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Estimating the Costs and Benefits of an Accelerated Sales Tax Remittance System for Massachusetts

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Executive Summary

The current sales tax collection system in the Commonwealth of Massachusetts is underperforming. Both nationwide and locally, sales tax collection systems rely on elevated levels of voluntary compliance. These systems fail to maximize collection on a sales tax base that is 1) growing slowly —if not shrinking— under duress from online sales (Dadayan, 2018) and 2) predisposed to fraud, particularly in a high-tech environment where enforcement is one step behind tax evasion technology.

Current pencil and paper systems are antiquated and costly to administer. They impose staggering and unnecessary burdens on businesses. Consumers have greatly benefited from the speed, efficiency and convenience of payment instruments even as they continue to use cash. It is time to apply those efficiencies to the back end of the tax collection process.

Accelerated Sales Tax Remittance (ASTR) systems now under development are one of the ways to improve the Commonwealth's tax collection system. Working with current payment processing infrastructure, ASTR enables real-time sales tax collection for transactions using credit or debit cards.

In place, an ASTR system will:

- capture approximately $770 million in "new" revenue;
- result in a significant increase in compliance;
- provide the necessary third-party oversight to ensure compliance;
- relieve small business of paperwork;

- transfer approximately $7.3 million in gains generated by the "float" to the Commonwealth where it belongs; and

- broaden the tax base without raising taxes.

Table ES1: Incremental Annual Increase in Massachusetts Sales Tax Revenue Under ASTR ($Millions)	
Benefit Item	**Amount of Benefit**
Sales tax revenue collected (Regular, Meals and Autos)	$6,600
Sales tax revenue from debit, credit, prepaid and gift cards (Auto Sales Excluded)	$4,617
Incremental sales tax revenue from improved compliance	$763
Incremental revenue from increased float	$7.30
ASTR One Full Year Incremental Revenue for MA	**$770.3**
Sources: Senate Ways and Means FY19 Fiscal Note, Performance Economics	

These estimates, based on a Monte Carlo set of simulations, are reliable and based on the best available estimates of fraud by noted public finance economists.

This initiative brings innovation to an antiquated sales tax collection process using technology, infrastructure, processes. and workflows that are already in existence and being used today by the payment processing industry. The ASTR proposed for Massachusetts does not require major hardware upgrades, a claim made by its critics based on incomplete information.

Notwithstanding opposition from retailers, banks and financial intermediaries, ASTR holds great promise for improving sales tax collection.

Introduction

Effective tax collection is a key component of sound tax policy. State sales taxes are a reliable source of revenue. Sales taxes place virtually no compliance burdens on individual taxpayers, but places burdens on the vendors who collect them. On most purchases, consumers pay the tax at point-of-sale. The vendor, without compensation for his or her effort, is then responsible for remitting the sales tax to the Commonwealth in a timely fashion.

Of the many virtues of the sales tax, one is its transparency (Brunori, 2016). Sales taxes are itemized clearly so consumers can tie public services received with the amount of taxes paid. Another advantage, sales taxes are preferable to income taxes since they encourage savings. Thus, they do not affect business decisions (Mikesell, 1998; Brunori, 2016). State sales taxes are easy to administer. With liability falling upon the vendor, the state can enforce laws and levy penalties to enable compliance. Because of explicit policy choices, states must ensure that sales tax revenues are sustainable. In Massachusetts, portions of the sales tax are earmarked for school building construction and public transportation.

However, the sales tax faces many challenges. The current remittance system is not optimized to benefit the Commonwealth. Since vendors can hold the Commonwealth's tax money for up to periods of 50 days, vendors are able to reap "the float," the interest that accrues during that period. This raises an important public policy question: Should vendors reap the interest on the float? Or does that money belong to the Commonwealth from the point-of-sale? To benefit all taxpayers, the Commonwealth should not be leaving any money on the table. Few would dispute

the fact that the state already receives immediate payment when third-party payroll firms withhold state income taxes. Sales taxes should be no different.

While the stream of sales tax revenue as a percentage of all tax income is stable and reliable, state sales collection systems are not modernized to minimize the amount of taxes that go uncollected due to fraud or bankruptcies. Illicit technologies which enable vendors to disguise sales amounts, cost the Commonwealth millions in uncollected taxes (Ainsworth, 2016).

Current technology centered around software adjustments raises the prospect that taxes can be collected daily at the point-of-sale. This would increase efficiency and improve the state's cash flow.   The re-direction of payment processes to the state treasury can be accomplished by patented technology that splits funds.

As part of the Fiscal Year 2018 budget, Governor Charles Baker called for the establishment of an "Accelerated Sales Tax Remittance" system. The Department of Revenue completed a public review process in the fall of 2017, gathering comments from all stakeholders including retailers, payment processors, and trade groups. The DOR is further studying the prospects with the expectation that a system requiring daily remittances will be in place by 2021.

The rise of the digital revolution has enabled payments methods to leapfrog into new domains after decades of limited options.   This development has been welfare-improving for consumers, vendors and financial firms. A Federal Reserve Bank of Boston study found that the number of online purchases increased significantly between 2015 and 2017 (Greene and Stavins, 2018) with the use of mobile technologies

growing. One third of all consumers made mobile payment in 2017 compared with one-fourth in 2015 (Greene and Stavis, 2018). It may be apparent that consumers as taxpayers prefer a daily collection system where taxes flow immediately from the point of sale. Although no current ASTR system exists in any state, expectations about technology point in this direction. "There is no technical reason why sales taxes cannot be transferred directly to the tax agency at the close of the transaction. When electronic commerce is ubiquitous, the logic (and the dollars) of real time sales tax payment will become reality" (Murry & Fox, 1997). That time has long since arrived.

However, state and local governments have not fully capitalized on the technological advances. Using new technology, states will soon be able to test systems which would allow vendors to remit the sales taxes they collect daily. The Massachusetts Department of Revenue did not "identify any long-term logical or technological barriers to implementing ASTR." The DOR also stated "ASTR should be regarded as an achievable modernization goal using current technology". The DOR only questioned the feasibility of meeting a June 2018 deadline, which has since passed. It maintains, however, that a system could be in place in three years.

This paper seeks to identify the benefits and costs of an ASTR for the Commonwealth of Massachusetts. In Section 1, the authors will review the ASTR design and stakeholder opposition to the proposal. Section 2 will critique estimates from a prominent study (Mackey, 2017) on the costs associated with an ASTR. Section 3 will compare and contrast the ASTR with the current system, focusing on leakage and tax evasion. Section 4 will present a working model that identifies more realistic costs and benefits of ASTR.

Section I: Accelerated Sales Tax Remittance: Background

In 2017, Governor Charles Baker introduced a provision in H3800 subsequently approved by the House and Senate that calls for the establishment of an "Accelerated Sales Tax Remittance" system. Section 94 directed the Department of Revenue Commissioner to establish regulations that "any third-party payment processor, upon receiving a request for payment from a vendor or operator, shall directly pay the identified tax portion of such request …at substantially the same time that any non-tax balance is paid to the vendor or operator. Section 95 established a deadline of June 2018. The DOR reported that the plan would cost $4 million and require 20 FTEs to develop.

The Governor proposed ASTR as an effective way to modernize sales tax collection. Supporters maintain ASTR will reduce sales tax leakage and fraud with no hardware changes (Bloomberg, March 2018).

The proposal has met opposition from some retailers, payment processors, telecommunications providers and other firms who voiced their issues during a public input process. The opposition estimated that the ASTR change would cost Massachusetts industry more than $1 billion.

Nonetheless, the DOR concluded that the ASTR "should be regarded as an achievable modernization goal using current technology."

Section II: Critique of STRI Study

A recent study from the State Tax Research Institute is among the most prominent critiques of the ASTR concept (Mackey, 2017). The study asserts that a daily sales tax

collection system would cost $1.2 billion on a non-recurring basis and an additional $28 million in annual recurring costs, both estimates posing a "significant financial burden on businesses operating in Massachusetts." The costs would be spread across the state's retail, telecommunications providers and payment processors.

Table 1. State Tax Research Institute Cost Estimates			
Percent of Sector Accepting Credit Cards	95%	100%	100%
Impacted Businesses	66,271	1,565	164
Average Cost Per Sector (non-recurring)			
20% Hardware	$1,000	$35,000	$2,000,000
80% Software	$400		
Total Estimated cost (non-recurring)	$35,500,799	$54,775,000	$328,000,000
Average Cost Per Sector (recurring)		$3,500	$100,000
Total Estimated Cost (recurring)		$5,477,500	$16,400,000
Total Costs (non-recurring)	**$418,275,799**		
Total Costs (recurring)	**$21,877,500**		

Source: Author's Calculations based on STRI survey data and interviews. Published in Appendix A, STRI, "Daily Sales Tax Collection System Could Cost Massachusetts Businesses $1.2 billion." (September 2017).

The STRI analysis suffers from several flaws including faulty assumptions and a general failure to understand technical aspects of the ASTR system. These include mis-readings of any ASTR project specifications and an unscientific survey of 20 vendors. The STRI study also fails to acknowledge the ASTR's potential to reduce fraud.

The cost estimates in Table 1 are based on invalid assumptions— chiefly the expectation that extensive hardware and software upgrades are required. Purported recurring costs are assumed to take the form of increased tasks such as record-keeping for retailers. An ASTR system explained in this paper would actually reduce the costs of existing retailer tasks. The $700M processor cost estimate is based on a technology

system that is not required and is not based on existing processor split funding platform functionality.

The study also lacks transparency. It does not disclose the survey instrument used or the questions posed to business leaders. The survey results did not include any responses from medium-sized retailers relying instead on "big box" stores, financial institutions and processors. The author claims by his estimation there are over 70,000 retailers operating in Massachusetts. A survey with a sample size of 20 for a population of 70,000 retailers in Massachusetts cannot be expected to produce robust results. Not only is the sample size suspect, but the survey instrument itself was full of questions unrelated to any proposed ASTR system.

"The cost estimates from these companies are based on experiences with other major systems integration projects involving both in-house and outsourced programming expertise." (Mackey, 2017). Proponents of the ASTR insist implementation does not have any relationship to a major systems integration project. A comparison with the costs associated with the recent migration to the EMV "chip reader" by payment processors cannot apply to an ASTR system. That is because the ASTR model does not begin until the settlement process begins. No software or hardware changes are required at the front end of the transaction process. An ASTR does not require new hardware at the point of sale. To indicate otherwise is to mislead.

"[Larger payment processor] estimates ranged between $2.6 million on the low end to many multiples of that amount on the high end." (Mackey, 2017). The enormous variance and standard deviation of the very small number of responses further substantiates the unscientific and inaccurate nature of this survey. At its core, the STRI study lacks a

basic understanding of the proposed system thereby basing its analysis on wholesale infrastructure changes from point-of-sale to back office.

Overall, the STRI study has not convinced the DOR that an ASTR would increase costs. "The costs to DOR of developing and implementing ASTR should be relatively small in comparison to the revenue benefit to the state, both in year one and in subsequent periods." Moreover, the STRI study does not address the problem of uncollected taxes. An ASTR potentially could improve collection and prevent fraud. The recapturing of these uncollected taxes would indeed be "new revenue."

Empirical analysis has identified actual noncompliance rates for sales tax may be as high as 28 percent. The current system suffers from both tax delinquencies of 4 to 5 percent in Connecticut to an indeterminate amount in Indiana where officials are unable to estimate lost revenue.

Tax evaders are one step ahead of tax revenue collectors. Tax losses from Zappers (essentially sales suppression software) and related frauds in the Massachusetts restaurant industry alone could exceed $600 million (Morelli, 2017). Focusing on the restaurant industry and its contribution to state Gross Domestic Product and using data from Quebec as a benchmark, Ainsworth estimates that the use of Zappers are prevalent. (Ainsworth, 2009).

Authorities have filed charges against restaurant owners in the states of Washington and Illinois. In August 2017, the Attorney General of the state of Washington obtained a guilty plea from a restaurant owner who stole nearly $400,000 in sales tax receipts (Office of the Attorney General, State of Washington). In August 2018, the U.S. Attorney for the

Northern District of Illinois said the owners of five restaurants used Zappers to avoid paying taxes over a period of six years. (Bologna, 2018).

Compared to the income tax, the sales tax inherently suffers from compliance problems. Third party verification is critical to a viable tax collection system (Christian, 2013). The installation of ASTR process may diminish the incentive to cheat.

Applying the agency theory to sales tax collection, Christian (2013) identified the structural weaknesses of state sales tax collections. Agency theory holds that the interests of the principal (in this case the Commonwealth) should always align with the agent (the vendor). Beset by two problems — adverse selection (the Commonwealth cannot choose its agents or vendors or ensure their trustworthiness) and moral hazard (where the agent shirks his responsibility to meet the goals of the principal) — the current system is flawed. Adverse selection can be solved if the principal can obtain needed information usually at a price. Moral hazard can be resolved by outcome-based contracts that meet goals. In the current setting, that means providing incentives not to cheat. Solving these issues are problematic and costly since they require vigilant monitoring. As Christian (2013) explains:

> …agency theory presumes that the principal is risk neutral and the agent is risk averse, a dynamic that does not exist in the sales tax principal-agent relationship. The risk presumptions of agency theory assume the incentives to the agent under the contract take into account the fact that the risk of failure is borne by the principal, whose portfolio is sufficiently diversified to absorb the risk of failure. In the sales tax collection contract, *the agent has no incentive at all, other than possibly*

the incentive to steal as much tax money as possible.
[Emphasis added]

Obtaining a level playing field would require high costs. Christian maintains that monitoring would be "cost prohibitive" since state governments rely on audit paradigms rather than contracts that enforce compliance. Christian adds:

> Indeed, an agency theory analysis of the state's position in the sales tax collection principal-agent relationship provides ample reasons why compliance is significantly lower with respect to retail consumption taxes versus income taxes, where third-party verification removes the opportunity to evade with respect to a large portion of taxable income. Agency theory informs the principal in the design of contracts that control adverse selection and moral hazard, but in the instant case, it is impossible for the principal to follow that guidance. Agency theory provides the warning that in the sales tax collection process, the state must find alternative means to monitor and enforce compliance because standard methods of controlling adverse selection and moral hazard will be of little use. (Christian 2013).

Summarily, Christian offers a pessimistic take: "In an environment where there are no third-party controls to help enforce remittance of sales taxes collected, government cannot reasonably assume that sales tax theft will not occur regularly. (Christian, 2013).

Determining whether ASTR can reduce tax fraud more effectively than standard models requires further research. But the ASTR methods do address some of the agency problems by mandating reporting and positing credit card record transactions as a form of third-party verification. Current critiques of ASTR, based on the

assumption of no new revenue, fail to address the issue of fraud. Eliminating or reducing fraud is a strong form of expanding the tax base to identify new revenue.

Section III: How the ASTR Works

To properly understand how an ASTR system would work requires a brief overview of how the Commonwealth presently collects sales taxes. According to the Department of Revenue the Commonwealth operates on a "trustee tax" approach where 'the tax is borne in economic terms by the purchaser but collected and remitted by the vendor." (DOR, 2017) Most sales taxes are collected at the point-of-sale (automobile sales taxes are paid when the vehicle is registered at the Registry of Motor Vehicles.) Consumers pay the tax and vendors collect it at which point the consumer has fulfilled his or her responsibility to the Commonwealth. The vendor is required then to hold the tax and then remit it to the Commonwealth on the twentieth day of the following month.

Most vendors are required to file and remit monthly, but provisions are made for small businesses which can file quarterly or annually. Meals tax remittances are treated differently; they are required monthly. While other states provide a stipend for compliance, Massachusetts does not compensate vendors for collecting the tax. Sales tax dollars paid by the consumer may not reach the Department of Revenue for 50 days.

Consumers are increasingly using credit and debit cards as well as mobile payments for transactions. The settlement process is easy to follow as each step of a credit or debit card transaction is recorded:

- A customer makes a credit/debit card purchase;
- The vendor accepts credit/debit card purchase as payment;

- The payment processor sends the transaction to a credit brand (Visa, MasterCard);
- The issuer of the credit card, i.e. a bank, pays the credit card brand;
- The card brand bills the customer; and
- The issuer receives payment.

A "paper trail" of all the above actions is recorded throughout the process. As the customer receives his bill, the credit card brand pays the processor who pays the vendor the sale amount, less the processing fee. As a "trustee of the tax", the vendor remits the tax to the state which receives the payment. Under the current system, the point at which the vendor submits to the state *is the only part of the process that is a voluntary and manual declaration*.

An ASTR process "hardens" the last two steps since the processor will pay the sales tax directly in real time to the state revenue department at the same time the vendor receives payment for the goods or service. By removing vendor discretion on when to pay the bill, the ASTR process resolves any of the agency problems defined above.

This is made possible because an ASTR can leverage existing payment systems, technology, and infrastructure to enable states to collect sales taxes through daily credit and debit sales tax transactions. A reliable "bifurcation" system should be able to accomplish the following:

- Capture and transmit sales tax data;
- Split sales revenue to different destinations; and
- Remit funds to the government directly.

The ASTR systems proposed do not alter the current card transaction process at the front end, which commences with the consumer. The credit card process can be broken down to three key stages: authorization, authentication and lastly, clearing and settlement. (Papadimitriou, 2009).

During the first stage, the consumer presents a credit or debit card for payment at the point of sale. After the consumer swipes his or her card, the cardholder's information is sent to the acquiring bank. The bank forwards the details to the credit card network (i.e. MasterCard, Visa or Discover). The credit card network clears the payment and makes a request authorization from the issuing bank. No hardware or software changes are required by the ASTR.

During the second stage, the issuing bank conducts a security check. Then the issuing bank validates the credit card number, checks the cardholder's balance for available funds and approves (or rejects) the transaction. If approved, a response goes back through the system, to the credit card company and the acquiring bank. The merchant receives an authorization while the bank places a hold on the amount of funds needed to pay for the purchase. Once secure in the knowledge that there are funds available to cover the purchase, the merchant or the vendor will hand the customer a receipt. Again, up to this point, the ASTR plays no role in the workflow of this process.

The ASTR is introduced only in the settlement process long after the consumer has presented his or her card. Here the vendor's remaining role is to submit a batch file of its transactions to the processor on a daily basis, as is current practice. This batch file is then sent by the processor to the credit card network for settlement. The processor

uses a "separator" to identify the sales tax collection amount. If sales tax data is in the settlement file, the ASTR business logic remits the sales tax amount via "split funding" capability to the state's revenue department. As this takes place, the conventional processes continue as credit card networks pay banks which credit the merchant account and issues a statement to the cardholder/consumer. The "bifurcation" allows the process to split the funds, much in the manner a processor retains fees for services provided to the merchant. The diagrams below show the payment process flow and at which stage ASTR will be implemented.

Figure 1. Payment Process Flow and ASTR Implementation

A. Authorization Stage

Cardholder → Merchant → Acquirer → Credit Card Network (Visa, MC) → Issuing Bank

B. Authentication Stage

Issuing Bank → Credit Card Network (Visa, MC) → Acquirer → Merchant → Cardholder
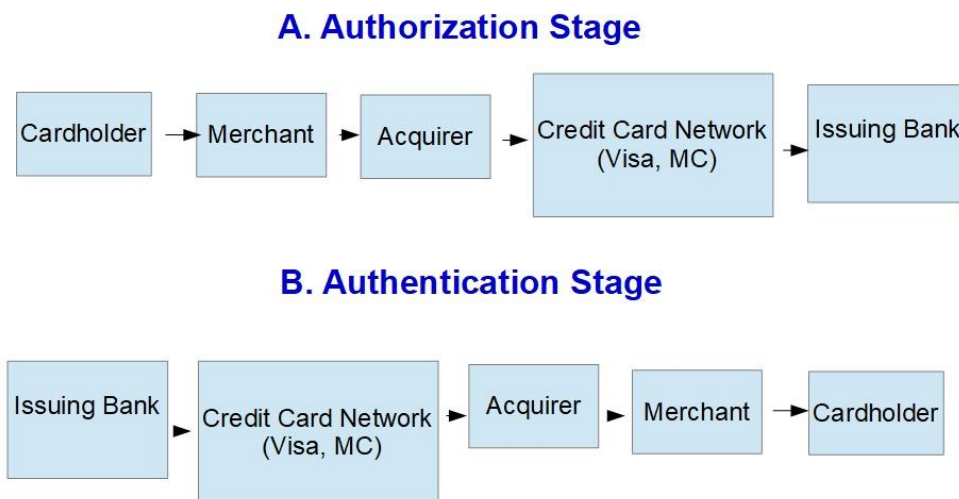
No development required as ASTR does not attempt to obtain the sales tax amount at Point of Sale during these two stages.

Source: Papadimitriou, WalletHub, 2009

C. Clearing and Settlement Stage

State department of revenue

6. Acquirer credits merchant less the sales tax withholding percentage required by state

8. Issuing Bank sends posts to cardholders credit card statement; cardholder pays bill

7. Sales tax withholding percentage required by state sent to state treasury

5. CCN pays acquirer its percentage

4. Bank transfers funds to acquirer (less interchange fee)
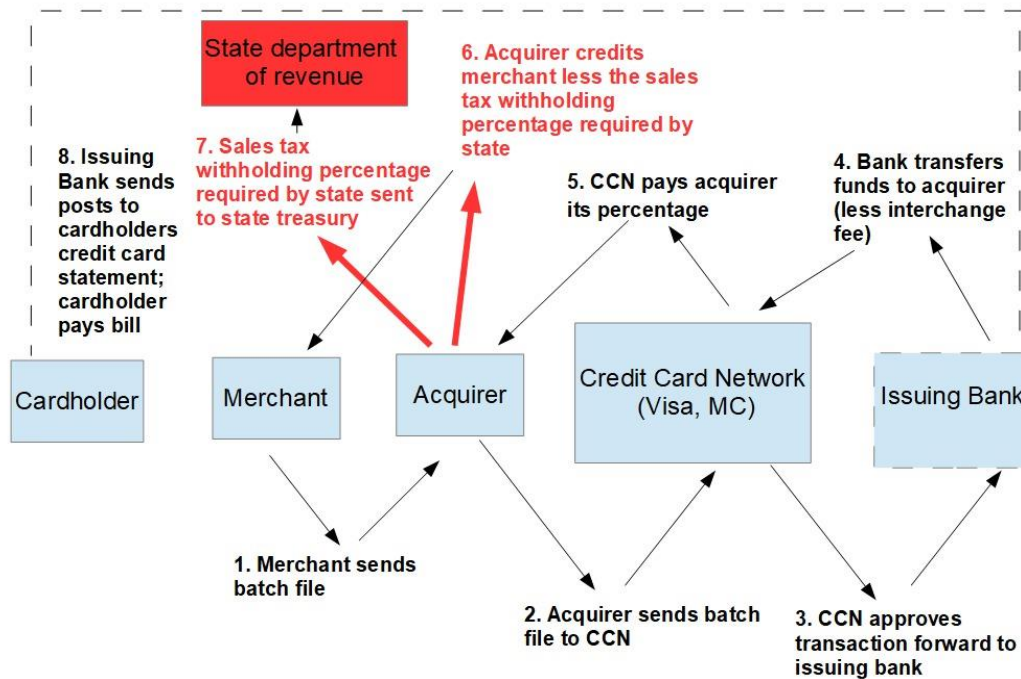
Cardholder

Merchant

Acquirer

Credit Card Network (Visa, MC)

Issuing Bank

1. Merchant sends batch file

2. Acquirer sends batch file to CCN

3. CCN approves transaction forward to issuing bank

ASTR will be implemented at the end of the settlement stage in steps 6 and 7 in the above diagram. There is little doubt that current credit card processing technology and industry standards exist today that can be adapted to the process described above. One firm Vantiv, in a 2015 filing with the MBTA, asserted that it could include sales tax data in a settlement file (Vantiv, STAC 2017). Many payment process companies can currently split transactions (or "split funding") into two separate accounts. An executive for First Data Corporation, a well-known credit card processor, testified before the Connecticut state legislature about the prospects and her company's support for split funding. Noting that First Data had already devised a system whereby funds are directed to separate accounts for merchants, the executive suggested that a system like ASTR could be put in place without jeopardizing privacy or accuracy and without requiring hardware changes. Those changes and the benefits would not be exclusive

to First Data but applicable to the industry (McCreeven, DOR, Accelerates Sales Tax Feasibility, 2017,197-198). Lastly, the IRS already requires that payment settlement entities identify and split off tax obligations (DOR Input, 217-219).

The implementation of the Governor's Sales Tax Modernization initiative would simply mandate that the technology that is being used to put revenue in the credit card processor's pocket also be used to ensure that Massachusetts taxpayers are also seeing the benefits from this existing technology.

While testimony from industry stakeholders — retailers, banks, payment processors and credit card issuers — skews negative on ASTR proposals, several executives confirm the DOR analysis that no long-term barriers exist. JetPay, a national processor, made clear that even though bifurcation of the sales tax to the states is not currently in place, current technologies exist to expedite the idea (Davidson, JetPay in DOR, 2017).

Section IV: Calculating the Benefits and Costs of ASTR Adoption

The reduction of fraud in the collection of state sales tax from Massachusetts retailers is the largest benefit of ASTR adoption. With minor adjustments, payment processors are enabled to "split" every taxable point of sale purchase using a debit or credit card into multiple revenue streams, including a specific stream that would remit sales tax revenue directly to a state account. This process is called "bifurcation." This is not a major overhaul. Payment processors currently collect their fees from vendors for the right to use the payment processors system this way.

ASTR will help control two areas where the state is not maximizing tax revenue: underreporting and bankruptcies or business deaths. In first instance, retailers collect the sales tax, but underreport the amount required by law for remittance. This is fraud. The retailer intends to keep the sales tax revenue for themselves. The second instance is retailer delinquency. An example of this may be a vendor that closes their business ignoring all remittance requirements and keeping the sales tax revenue for themselves. Both of these instances would be alleviated with the adoption of ASTR.

Another added benefit, although smaller than the fraud reduction benefit, is the ability for the state to earn interest on the float of sales tax revenue. Currently, retailers collect sales tax revenue during a given month, but are not required to remit until the 20th day of the following month. For example, a retailer that collects sales tax revenue on the 1st of August can deposit that money in a bank account and earn interest on it until the 20th of the following month at which point the remittance is due. Under ASTR, this float interest would accrue to the Massachusetts Department of Revenue.

Estimates of the uncollected tax revenue and the potential reversal of the float to the Commonwealth cannot be determined by standard calculations yielding a particular data point. Variables such as the amount of tax fraud in Massachusetts, the percentage of all purchases still conducted in cash transactions and future interest rates are difficult to quantify and predict. The best approach is to apply a Monte Carlo model.

A Monte Carlo model is used here to estimate a value of an outcome when there is uncertainty around the variables that affect that outcome. The advantage of a Monte Carlo model is that it allows for the use of a distribution to estimate these variables. Using a distribution for these variables instead of a single point estimate, produces a

distribution range of total savings accruing to Massachusetts. For example, instead of assigning a point estimate to the percent of sales resulting in sales tax fraud, a distribution is assigned to that variable based on several independent studies on the topic. This is a more robust method and gives a useable spectrum of possible results by assigning outcome percentages to these results.

Estimated Increase in Revenue Collected Under ASTR Due to Increased Compliance

Estimating the impact of reducing sales tax fraud is difficult because it involves estimating something that can't be seen, fraud. In many states, retailers or vendors declare what tax revenue they are liable for and then remit that amount to the state, for all intents and purposes the government takes the retailers word for it. The vendors serve as trustees of the tax. Since there is no independent third-party oversight countervailing the other two parties (consumers and retailers) state agencies are unable to know how much these retailers are defrauding the state. Independent studies aimed at estimating the amount of sales tax fraud in Massachusetts are unavailable. However, credible studies aimed at estimating the amount of sales tax fraud in other jurisdictions can be found in the literature. We rely on these independent studies to provide the Monte Carlo model with a range of sales tax fraud estimates. The table below lists the sources for the assumed distribution around the sales tax fraud estimate used in this report.

Table 2. Empirical Estimates of Sales Tax Fraud	
Estimate of Sales Tax Fraud	**Publisher of Study**
5%	Office of Minnesota Legislative Auditor
13%	Tax Policy Center
15%	Brookings Institution
16%	Boston University Law School
10%-28%	Florida International University

This range of estimates of sales tax fraud inform the distribution for the variable in the Monte Carlo model. The distribution for the variable representing the amount of sales tax fraud in Massachusetts on regular consumer items in the Monte Carlo model has a mean of 16% and a standard deviation of 5% and is assumed to be distributed normally. This means that in 95% of the simulations run in the model, the sales tax fraud variable for regular purchases will take on a value between 6% and 26%, within the range of empirical estimates. The distribution for sales tax on meals is slightly higher given the prevalence of Zappers and sales suppression software. This distribution has a mean of 19% and a standard deviation of 7%.

The adoption of ASTR and the altering of the payment processors' platforms will help eliminate fraud and delinquency on sales made with debit and credit cards, but associated fraud with cash transactions will not be captured. Therefore, these cash transactions must be accounted for in the Monte Carlo model to ensure that the model is not overcounting the effect on fraud of the adoption of ASTR. Depending on the type of purchase, the use of cash versus debit or credit card is more prevalent. For restaurant purchases, the range of estimates of the percentage of sales paid for in cash is 19% to 39% depending on the type of restaurant. The range for all other purchases is 8% to 27% depending on the what and where the transaction took place.[1] The table below displays the distribution assumption for the two Monte Carlo model variables.

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[1] TSYS, "2016 U.S. Consumer Payment Study," 14-15. Accessed here
https://www.tsys.com/Assets/TSYS/downloads/rs_2016-us-consumer-payment-study.pdf August 4, 2018. Steele, Jason, "Payment Method Statistics," CreditCard.com. Accessed here
https://www.creditcards.com/credit-card-news/payment-method-statistics-1276.php, September 25, 2018.

Table 3. Estimates of Percentage of Purchases in Cash	
Variable	**Distribution**
Percent of Regular Purchases Using Cash	Mean = 16.5%, St. Dev. = +/- 4%
Percent of Meal Purchases Using Cash	Mean = 29%, St. Dev. = +/- 5%

The break out of Massachusetts sales tax by type taken from the Massachusetts Senate Ways and Means FY19 Fiscal Note will be the base used. To determine the increased revenue collected under ASTR, we decompose the tax base as identified in the Massachusetts Senate Ways and Means FY 19 Fiscal Note. The table below breaks out the sales tax revenue by source.

Table 4. FY 2019 Sales Tax Revenue ($Millions)	
Source of Sales Tax Revenue	**Amount**
Sales – Regular	$4,502
Sales – Meals	$1,210
Sales - Motor Vehicles	$866
Total	$6,578
Source: Massachusetts Senate Ways and Means FY 19 Fiscal Note	

During the Monte Carlo simulations, the cash transaction percentages are applied to the appropriate base, cash transaction percentages for regular purchases are applied to the regular purchases and the cash transaction percentages for meal purchases are applied to the meal purchases. The motor vehicle sales tax revenue is omitted in the analysis since the state requires the purchaser (rather than the seller) of the car to pay the sales tax. This is easily verified when the purchaser tries to register the car. Due to their third-party structure of the transaction, vehicle sales tax fraud is lower.

Once the bases have been adjusted to include only credit or debit card purchases, the fraud specific estimates are applied to the bases representing credit and debit card

purchases. The regular purchase estimate of fraud is applied to the regular purchases base and the restaurant-specific estimate of fraud is applied to meal purchases base.

The Monte Carlo model, using these inputs, runs 10,000 simulations using different possible combinations of the declared variables chosen from the distributions based upon a range of independent estimates. The values for each simulation can be chosen from any value within the ranges for these variables. The result is an estimated distribution of the increased sales tax revenue collected by Massachusetts resulting from the increase in compliance due to the adoption of ASTR. The table below lists the mean increase in revenue collected due to the reduction in fraud across purchase types.[2]

Table 5. Increased Sales Tax Revenue from Fraud Reduction	
Type of Taxable Purchase	**Amount of Increased Revenue due to Increased Compliance (Mean of Distributions) $Millions**
Sales – Regular	$599.75
Sales – Meals	$163.62
Total	**$763.37**
Source: Output of Monte Carlo model of ASTR	

The adoption of ASTR will put the payment processors in the position of serving as an independent third-party in the remittance of state sales tax. The splitting of the sales tax from the total purchase price at the point of sale and automatically transferring it to a state account will increase sales tax revenue by approximately $763.37 million, without raising the tax rate.

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[2] The full output of the Monte Carlo model appears in the Appendix to this report.

Estimated Increase in Revenue Collected Under ASTR due to Float Interest

Retailers in Massachusetts collect sales tax revenue every day during a given month and hold on to it until they are required to remit it to the state by the 20th day of the following month.   After the retailers collect the sales tax revenue — and before they remit it to the state authorities— they can collect interest on the sales tax revenue float for the time between when it is collected and when it is required to be remitted. Under an ASTR system, Massachusetts would capture that float interest instead. Many big box retailers collect sales tax revenue and earn float interest on that revenue before the remittance to the state. For larger retailers this can be a significant amount of earned interest, even at low interest rates.

To put this in perspective, Walmart collected $15.7 billion in 2017 in state sales and use taxes across the United States.[3] Target collected approximately $5.1 billion in 2017 in state sales and use taxes across the United States.[4] Using a conservative interest rate of 1.5% and an average holding period of 45 days produces interest earned from the sales tax revenue float of $29.07 million and $9.5 million for Walmart and Target respectively.[5] Most likely, the interest rate will be higher in the future. The Federal Reserve Bank has been raising interest rates over the last 18 months and has signaled that it will continue to do so. If an interest rate closer to the historical average of the

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[3] Walmart's corporate website https://corporate.walmart.com/our-story/locations/united-states#/ accessed August 4, 2018. A table with the breakdown of taxes collected by state appears in the Appendix to this report.

[4] This estimate was derived by applying the sales per sq. ft for Target gleaned from https://csimarket.com/stocks/operatingstat_annual.php?code=TGT on August 4, 2018 and applying it to sq. ft. per state gleaned from https://corporate.target.com/annual-reports/2017/financials/sales-per-capita. The national sales figure that this methodology produced was then controlled to the 2017 revenue total for Target in the United States gleaned from https://www.statista.com/statistics/299541/revenue-of-target-worldwide/ on August 4, 2018.

[5] Tables containing tax revenue collected by Walmart and Target appear in the Appendix to this report.

mid 5% range materializes then the lost float going forward could be over 3 times as much for the two retailers cited above. This may be part of the reason why big box retailers have opposed the adoption of ASTR: the exploitation of the float is not insignificant.

The Massachusetts monthly sales tax revenues for July 2017-June 2018 (Fiscal Year 2018) were disaggregated across the days of each month, less the sales tax on auto purchases. A mean interest rate of 1.5% and a standard deviation of 0.5% is used to determine the float interest accumulating to Massachusetts under ASTR. The interest rate will fall between 0.5% and 2.5% in 95% of the Monte Carlo simulations. The model produces an average gain in float interest of $7.3 million dollars in the course of a single fiscal year.[6] This is most likely a very conservative estimate moving forward, given the rising interest rate atmosphere in the present economy.

Summarizing the results

The average total increased revenue generated from the adoption of ASTR is $770.69 million. The breakout of the sources is below.

Table 6. Total Increased Sales Tax Revenue from Adoption of ASTR	
Type of Taxable Purchase	**Amount of Increased Revenue (Avg. of Distribution) ($Millions)**
Sales – Regular Increased Compliance	$599.75
Sales – Meals Increased Compliance	$163.62
Float Interest	$7.30
Total	**$770.69**
Source: Performance Economics	

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[6] The full distribution of the float interest variable appears in the Appendix to this report.

The Massachusetts FY 19 budget expects to receive $6,577 million in sales tax revenue. The increased revenue due to the adoption of ASTR represents an 11.7% increase over the legislature's forecast. This represents additional revenue accruing to Massachusetts without having to raise the sales tax rate.

Estimated Costs of Implementing ASTR in Massachusetts

The opposition to ASTR believes the costs of implementing the new sales tax collection system to be over $1 billion dollars in reoccurring and non-reoccurring costs to payment processors and vendors. This cost estimate is based on the faulty assumption that there will be large hardware and software upgrades required of vendors and payment processors similar to the costs associated with migration to the new chip technology in credit and debit cards. This is not the case. The institution of the ASTR system will take place at the final stage of payment processing: settlement.

The authors of this study consulted with an industry expert to develop realistic ASTR implementation costs in Massachusetts. The industry expert, Stephen Ruch, provided a detailed accounting of the ASTR implementation costs, based on his decades of experience in the payment processing industry.[7] He delineated the tasks needed to be completed by the payment processing companies to implement ASTR and assigns a number of full-time equivalent employees (FTE), the hourly rate earned by these employees and the number of months to complete each task.[8] Mr. Ruch develops two options for payment processors. Each payment processor would choose which implementation strategy to adopt based on several factors such as; the nature and

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[7] Mr. Ruch's biography is contained the Appendix to this report.
[8] Detailed table outlining the two payment processor options for ASTR implementation are contained in the Appendix to this report.

makeup of their settlement platform and reporting systems, their processes and workflow and overall cost.

Both payment processor implementation options are one-time development costs. If Massachusetts was to be the first state to implement ASTR, then these one-time development costs to meet Massachusetts requirements would also cover implementation requirements in any other state. So, it is a single development cost to provide ASTR in every state. The two options costs differ because of different FTE requirements depending on the nature of the payment processor's settlement platform. The first option carries a one-time expense of $3,436,800 per settlement platform and the second option has a $1,699,200 cost per settlement platform. The number of platforms by payment processor in the state of Massachusetts appears in the table below.

Table 7. Payment Processors Operating in Massachusetts	
Payment Processor	**Number of Settlement Platforms**
Chase Paymentech	2
TSYS	1
WorldPay/ Vantiv	3
First Data*	2
Global Payments**	2
Elavon	1
Stripe	1
Square	1
Clearent	1
EVO Payments	1
JetPay	1
Amazon	1
PayPal	1
American Express	1
Total Payment Processors in Massachusetts	**19**
Source: Stephen Ruch * Includes Bank of America and Wells Fargo ** Includes Heartland	

The implementation costs are on a per platform basis, so the total cost to the payment processor industry in Massachusetts to implement ASTR is between $32,284,800 (19 x $1,699,200) for the lower cost option and $65,299,200 (19 X $3,436,800) for the higher cost option. The actual cost to payment processors to implement ASTR will depend on which option the 19 platforms choose to implement ASTR. The actual cost will fall somewhere in the range outlined above.

These are one-time development costs to the payment processors and will not only meet the requirements in Massachusetts, but payment processors can leverage these changes to their platforms to meet the requirements in other states and little to no additional cost.

The Massachusetts DOR estimated that the cost to the department of implementing ASTR would be approximately $4.4 million. Of this $4.4 million, $4.0 million is a one-time development cost and $400,000 is reoccurring costs for additional full time staff. In the first year of ASTR the maximum possible total one-time cost of implementation would be approximately $4,000,000 for the Department of Revenue and $65,299,200 across all payment processors, for a total of $69,299,200.

Conclusion

Effective, efficient, and easy tax administration are key principles of sound state tax policy. The sales tax —while a reliable source of revenue — faces collection challenges posed by illicit technology and inefficient transaction costs enabled by outdated pencil and paper payment methods, fraud and bankruptcies. Payment processors have claimed in public settings that the technology to split payments —such as would be required under ASTR —has existed for years. Furthermore, this implementation can

take place without new hardware requirements for vendors. These assessments are at odds with opponents of ASTR who claim hundreds of millions of added costs will be incurred to get the system operational. Several of those opponents are the same payment processors that previously had claimed that the ability to split payments already exists.

The average total increased revenue generated from the adoption of ASTR is $770.69 million according to the model presented in this paper. Foremost, the ability of the ASTR to minimize sales tax fraud is especially critical. Additionally, savings would accrue by redirecting the "float" to the state's treasury, its proper destination. Arguments made by opponents against an ASTR regarding complexity and labor costs do not withstand scrutiny and fail the test of basic economic analysis when the correct assumptions are considered. As it is a software modification rather than a hardware installation, the ASTR does not increase significantly the cost of administration.

After the implementation of ASTR, the net benefit to the state will be over $700 million annually in "new" revenue without the raising of the sales tax rate. Thus, an ASTR observes the key tax policy objective of base-broadening without rate increases. This is especially crucial since past efforts to expand the base – by taxing services – have been particularly difficult. This is a textbook case of public policy that will cause an overwhelming net benefit to the citizens of Massachusetts.

Technology moves quickly sometimes to the detriment of effective public policy. The current system is susceptible to tax fraud, costing the state treasury millions of dollars each year. Yet the potential for technology-enhancing procedures may be too persuasive to pass over. Consumers have already adapted to the numerous payment

instruments available to them. They are likely to support a transparent system that does not impinge on their convenience of payment while benefiting themselves as taxpayers over the long-term.

The evidence presented in this paper is consistent with welfare-enhancing view that ASTR is a net benefit to the Commonwealth as identified by the Department of Revenue. The cost savings identified here based on an extensive Monte Carlo analysis show that an ASTR, properly enacted and implemented, would benefit taxpayers, vendors and the Commonwealth.

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Appendix

Table A1. Statistics for Distribution of Amount of Regular Sales Using Debit/Credit	
Statistic	**Value**
Mean	$3,759.08
Median	$3,758.96
Mode	---
Standard Deviation	$180.63
Variance	$32,626.17
Skewness	0.0123
Kurtosis	3.03
Coeff. of Variation	0.0481
Minimum	$3,122.83
Maximum	$4,541.17
Mean Std. Error	$1.81
Source: Monte Carlo Model Output	

Figure A1. Distribution for Amount of Regular Sales Using Debit/Credit
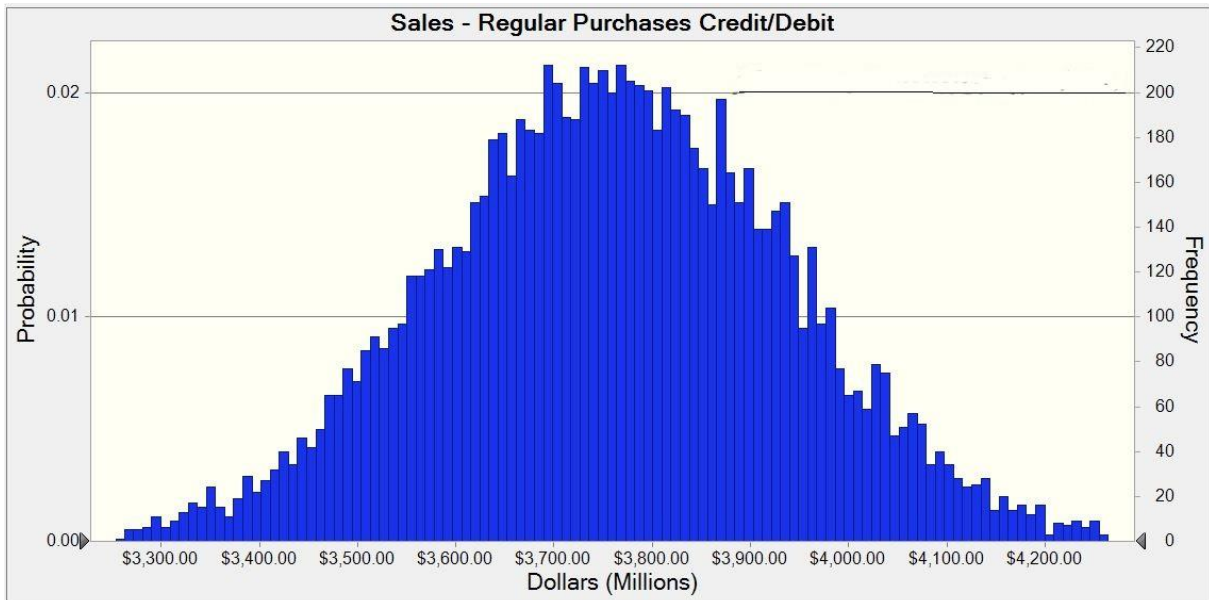
Table A2. Statistics for Distribution of Amount of Meal Sales Using Debit/Credit	
Statistic	**Value**
Mean ($Millions)	$858.10
Median ($Millions)	$857.88
Mode	---
Standard Deviation ($Millions)	$60.13
Variance ($Millions)	$3,615.71
Skewness	
Kurtosis	2.97
Coeff. of Variation	0.0701
Minimum ($Millions)	$627.64
Maximum ($Millions)	$1,111.65
Mean Std. Error	$0.60
Source: Monte Carlo Model Output	

Figure A2. Distribution for Amount of Sales – Meals Purchases Using Debit/Credit
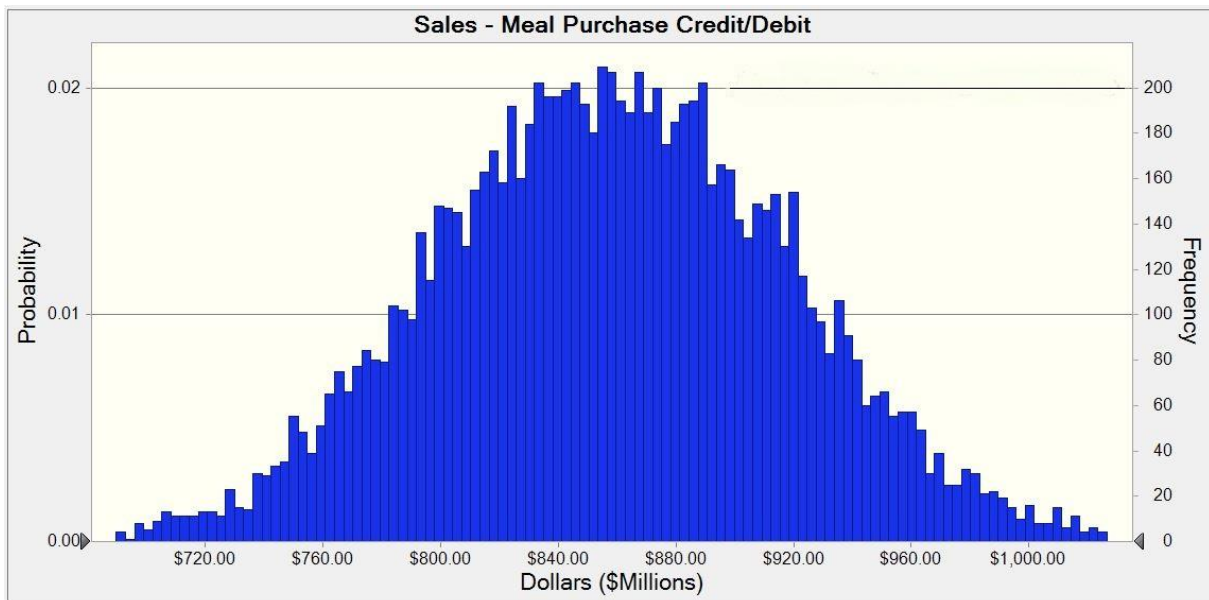
Table A3. Statistics for Distribution of Amount of Increased Regular Sales Tax Revenue Due to Improved Compliance	
Statistic	**Value**
Mean ($Millions)	$599.89
Median ($Millions)	$598.84
Mode	---
Standard Deviation ($Millions)	$191.78
Variance ($Millions)	$36,779.33
Skewness	$0.06
Kurtosis	3.01
Coeff. of Variation	0.3197
Minimum ($Millions)	($84.84)
Maximum ($Millions)	$1,367.94
Mean Std. Error	$1.92
Source: Monte Carlo Model Output	

Figure A3. Distribution for Amount of Increased Regular Sales Tax Revenue Due to Improved Compliance
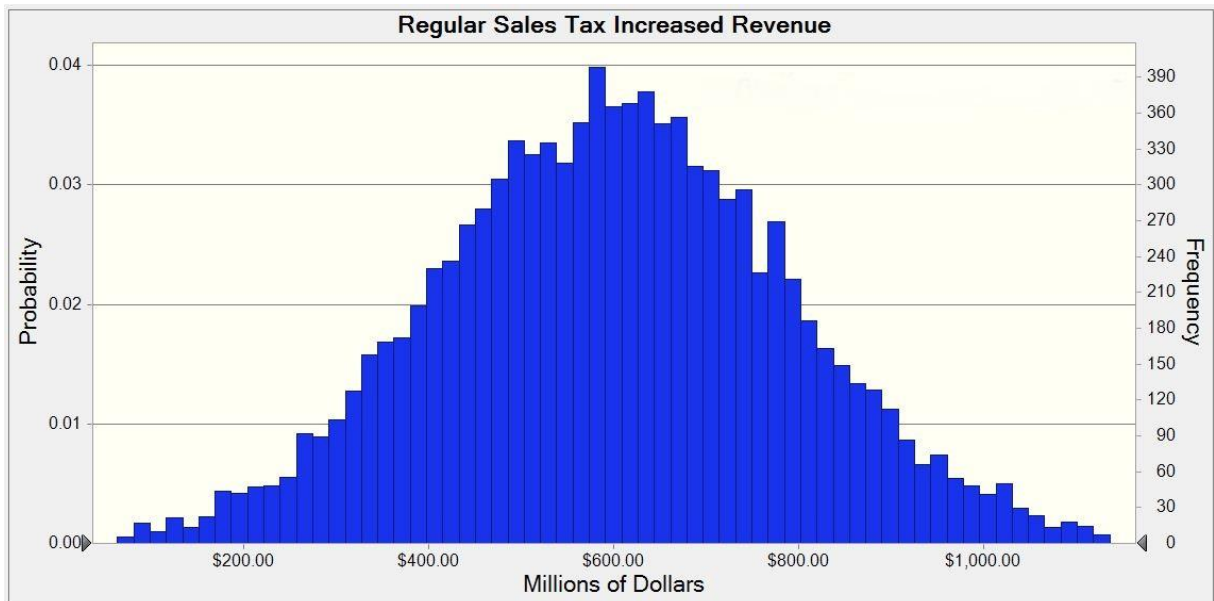
Table A4. Statistics for Distribution of Amount of Increased Meals Sales Tax Revenue Due to Improved Compliance	
Statistic	**Value**
Mean ($Millions)	$163.59
Median ($Millions)	$162.87
Mode	---
Standard Deviation ($Millions)	$56.87
Variance ($Millions)	$3,233.75
Skewness	0.0791
Kurtosis	3.02
Coeff. of Variation	$0.35
Minimum ($Millions)	($66.53)
Maximum ($Millions)	$381.90
Mean Std. Error	$0.57
Source: Monte Carlo Model Output	

Figure A4. Distribution for Amount of Increased Regular Sales Tax Revenue Due to Improved Compliance
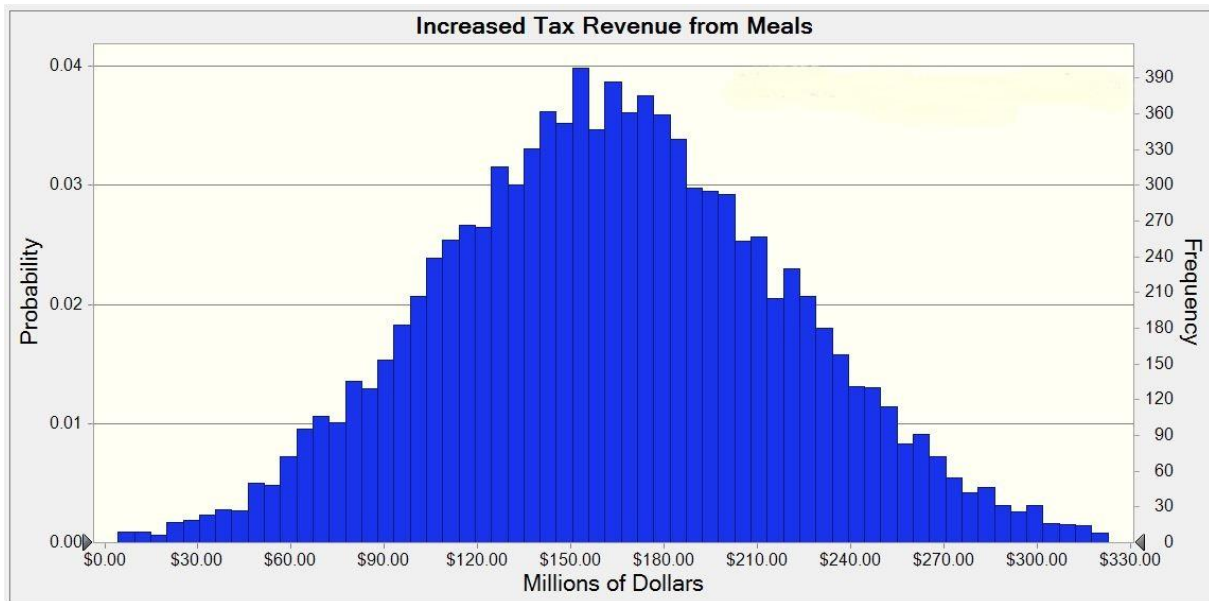
Table A5. Statistics for Distribution of Amount of Increased Revenue Due to Float Interest	
Statistic	**Value**
Mean ($Millions)	$7.30
Median ($Millions)	$7.30
Mode	$7.28
Standard Deviation ($Millions)	---
Variance ($Millions)	$2.44
Skewness	$5.94
Kurtosis	-0.004
Coeff. of Variation	3.01
Minimum ($Millions)	$0.33
Maximum ($Millions)	($3.83)
Mean Std. Error	$16.42
Source: Monte Carlo Model Output	

Figure A5. Distribution for Amount of Increased Revenue Due to Float Interest

Table A6. Statistics for Distribution of Total Amount of Increased Revenue Due to Adoption of ASTR	
Statistic	**Value**
Mean ($Millions)	$770.78
Median ($Millions)	$769.66
Mode	---
Standard Deviation ($Millions)	$200.71
Variance ($Millions)	$40,286.06
Skewness	0.0483
Kurtosis	3.03
Coeff. of Variation	$0.26
Minimum ($Millions)	$84.04
Maximum ($Millions)	$1,582.70
Mean Std. Error	$2.01
Source: Monte Carlo Model Output	

Figure A6. Distribution for Total Amount of Increased Revenue Due to Adoption of ASTR

Table A7. Walmart Sales and Use Tax Collection by State		
State	Sales and Use Tax Collected ($Millions)	Number of Stores
Alabama	$684.6	145
Alaska	$8.4	12
Arizona	$254.7	130
Arkansas	$445.4	132
California	$1,100	306
Colorado	$329.1	106
Connecticut	$78.2	36
Delaware	$0	10
District of Columbia	$0	3
Florida	$937.4	383
Georgia	$613.4	215
Hawaii	$55	12
Idaho	$104.4	27
Illinois	$646.7	194
Indiana	$354.7	130
Iowa	$179.4	68
Kansas	$361.4	84
Kentucky	$243.4	106
Louisiana	$579.4	138
Maine	$65.0	25
Maryland	$156.3	61
Massachusetts	$95.6	50
Michigan	$256.2	120
Minnesota	$185.0	82
Mississippi	$333.2	85
Missouri	$628.6	156
Montana	$0	16
Nebraska	$107.8	47
Nevada	$150.4	50
New Hampshire	$0.654	29
New Jersey	$160.6	73
New Mexico	$145.6	53
New York	$391.9	115
North Carolina	$605.4	219
North Dakota	$54.2	17
Ohio	$496.5	172
Oklahoma	$588.7	135
Oregon	$0	43

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Pennsylvania	$335.5	161
Rhode Island	$22.9	9
South Carolina	$281.3	124
South Dakota	$83.5	17
Tennessee	$754.6	155
Texas	$1,700.0	599
Utah	$178.5	59
Vermont	$10.0	6
Virginia	$336.6	155
Washington	$269.1	68
West Virginia	$109.0	44
Wisconsin	$194.7	99
Wyoming	$30.3	14
Totals	**$15,703.3**	**5,295**

Source: Walmart Corporate Website https://corporate.walmart.com/our-story/locations/united-states#/united-states

Table A8. Estimated Target Sales and Use Tax Collections By State - 2017

State	## of stores*	Retail Sq Ft ('000s)*	Sales by State 2017 – Uncontrolled** ($Millions)	Sales By State Controlled to Total US Revenue ($Millions) ***	State Sales Tax Rate	Average Local Rate	Average Combined State and Local Rate	Implied State and Local Tax Collected ($Millions)
Alabama	22	3,150	$970.02	$910.29	4.00%	5.15%	9.15%	$83.29
Alaska	3	504	$155.20	$145.65	0.00%	1.43%	1.43%	$2.08
Arizona	47	6,187	$1,905.24	$1,787.92	5.60%	2.78%	8.38%	$149.83
Arkansas	9	1,165	$358.75	$336.66	6.50%	2.92%	9.42%	$31.71
California	283	35,948	$11,069.92	$10,388.27	7.25%	1.30%	8.55%	$888.20
Colorado	41	6,215	$1,913.86	$1,796.01	2.90%	4.62%	7.52%	$135.06
Connecticut	20	2,672	$822.82	$772.16	6.35%	0.00%	6.35%	$49.03
Delaware	3	440	$135.49	$127.15	0.00%	0.00%	0.00%	$-
District of Columbia	1	179	$55.12	$51.73	5.75%	0.00%	5.75%	$2.97
Florida	122	16,985	$5,230.40	$4,908.33	6.00%	0.80%	6.80%	$333.77
Georgia	50	6,820	$2,100.17	$1,970.85	4.00%	3.23%	7.23%	$142.49
Hawaii	7	1,111	$342.12	$321.06	4.00%	0.35%	4.35%	$13.97
Idaho	6	664	$204.47	$191.88	6.00%	0.03%	6.03%	$11.57
Illinois	94	12,152	$3,742.12	$3,511.69	6.25%	2.48%	8.73%	$306.57
Indiana	31	4,174	$1,285.35	$1,206.20	7.00%	0.00%	7.00%	$84.43
Iowa	20	2,835	$873.02	$819.26	6.00%	0.82%	6.82%	$55.87
Kansas	17	2,385	$734.44	$689.22	6.50%	2.18%	8.68%	$59.82
Kentucky	13	1,551	$477.62	$448.21	6.00%	0.00%	6.00%	$26.89
Louisiana	15	2,120	$652.84	$612.64	4.45%	5.00%	9.45%	$57.89
Maine	5	630	$194.00	$182.06	5.50%	0.00%	5.50%	$10.01
Maryland	39	4,860	$1,496.60	$1,404.44	6.00%	0.00%	6.00%	$84.27
Massachusetts	42	5,260	$1,619.78	$1,520.04	6.25%	0.00%	6.25%	$95.00
Michigan	53	6,370	$1,961.59	$1,840.80	6.00%	0.00%	6.00%	$110.45
Minnesota	74	10,440	$3,214.92	$3,016.96	6.88%	0.55%	7.43%	$224.01
Mississippi	6	743	$228.80	$214.71	7.00%	0.07%	7.07%	$15.18

Missouri	35	4,608	$1,419.00	$1,331.62	4.23%	3.86%	8.09%	$107.66
Montana	7	780	$240.20	$225.40	0.00%	0.00%	0.00%	$-
Nebraska	14	2,006	$617.73	$579.69	5.50%	1.39%	6.89%	$39.94
Nevada	17	2,242	$690.41	$647.89	6.85%	1.29%	8.14%	$52.74
New Hampshire	9	1,148	$353.52	$331.75	0.00%	0.00%	0.00%	$-
New Jersey	45	5,882	$1,811.32	$1,699.78	6.63%	0.03%	6.66%	$113.12
New Mexico	10	1,185	$364.91	$342.44	5.13%	2.65%	7.78%	$26.62
New York	79	10,117	$3,115.45	$2,923.61	4.00%	4.49%	8.49%	$248.21
North Carolina	51	6,540	$2,013.94	$1,889.93	4.75%	2.20%	6.95%	$131.35
North Dakota	4	554	$170.60	$160.10	5.00%	1.83%	6.83%	$10.93
Ohio	62	7,675	$2,363.46	$2,217.92	5.75%	1.40%	7.15%	$158.58
Oklahoma	15	2,168	$667.62	$626.51	4.50%	4.43%	8.93%	$55.95
Oregon	19	2,280	$702.11	$658.88	0.00%	0.00%	0.00%	$-
Pennsylvania	71	8,827	$2,718.21	$2,550.83	6.00%	0.34%	6.34%	$161.72
Rhode Island	4	517	$159.21	$149.40	7.00%	0.00%	7.00%	$10.46
South Carolina	19	2,359	$726.44	$681.70	6.00%	1.43%	7.43%	$50.65
South Dakota	5	580	$178.61	$167.61	4.50%	1.90%	6.40%	$10.73
Tennessee	31	3,990	$1,228.69	$1,153.03	7.00%	2.46%	9.46%	$109.08
Texas	149	20,863	$6,424.60	$6,029.00	6.25%	1.92%	8.17%	$492.57
Utah	13	1,954	$601.72	$564.67	5.95%	0.83%	6.78%	$38.28
Vermont	0		$-	$-	6.00%	0.18%	6.18%	$-
Virginia	58	7,689	$2,367.77	$2,221.97	5.30%	0.35%	5.65%	$125.54
Washington	37	4,329	$1,333.08	$1,251.00	6.50%	2.69%	9.19%	$114.97
West Virginia	6	755	$232.50	$218.18	6.00%	0.38%	6.38%	$13.92
Wisconsin	37	4,560	$1,404.22	$1,317.75	5.00%	0.44%	5.44%	$71.69
Wyoming	2	87	$26.79	$25.14	4.00%	1.39%	5.39%	$1.36
Totals	**1,822**	**239,255**	**$73,677**	**$69,140**				**$5,120**

Table A9. Projected Processor Level Implementation Costs - Option 1				
Expenditure Item	**Estimated Full Time Employees (FTE)**	**Total FTE Hourly Expense**	**Estimated Total Expense**	**Estimated Months to Complete**
Bifurcation (Split Funding)/ Per Settlement Platform (Split funding for all Major Card Brands and Debit Networks)	10	$175	$1,120,000	4
Consolidated Funding (Funds are held and collected by the processor for all MIDs. They then send one daily wire to the state for all merchants. One hundred percent of funds collected on behalf of state for sales tax shall be forwarded to the state.)	4	$175	$336,000	3
Testing/ Certification	4	$125	$240,000	3
Compliance	4	$150	$288,000	3
Accounting/ Reconciliation	4	$125	$240,000	3
Merchant Level Reporting (Daily, Weekly, Month-to-Date, Monthly Statements and Annual Reports updated to include sales Tax as a line item on the report)	5	$125	$400,000	4
State Level Reporting (Daily, Weekly, Monthly Statements and Annual Reports updated to include Sales Tax as a line item on the report)	4	$125	$240,000	3
Sub Total			$2,864,000	
Administrative Overhead (20% of Total Dev Cost)			$572,800	
Total Budgeted Expense			**$3,436,800**	
Source: Stephen Ruch				

Table A10. Projected Processor Implementation Costs - Option 2				
Expenditure Item	**Estimated Full Time Employees (FTE)**	**Total FTE Hourly Expense**	**Estimated Total Expense**	**Estimated Months to Complete**
Daily Discount Fee (for Sales Tax) Collected Daily				
(Leverage billing systems fee sequence codes to capture sales tax withholdings daily)	2	$175	$224,000	4
Consolidated Funding				
(Funds are held and collected by the processor for all MIDs. They then send one daily wire to the state for all merchants.One hundred percent of funds collected on behalf of state for sales tax shall be forwarded to the state.)	2	$175	$168,000	3
Testing/ Certification	2	$125	$120,000	3
Compliance	2	$150	$144,000	3
Accounting/ Reconciliation	2	$125	$120,000	3
Merchant Level Reporting				
(Daily, Weekly, Monthly Statements and Annual Reports updated to include Sales Tax as a line item on the report)	5	$125	$400,000	4
State Level Reporting				
(Daily, Weekly, Monthly Statements and Annual Reports updated to include Sales Tax as a line item on the report)	4	$125	$240,000	3
Sub Total			$1,416,000	
Administrative Overhead (20% of Total Dev Cost)			$283,200	
Total Budgeted Expense			**$1,699,200**	
Source: Stephen Ruch				

Exhibit A – Stephen Ruch Executive Biography

Stephen Ruch
Electronic
Payments
Industry
Executive

Stephen Ruch is a 28-year veteran of the Electronic Payments Industry with global experience who has a proven track record leading both business development & operational teams in the Acquiring and Private label spaces to sustained success. Mr. Ruch has served in leadership roles with various organizations ranging from a Card Network to Acquirers, a Private Label card Issuer and a Merchant/Payment Facilitator. His experiences offer a unique perspective of many sides of the payments industry.

Summary of Experience:

Most recently, Mr. Ruch was President and CEO of Clark Brands, LLC headquartered in Lisle, Illinois where he was responsible for developing and leading the growth strategy and had full P&L responsibility and was tasked with ensuring the company achieves its strategic and financial targets.

Prior to joining Clark Brands in August of 2014, Mr. Ruch was Senior Vice President, Growth, Innovation and Planning with MasterCard Worldwide. In this role, he was responsible for driving the global strategy and developing innovative solutions for new business initiatives throughout Franchise Development. He had oversight responsibility for Strategy, Education & Planning; Brand Licensing, Registration & Brand Standards, as well as ensuring Regional Alignment across Franchise Development on a global basis.

Prior to MasterCard, Mr. Ruch was Senior Vice President of Merchant Services at Commerce Bancshares in Kansas City, Missouri. As head of Commerce's Merchant Acquiring division, Mr. Ruch oversaw strategic

planning, sales, account management, operations, product development, underwriting, risk and compliance and had overall responsibility for the profitable growth and performance of the Acquiring business.

Prior to Commerce Bancshares, Mr. Ruch spent three years with CNH Capital where he was responsible for the growth and development of CNH Capital's Private Label Credit Card, Consumer Finance and Insurance businesses on a national basis.

Mr. Ruch also spent 17 years with Fifth Third Bank Processing Solutions (now Vantiv) where he held positions of increasing responsibility in both the Financial Institutions and Merchant Acquiring divisions up until his departure in 2006 when he was serving as Director of Retail Sales and Operations.

Education profile
Mr. Ruch holds a Bachelor of Science Degree in Marketing and Information Systems from the Haile College of Business at Northern Kentucky University

About Performance Economics

The economists of Performance Economics have worked in academia, the private sector and government. PE's staff has a profound understanding of the fundamentals of economic theory and over two decades of experience as economists.

Research Leader

John Barrett has over 20 years of experience as an economist. He has held positions in the public sector, academia and the private sector. Before co-founding Performance Economics, Mr. Barrett was Vice President of Strategic Analytics at Mullen in Boston, which ranked number 2 in *Advertising Age's 2014 Agency A-List*. Prior to that, he was a Principal at IHS Global Insight, the world's leading economic forecasting and consulting firm. He is a lecturer of undergraduate economics at Emmanuel College and Suffolk University in Boston where he was also the Director of Research at the University's public policy think tank, the Beacon Hill Institute. Mr. Barrett started his career as a Regional Economist at the Bureau of Economic Analysis where worked with the bureau's RIMS II multiplier model. He is an expert on economic impact modeling; helping Fortune 500 companies determine their impact on the national and global economies and speaking frequently at conferences on the subject. He has also aided companies and countries in their attempts to be more competitive in the global marketplace. He has performed research for the European Commission and authored/co-authored three chapters in its 2009 report, "Sectoral Growth Drivers and Competitiveness in the European Union."

Mr. Barrett has been a panelist at many EB-5 related conferences. He advises attendees on issues regarding EB-5 economic impact modeling and provides guidance around

the latest issues the USCIS has raised concerning job impacts in the EB-5 program. He has been a guest speaker at conferences for the American Immigration Lawyers' Association, the Association to Invest in USA and Immigration Law Weekly. In August 2014, he was a panelist at AILA's Annual EB-5 Conference in Chicago.

Mr. Barrett holds a Master's of Science in Economics from New Mexico State University and a Master's of Science in Finance from the Sawyer School of Management at Suffolk University.

Research and Production Editor

Frank Conte has over 40 years of experience as a journalist, editor and public policy analyst. Mr. Conte is the former director of communications and information systems at the Beacon Hill Institute, where he managed its renown business climate index for the State Competitiveness Project. His work has appeared in the *Boston Globe, the Boston Herald, Inquiry Magazine, the Boston Business Journal, the Worcester Business Journal and NewBostonPost.com*. Mr. Conte has also co-authored policy studies on state fiscal policy, tax policy, renewable energy and health care. He is a currently a technology consultant, a free-lance writer and editor as well as a publisher of two news aggregation web sites.

Mr. Conte holds a Master's of Science in Public Affairs from the University of Massachusetts-Boston and a Bachelor's of Science in English from Suffolk University. Mr. Conte is a member of the UMass-Boston chapter of Pi Alpha Alpha.

The Purpose of this Report

The purpose of this report is to analyze a proposal to upgrade the Commonwealth of Massachusetts's sales tax collection capacity. Using generally-accepted economic methods, this report seeks to identify the benefits and costs of an accelerated state tax revenue collection system that transfers taxes paid by consumer directly to the state treasury. This report will examine the prospects for cost-savings to taxpayers and evaluate current claims about the viability of a ASTR system.

General & Limiting Conditions

Every reasonable effort has been made to ensure that the data contained in this report are accurate as of the date of this study. However, factors exist that are outside the control of Performance Economics LLC which may affect the estimates noted herein. This study is based on estimates, assumptions and other information developed by Performance Economics LLC through its own research, general modeling knowledge, and information provided by, and consultations with, the client and the client's representatives. No responsibility is assumed for inaccuracies in reporting by the client, the client's agent and representatives, or any other data source used in preparing or presenting this study.

This report is based on information that was current as of December 2018 and Performance Economics LLC has not undertaken any update of its research effort since such date.

Because future events and circumstances, many of which are not known as of the date of this study, may affect the estimates contained therein, no warranty or representation is made by Performance Economics LLC that any of the projected values or results contained in this study will actually be achieved.

Possession of this study does not carry with it the right of publication thereof or to use the name of "Performance Economics LLC" in any manner without first obtaining the prior written consent of Performance Economics LLC.

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