is moved by airlift versus sealift. Customers are expected to be somewhat price-sensitive—because they are given a budget for the exercise, and any costs that are above that budget might need to come from unit funds—but the exercises are not typically canceled if the costs are above budget. For a short-notice contingency operation, customers are moving their entire units overseas to meet a specific mission and required delivery date, and the mode of transportation is usually specified in Time-Phased Force Deployment Data. For some contingency customers, funding comes indirectly, through a regional

FIGURE 3
 Budgeted Financial Data for Special Assignment Airlift Mission



SOURCE: Analysis of AMC IF-12s.

combatant command, rather than from unit funds. Because these customers do not directly pay for the move, and because the purpose is to meet military missions, they are more concerned with the timely arrival of materiel than the cost of a movement. For pre-planned movements, the type of cargo and the destination determine whether commercial or organic aircraft will be used, but customers may have some control over the size and type of aircraft they charter, which can influence the price.

Cost data suggest that roughly half of JETP and two-thirds of SAAM/Contingency charters involve organic aircraft. It is likely that relatively few of these customers can go outside the DTS because of the sensitive or hazardous nature of materials being moved (ammunition for example). For passengers and materiel currently being moved on commercial aircraft, it does not appear to be worthwhile for customers to try to charter aircraft outside the DTS just to avoid the 10-percent markup over commercial rates that is charged under these business lines.

AMC publishes rates for SAAM and JETP organic flights and international commercial flights for each fiscal year, so they are visible in advance to customers. Rates for organic airlift are calculated based on the cost per hourly flying hour for each aircraft type, with a minimum rate of two flying hours per mission. Table 4 shows an example of these rates for FY 2021. Customers are also required to pay for flying hours required to position and deposition the aircraft from its home station. Rates for international commercial flights are based on established rates per seat-mile or per ton-mile times the aircraft's maximum standard payload, times the distance traveled (including positioning and deposing miles if required), plus any miscellaneous fees (such as landing fees, standby fees, or stop charges) and a 10 percent administrative fee. Domestic commercial flights are billed at the contract cost plus a 10 percent administrative fee (USTRANSCOM AMC, 2020).

In addition, USTRANSCOM provides a mission cost estimation tool that gives users a cost estimate

TABLE 4
Organic Airlift Mission Rates for Fiscal Year 2021

Aircraft	Special Assignment Airlift Mission/Joint Exercise Training Program/ Contingency Flying Hour Rate	Minimum Activity Rate
C-5	\$34,846	\$69,692
C-130E/H	\$8,852	\$17,704
C-130J	\$12,403	\$24,806
C-17	\$17,068	\$34,136
KC-10	\$24,250	\$48,500
KC-135	\$14,969	\$29,938
KC-46	\$19,840	\$39,680

SOURCE: USTRANSCOM ACM, 2020.

specific to their movement. However, Connor, Vas-seur and Baldwin, 2019, reported that

In the SAAM and JETP business lines, we find that customers are being given worst-case-scenario cost estimates that may discourage some customer movements that would support readiness. There is significant variation in positioning and depositioning costs on organic movements; this variation falls outside of customer control and cannot be predicted in advance. Thus, we recommend charging the average positioning and depositioning costs (which are all variable costs) as a percentage of the number of flying hours for the main mission, rather than charging actual flying hours for positioning and depositioning legs.

Can Fixed Costs Be Distinguished from Variable Costs?

Most of the variable costs associated with SAAM/Contingency and JETP should be relatively easy to distinguish. For example, the cost of a commercial charter is simply a pass-through from USTRANSCOM to the customer. For organic movements driven by the nature of workload or by readiness, organic costs per flying hour could be used to estimate variable costs. There may be some additional costs that vary with workload, such as supplies and equipment, that are more difficult to track with existing accounting systems.

Fixed costs are currently recovered through the 10-percent administrative fee on commercial char-

ters, and presumably some portion of flying hour costs charged for organic aircraft is intended to cover a share of fixed costs, because revenues from the ARA are below our estimate of fixed costs for both SAAM and JETP.

Variable costs, such as the cost of commercial charters and costs per flying hour for organic aircraft, mostly are known in advance; therefore, it should not be necessary to estimate these costs. However, actual flying hours for positioning and depositioning may not be known until after the movement, but they could be estimated based on past experiences.

Are the Benefits of Variable Cost Pricing Greater Than the Cost of Implementation?

If Variable Cost Pricing were introduced for SAAM/Contingency and JETP, the prices that customers are charged would likely fall. We estimate that ARA revenues for these two business lines are below fixed costs: Fixed costs represent 16–17 percent of total costs for these two business lines and the ARA accounts for 6–7 percent of revenues. In addition, for commercial movements, the 10-percent administrative fee would be recovered separately from prices. With lower prices, customers have the option to take more if there are net benefits to the mission. If they do this, that indicates a benefit to DoD from implementation of the different price structure.

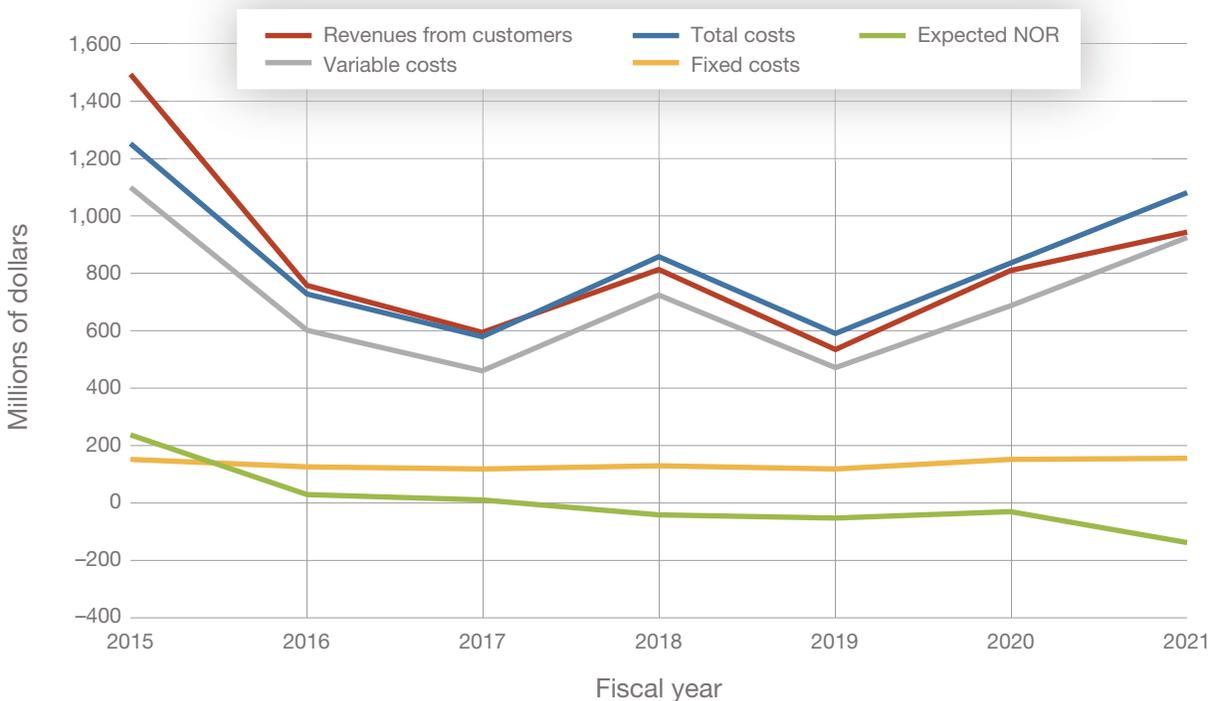
SAAM/Contingency is AMC's largest business line, with average annual revenues of \$2.67 billion

over the period from FY 2015 to FY 2021. JETP is relatively small, with average annual revenues of \$108 million over the same period. However, the two business lines provide similar services and are currently priced in similar ways, so it would make sense to use the same pricing policy for both business lines if a change is made. With combined revenues close to \$2.8 billion per year, there is a fairly broad scope for welfare gains to exceed implementation costs, but customer price sensitivity may be low. A large share of workload must utilize organic aircraft, so there is relatively little scope to go outside the DTS, and customers may have little choice regarding the mode of transportation for exercises, planned deployments, and short-notice contingencies. The primary effect may be on the amount of cargo customers choose to ship for these activities, particularly for movements that are planned further in advance.

Surface Deployment and Distribution Command Liner Operations

Liner Operations is SDDC’s largest business line; average budgeted revenues were \$850 million from FY 2015 through FY 2021 (see Figure 4 for budget information). Liner Operations maintains a Universal Services Contract with commercial shippers for less than full-shipload movements of break-bulk, dry bulk, and containerized cargo. All of its revenues are obtained from customers through (1) stabilized rates based on traffic area pairs and type of cargo, (2) actual costs plus overhead recovery (for multimodal and one-time-only shipments), or (3) reimbursement of costs associated with container demurrage or direct booking of shipments by some customers, such as the Army & Air Force Exchange Service, Defense Commissary Agency, and Defense Logistics Agency.

FIGURE 4
Budgeted Financial Data for Liner Operations



SOURCE: Analysis of SDDC IF-12s.

Are Prices Expected to Influence Customer Decisions?

Sealift is slower and cheaper than airlift; movements of less than full shiploads of cargo are generally preferred for heavier items or when delivery is less urgent or can be planned well in advance. We estimate that approximately 84 percent of the costs of Liner Operations are variable, so Variable Cost Pricing would reduce rates charged to customers by approximately 16 percent on average.⁶ This price reduction could shift some cargo from airlift to sealift, or customers may choose to ship more cargo if the marginal benefit exceeds the marginal cost.

Customers are required to use U.S.-flagged carriers for DoD cargo, so opportunities to reduce costs by going outside the DTS are likely to be limited. SDDC charges customers blended rates by traffic area pair, commodity code, and booking terms.⁷ For example, the rates for shipments from any port on the U.S. east coast to any port in Northern Europe would be the same (depending on the commodity and booking terms). Therefore, it might be possible to get a lower price outside the DTS by using lower-cost ports.

Billing rates for scheduled commercial ocean liner service for each traffic area pair, commodity code, and booking term combination are published at the beginning of each fiscal year, so customers have visibility of these prices. However, if there has been no workload on a route/billing rate for the past three years, customers are charged contract cost plus a cost recovery rate. Commercial multimodal and One-Time-Only shipments are also billed at contract cost plus a cost recovery rate. These rates are therefore less visible to customers in advance, although they can request a cost estimate from USTRANSCOM J8 (USTRANSCOM SDDC, 2020b).

Can Fixed Costs Be Distinguished from Variable Costs?

It should be relatively easy to distinguish fixed and variable costs for this business line; contract costs and direct reimbursements from customers account for 98 to 99 percent of variable costs. Additional costs for supplies and equipment, transportation, utilities, and other contracts may be partially variable, but most of

the gains from Variable Cost Pricing could be obtained by charging customers based on contract costs.

Another question to be addressed for this line of business is whether customers would continue to be charged blended rates for traffic area pairs or actual contract costs for each shipment. Charging customers actual contract costs would more closely match SDDC revenues with costs, but they might be less visible to customers in advance, as is currently the case with infrequently used routes, commercial multimodal, and One-Time-Only shipments. In part, this would depend on whether rates charged by shippers for each route are established in advance by such contracts as the Universal Services Contract, or are billed by the shipper after the shipment occurs. In the latter case, this could also cause some delays in customer bills.

Are the Benefits of Variable Cost Pricing Greater than the Cost of Implementation?

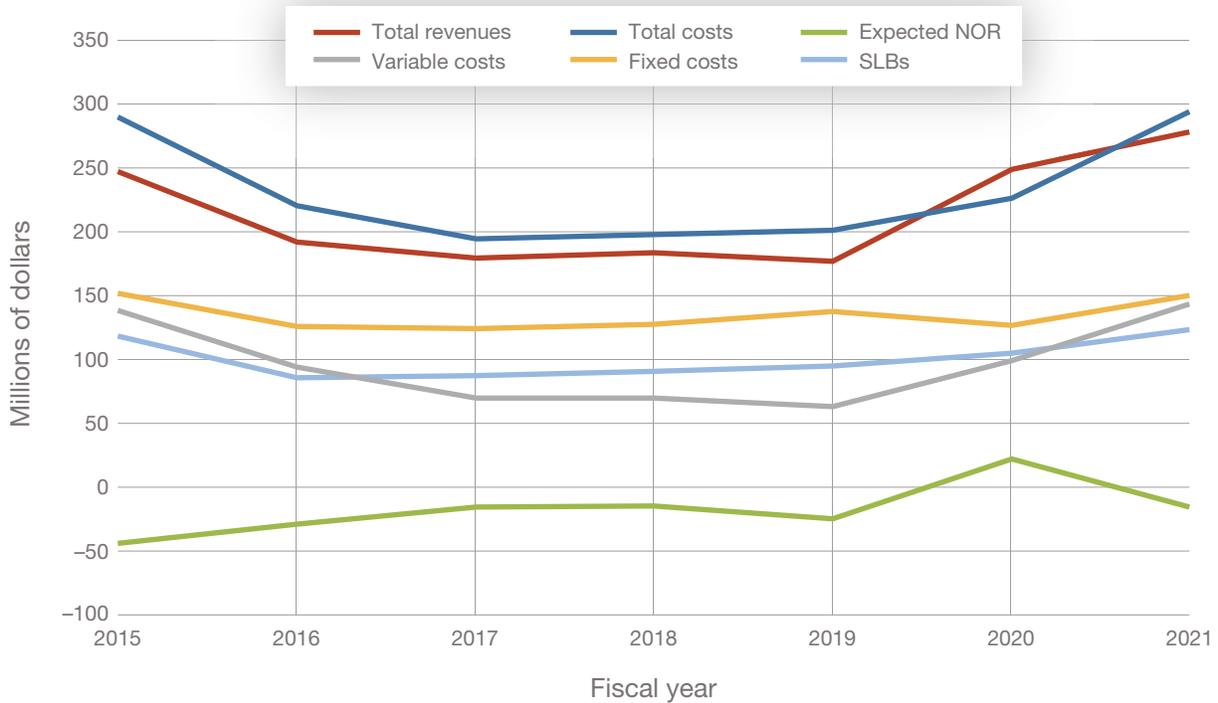
Liner operations accounted for an average of \$850 million in annual budgeted revenues from FY 2015 through FY 2021. This reduces the scope of potential benefits in comparison with the AMC business lines discussed earlier, but the costs of implementation should also be relatively low, especially if customers are simply charged contract costs and other direct reimbursables.

The primary benefits to customers are likely to be some shifting of non-time-sensitive workload from airlift to sealift in response to lower prices and some welfare gains from shipping additional cargo in cases where the benefits exceed the costs.

Port Operations

In the Port Operations business line, SDDC contracts with U.S. ports to provide local services, such as stevedoring; it also has military battalions located at certain ports to assist with loading and unloading ships. During FY 2015 through 2021, this line of business had average budgeted revenues of \$216 million (see Figure 5 for budget information). Approximately 51 percent of budgeted revenues were collected from customers, mostly based on customer rates for ste-

FIGURE 5
Budgeted Financial Data for Port Operations



SOURCE: Analysis of SDDC IF-12s.

vedoring services. The remainder of revenues were collected as port readiness SLBs to recover the costs of personnel and facilities at U.S. ports, including the ammunition ports managed by the Army at Sunny Point, North Carolina and Concord, California.

Are Prices Expected to Influence Customer Decisions?

Customers have some options in this business line that impact requirements. Customers have the option to include stevedore services in shipping contracts instead of buying them separately through the Port Operations business line, so demand could be fairly elastic in comparison with other USTRANSCOM business lines. Customers may also choose to ship more equipment and supplies if costs of stevedore services are lower under Variable Cost Pricing. Customers would still be required to use U.S.-flagged ships, even if they were not using the DTS, but they could choose U.S. ports that do not have SDDC ste-

vedore contracts if costs are lower. Additional information from SDDC would be needed to determine which ports have contracts.

Shifting workload between bundled contracts that include stevedore services and the separate purchases of stevedore services through Port Operations would keep workload within the DTS, but it would shift it across USTRANSCOM business lines (most likely SDDC Liner Operations and MSC Cargo). Furthermore, as noted earlier, customers are able to choose alternative providers within the DTS because, in some cases, they can choose whether to bundle stevedore services into shipping contracts or buy them separately.

It is unclear whether those determining movement requirements see prices to inform those decisions. If they don't today, that could be changed by providing rate and budget information to those determining requirements. Additional information from SDDC and MSC would be needed to inform what types of contract offers customers see when they book movements through SDDC Liner Operations,

MSC Cargo, and SDDC Port Operations, and how frequently they are able to choose between bundled and unbundled stevedore services.

Can Fixed Costs Be Distinguished from Variable Costs?

We estimated variable costs for each line of business using USTRANSCOM subject-matter experts' assessments of each cost category reported in IF-12 exhibits as variable, partially variable, or fixed (see Connor, Vasseur, and Baldwin, 2019). We allocated partially variable costs based on the proportions of other costs that were designated as either fully variable or fully fixed. On this basis, the costs of Direct Contracts were considered fully variable, and accounted for about 34 percent of total budgeted Port Operations costs, or an average of \$78 million per year during FY 2015 through FY 2021. Fixed costs in this business line include the costs of personnel and facilities at ports, the costs of setting up contracts, travel, depreciation, and SDDC and USTRANSCOM headquarters overhead costs; these fixed costs account for 46 percent of costs in this business line overall. Several other cost categories were considered partially variable (Supplies and Equipment; Transportation of Things; Facilities Maintenance, Utilities and Rent; Other Contracts, and Other Costs); these categories amounted to about 20 percent of total budgeted costs. Based on our allocation methodology, 40 percent of partially variable costs were considered variable (8 percent of total budgeted costs) and 60 percent fixed (12 percent of total budgeted costs). If we assume that all costs currently paid by SLBs are fixed, this implies that about 14 percent of costs currently paid by customers are fixed.

Further information would be needed to determine which costs are truly fixed and what share of fixed costs are currently paid through customer rates. Some variable costs, such as the costs of stevedore services under existing contracts, should be fairly easy to measure. However, there could be other types of variable costs that are more difficult to distinguish with existing cost accounting systems. Changes to these systems would most likely be needed to fully distinguish variable costs, allocate them to individual shipments, and bill them to customers.

Rates charged under existing stevedore contracts are likely to be known in advance, and other variable costs may be tied to cost drivers (e.g., the number of containers, the weight of the cargo) and could be estimated in advance. However, customers might not correctly estimate the volume of cargo, so actual costs might differ from estimated costs, making assessment of the true costs of movements in advance at least somewhat difficult.

Are the Benefits of Variable Cost Pricing Greater Than the Cost of Implementation?

Port Operations is a moderately sized business line. Budgeted annual revenues averaged \$216 million per year, but a little over half (51 percent) were paid by SLBs. Of the 49 percent paid through customer rates, an average of \$78 million per year were associated with direct contracts, presumably for stevedore services. There are most likely some additional variable costs associated with customer movement. Figure 5 shows the revenue and cost data for Port Operations from FY 2015 to FY 2021.

To understand how customer movement decisions would be affected, we would need more information about the total amount spent on stevedore services across business lines, including Port Operations, SDDC Liner Operations, and MSC Cargo shipments, and the relative prices paid across business lines. We would also need an estimate of customer price elasticity. If the variable costs of using Port Operations stevedore contracts are lower than what shippers charge in bundled contracts, this would result in a net savings to DoD. In addition, shippers could lower rates to stay competitive, which would also benefit DoD. If customers choose to ship more equipment and supplies (in total across all three business lines), this implies that Variable Cost Pricing generates welfare gains—i.e., the benefits of sending additional items exceed the costs.

Since there are most likely some variable costs in addition to the rates charged under stevedore contracts, prices set equal to these rates would probably be too low. In that case, more workload might migrate to Port Operations from other business lines

(i.e., from bundled contracts through SDDC Liner Operations or MSC Cargo to unbundled stevedore services through Port Operations) than would be economically efficient.

To estimate implementation costs, we would need more information about the cost of changes to USTRANSCOM and SDDC accounting systems and billing processes that would be needed to separate fixed and variable costs and charge them to customers. Additional changes might be needed to USTRANSCOM, SDDC, and/or MSC booking systems to make the price differences visible to customers. The Transportation Management System may have this capability once it is fielded; according to USTRANSCOM personnel, it will provide information to customers about the costs of different transportation options that meet their requirements.

Additional costs could be associated with the effects of delayed billing if actual variable costs are not known until after the shipment occurs (unless it is already the case that customers are not billed until after USTRANSCOM receives a bill from the service provider). In addition, costs could be associated with shifting some fixed costs from customer rates to SLBs.

Military Sealift Command Army and Air Force Prepositioned Ships

These business lines fund the costs of operating ships loaded with prepositioned stocks for potential use during surge operations by the Army or Air Force, respectively. Costs are presently recovered using a daily rate (see Figure 6 for budget information for Army prepositioning and Figure 7 for budget information for Air Force prepositioning). This rate is calculated based on the costs of operating and maintaining the ships (as each ship is underway 365 days a year, this is simply total yearly costs divided by 365); an additional percentage goes to MSC as an administrative fee. According to cost data, Army stocks are placed on a mix of commercial and organic ships and Air Force stocks are placed on commercial ships. Both of these business lines are integral to readiness; prepositioned stock levels, types, and locations are driven by operational plans.

Are Prices Expected to Influence Customer Decisions?

The amount of material stored as prepositioned stock is based on mobilization plans. The authors of these plans could take the cost of storage into account; however, these plans do not change frequently. Some of this material cannot go on commercial transport, but much of the material stored as prepositioned stock is currently maintained on commercial vessels and would not need to be managed through the DTS. Most problematic for this business line is that within the services, the entities who set the requirements for prepositioned stock are not the same as those that receive the bills for such stock. As a result of this disconnect, it is unlikely that a change in the prices for prepositioned ships would cause customers to make changes to the levels of prepositioned stocks.

Can Fixed Costs Be Distinguished from Variable Costs?

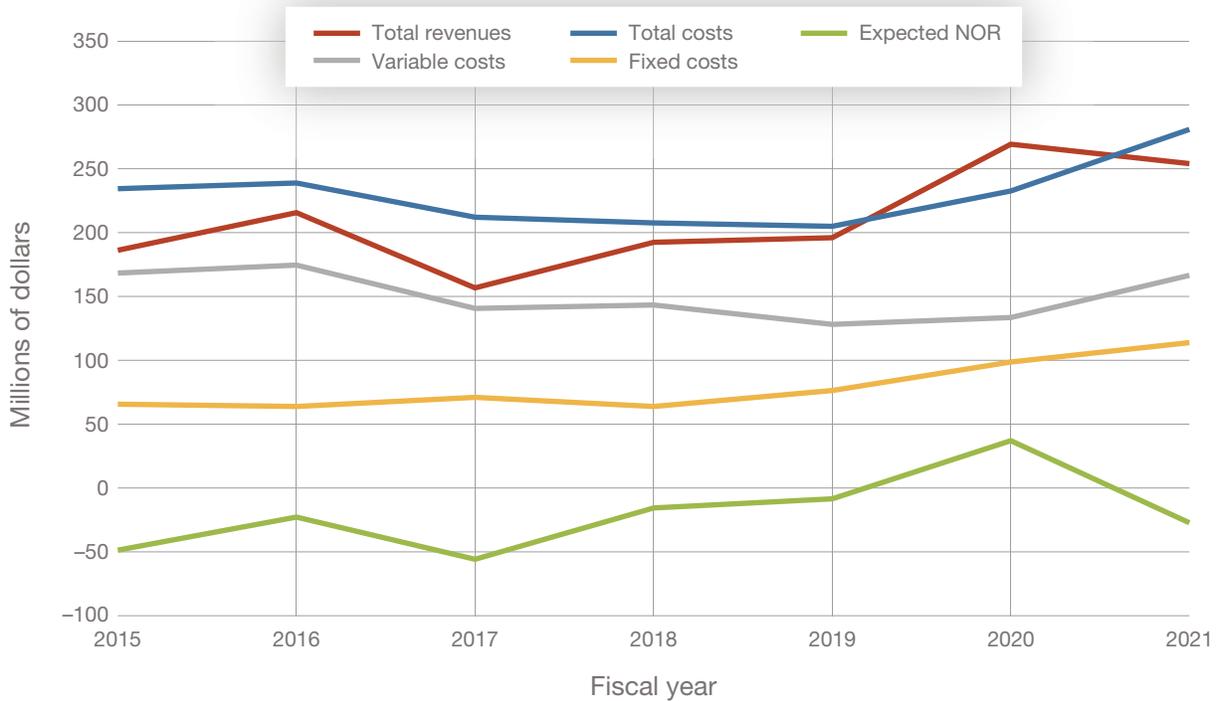
Variable costs in these business lines are primarily the costs of the commercial ships storing the stock. These costs should be identifiable before any other costs are allocated. For any cargo that must be stored on organic vessels, variable costs could be more difficult to determine. The fixed costs of these business lines are captured in the additional surcharge MSC places on top of the commercial contracts. These costs should also be identifiable before any movements are executed.

Are the Benefits of Variable Cost Pricing Greater than the Cost of Implementation?

These business lines are relatively modest, with Army Prepositioning averaging \$210 million per year, and the Air Force at \$29 million per year. Figures 6 and 7 show the distribution of revenues and costs for these business lines from FY 2015 to FY 2021.

The percentage of customer movement decisions that might be influenced by prices is unclear. These activities, as discussed earlier, are directly tied to readiness concerns. In these cases, workload is somewhat predictable—the services cannot dramatically

FIGURE 6
Budgeted Financial Data for Army Prepositioning



SOURCE: Analysis of MSC IF-12s.

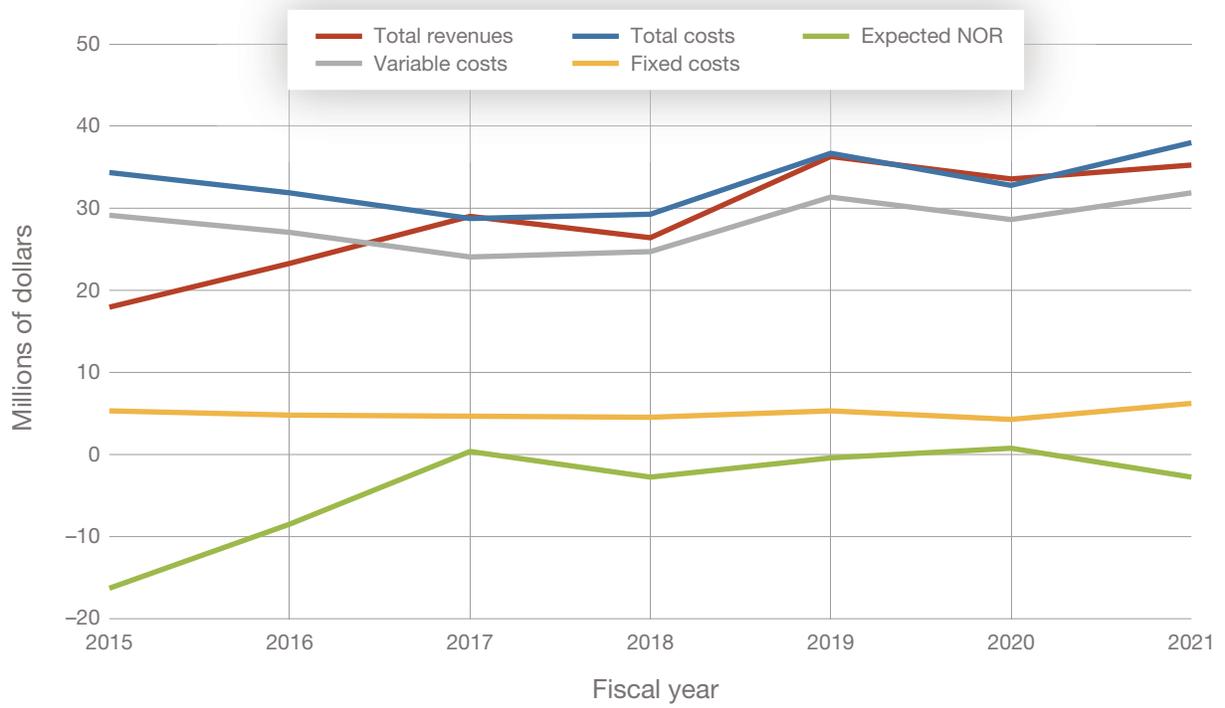
change the number of ships used for prepositioned stocks from year to year, but customer demand remains a concern because it affects costs. Understanding the price sensitivities of the services regarding these prepositioned stocks would be required to understand the impact of Variable Cost Pricing on these business lines.

Conclusions

More-detailed analysis of each of USTRANSCOM's business lines is needed to determine whether the

benefits of implementing Variable Cost Pricing are likely to outweigh the costs. This type of cost-benefit analysis would include estimations of the elasticity of customer demand for different types of customers and movements to understand the price sensitivity of TWCF customers. It also would include a deeper examination of USTRANSCOM business processes, information technology systems, and personnel requirements to understand implementation costs. This report has provided a preliminary assessment of the issues involved and outlined remaining questions that should be addressed by further analysis.

FIGURE 7
 Budgeted Financial Data for Air Force Prepositioning



SOURCE: Analysis of MSC IF-12s.

Notes

¹ For most purposes, Variable Cost Pricing is equivalent to the marginal cost approach discussed in the business and economics literature. Marginal costs are the costs imposed by customer decisions to use the DTS for their movements. In the sections that follow, we note where variable costs may differ from marginal costs.

² Note that implementation costs could be lower if implementation was included as part of other planned information technology system upgrades.

³ Further detail on these and other TWCF business lines is available in Vasseur et al., 2021.

⁴ Because USTRANSCOM charters whole aircraft for channel service, the marginal cost for any particular package or personnel movement is essentially zero up to the capacity of the aircraft. For commercial aircraft, USTRANSCOM could simply use commercial market package rates for prices and recover any charter costs that may not be covered through prices separately. For organic aircraft, variable costs can be allocated to individual shipments or passenger travel according to the capacity of the aircraft—e.g., if the aircraft can hold 1,000 standard-sized packages, the variable cost could be approximated as the variable cost of the flight(s) divided by 1,000. It also could be calculated based on average

utilization of the aircraft—e.g., the aircraft might hold 1,000 packages but typically only hold 500 packages on a leg.

⁵ These business lines use the same aircraft for generally the same services but differ based on customer and purpose. SAAMs serve a variety of customers and are frequently used for contingency operations; the JETP business line exists solely to execute Joint Staff–organized training exercises.

⁶ However, the extent of the price reduction associated with Variable Cost Pricing is likely to vary by the type of service. For example, SDDC’s FY 2021 liner rates and guidance indicate that shipments without a stabilized billing rate and One-Time-Only shipments will be billed at contract cost plus 4 percent, and Commercial Multimodal shipments will be billed at contract cost plus 1 percent (USTRANSCOM SDDC, 2020a). Direct booking customers are charged a cost recovery rate of 12 percent, except for the Defense Commissary Agency, which is charged 7 percent (USTRANSCOM SDDC, 2020a).

⁷ Breakbulk cargo, including vehicles and helicopters, is charged by measurement ton; containerized cargo is charged per container. Booking terms determine whether port handling and linehaul at the origin and/or destination are included in the price or must be booked separately by the customer (USTRANSCOM SDDC, 2020b).

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About This Report

This report was produced as part of a project conducted to meet the requirement of Section 1716 of the National Defense Authorization Act for Fiscal Year 2020 to perform an independent review of the Transportation Working Capital Fund (TWCF). This review is documented in Vasseur et al., 2021, and included an assessment of the financial viability of the TWCF as it is currently structured and recommendations to restructure the fund to make it more effective and efficient, including potential alternative funding mechanisms for some cost components. This report provides a preliminary analysis of the issues involved in implementing a Variable Cost Pricing model for several U.S. Transportation Command business lines, as recommended by the earlier report.

The research reported here was completed in July 2020 and underwent security review with the sponsor and the Defense Office of Prepublication and Security Review before public release.

RAND National Security Research Division

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