Fiscal Consequences of Scrapping Cash

by

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Abstract

The emergence of a range of digital media of exchange such as debit cards, credit cards, pre-loaded transit tickets, cafeteria passes and telephone coupons means for the first time that money in the form of paper currency and coins is no longer essential. The scrapping of traditional cash would mean the removal of the means of anonymous exchange with implications for the fiscal deficit. On the one hand it would mean a loss of seigniorage for national governments. On the other hand it would reduce tax evasion which would increase fiscal revenue of national, state and municipal governments. The absence of an anonymous means of exchange also has favorable fiscal implications from reduced spending on law enforcement, legal proceedings, incarceration, and public health from impeding the drug trade: digital media of exchange provide a trail to follow for illicit transactions, hindering activities of buyers and sellers. This paper calculates the size of the fiscal implications of scrapping cash and finds substantial gains for all levels of a nation's government, even the national government that loses seigniorage. It takes the view of Canada where virtually every adult has an account at a financial institution.

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[*] Sauder School of Business, University of British Columbia, 2053 Main Mall, Vancouver BC, V6T 1Z2, Canada. maurice.levi@sauder.ubc.ca The idea of investigating the *fiscal implications* of a cashless society was provided by Yuwa Hedrick-Wong. The author is indebted to Dr. Hedrick-Wong for framing and helping answer the question, and to Jonathan Levi for invaluable research assistance. I have also received helpful comments from Bernhard Schwab.

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Abstract

The emergence of a range of digital media of exchange such as debit cards, credit cards, pre-loaded transit tickets, cafeteria passes and telephone coupons means for the first time that money in the form of paper currency and coins is no longer essential. The scrapping of traditional cash would mean the removal of the means of anonymous exchange with implications for the fiscal deficit. On the one hand it would mean a loss of seigniorage for national governments. On the other hand it would reduce tax evasion which would increase fiscal revenue of national, state and municipal governments. The absence of an anonymous means of exchange also has favorable fiscal implications from reduced spending on law enforcement, legal proceedings, incarceration, and public health from impeding the drug trade: digital media of exchange provide a trail to follow for illicit transactions, hindering activities of buyers and sellers. This paper calculates the size of the fiscal implications of scrapping cash and finds substantial gains for all levels of a nation's government, even the national government that loses seigniorage. It takes the view of Canada where virtually every adult has an account at a financial institution.

Keywords: Seigniorage; tax evasion; drug trade; extortion; digital media of exchange; anonymous money.

JEL Classification: E52; E58; E62; H20; H50; H51

I. Introduction

There are a large and growing number of ways to pay when settling a transaction. Small payments can be made with a prepaid card, which may be limited to specific items such as public transit rides or cafeteria meals, or be useable wherever electronic payments are made. Welfare payments and children's allowances can be distributed on such pre-loadable cards. Debit cards and electronic bill payments (GIRO) allow payment and receipt of funds in checking accounts. Credit card transactions are in essence similar to debit card transactions, where the payer ultimately pays from a bank account, albeit with a delay. Payments via the Internet, telephone, ATMs and mobile money systems such as Google Wallet™ are simply conveniences that, as with other means of electronic payments, involve transfer of bank deposits from payer to payee. They differ only in how instructions are communicated to banks to debit and credit relevant parties' accounts. Of course, it is also possible to pay with cash, that is, paper currency and coins.

The critical difference between transactions facilitated by prepaid cards, debit and credit cards, electronic bill payment, Internet and telephone payment, ATMs, Google Wallet™ etc. on the one hand, and cash on the other hand, is that the parties involved in cash transactions remain anonymous. In the case of all electronic bill payments, including even mobile money systems such as Kenya's phone-to-phone M-Pesa, a record exists of the payer and the payee. This makes cash the preferred medium of exchange for transactions when the payer, payee, or both wish their identity to remain unknown to those who have an interest in who is paying or receiving money. Generally it is the recipients' identities that are of interest to authorities tracking, for example, those subject to income or sales tax, gangs that might be extorting, drug lords and kingpins engaged in producing or importing illicit substances, cigarette smuggling, prostitution, and so on. In a world without cash, a trail of all payments and receipts can be followed to track down criminals and be used as evidence in prosecutions. More importantly as far as the fiscal situations of governments are concerned, if all banknotes and coins were scrapped, thereby removing anonymous means of exchange, the incentive and ability to evade sales and income taxes, profit from extortion, deal in or manufacture drugs, smuggle cigarettes and so on would be reduced. This would increase tax revenues of governments via a higher declared tax base, and reduce government spending on law enforcement, incarceration, and dealing with the human costs of crime relating to addiction, trafficking, gang warfare, money laundering and so on associated with anonymous money.[1]

All levels of government would be affected in some way or other depending on the type of tax revenue they enjoy – municipalities which depend on property tax are less

[1] As a part measure we could consider the question concerning the withdrawal of just paper money, leaving small coins. If the use of coins only marginally took up the slack from lost paper money, we could use the estimates shown here where the seigniorage from coins is omitted.

affected by underground activities than are federal and most state/provincial governments which tax sales and incomes – and on the services different levels of government provide.

While federal, state and municipal governments all have reason to welcome elimination of cash because of the favorable effects on tax revenue and/or spending on law enforcement etc., the federal government that provides the means of transactions anonymity has reason to question the consequences of doing away with cash: the printing of paper currency and minting of coins used in the underground economy, the drug trade, extortion and so on represents profitable business. In the event that cash is eliminated the government's seigniorage is lost on future creation of cash as well as from redemption of existing cash. The redemption of existing cash is a loss through returning the accumulated seigniorage it has enjoyed and is an essential part of doing away with all means of anonymous exchange. This means that for the federal government there are negative consequences with a stock and a flow dimension. The purpose of this paper is to provide an indication of the size of the lost seigniorage, which represents a revenue loss to the federal government, and to compare the revenue loss to the fiscal revenue gains for all levels of government from reduced tax evasion, reduced fiscal expenditures in the war on drugs, and so on.

The perspective taken is the fiscal implications of scrapping cash for the different levels of government, not the social/welfare effects on the country as a whole, or on consumers, merchants, bankers or other groups that may be affected. This means that when a gain or loss is identified as being associated with a government's fiscal situation, this may or may not be a gain or loss of society. For example, a seigniorage loss to the federal government from doing away with cash is a gain for the public. This is because the public will face smaller losses in buying power than they otherwise would. Similarly, the gain in government tax revenue from undermining the underground economy by eliminating cash is a loss to those paying the extra taxes. That is, many of the effects of eliminating cash are transfers.[2] The focus on fiscal consequences is particularly pertinent in a time of troubling deficits.

We focus on the fiscal consequences of scrapping cash in Canada, a country in which 99.5 percent of the adult public have a bank account with a financial institution.[3] While it would be possible to scrap coin and paper money without everybody having a bank account – a magnetic card could be reloaded or fresh card received each month, just as children's allowances could be on a card – bank accounts make things easier. Each country will have its own institutional arrangements and induced behavioral

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[2] For the importance of distinguishing transfers from other types of effects see Pierre Lemieux (2007).
[3] See the Canadian Bankers' Association webpage, http://www.cba.ca/en/media-room/50-backgrounders-on-banking-issues/121-competition-in-the-financial-services-sector In the United States this number is closer to 90 percent. See http://money.cnn.com/2009/12/02/news/economy/fdic_survey/

modifications that will affect the precise fiscal consequences of scrapping cash. However, the principles are the same. In the case of Canada we can expect the fiscal benefits to be mitigated by U.S. dollars being used for some transactions in place of Canadian cash, assuming the scrapping of Canadian paper currency and coins is unilateral. Such currency substitution of foreign for domestic cash would likely be smaller than would occur in the United States. Therefore, a Canadian study should provide a conservative bound for the size-equivalent fiscal consequences of scrapping cash in the United States.

In calculating seigniorage as well as in estimating behavioral responses to the scrapping of cash we have to work with available information that is not always ideal: multi-source data may not correspond in definitions or time, and on occasion may give different estimates. In this paper seigniorage estimates are based on data from the Bank of Canada, the Royal Canadian Mint and the Bank of International Settlements. The size of the underground economy is based on estimates by Statistics Canada. The cost of substance abuse is based on a major study, *The Costs of Substance Abuse in Canada, 2002*, involving numerous federal and provincial ministries. In the event that estimates are different, we choose the most conservative reasonable estimates. In situations where there is no prior research indicating the response to having no anonymous channel of payment we use conservative guesstimates. It is hoped that this approach will at the very least encourage others to ask the question of the fiscal effects of withdrawing cash.

The paper is organized as follows. Section II calculates the seigniorage loss to the Canadian Mint which issues coins, and the Bank of Canada which issues paper currency. Section III considers the size of the underground economy. Sections IV and V consider the implications of the estimated size of the underground economy for the tax revenues of the federal and provincial governments. Section VI considers savings in government expenditures from unearthing the subterranean drug trade. Section VII concludes with the overall fiscal implications, suggesting that all levels of government would enjoy favorable fiscal effects from scrapping anonymous money. Indeed, the benefit would be substantial being approximately equivalent to 50 percent of the size of recent federal fiscal deficits.

II. Seigniorage Benefit of Cash for the Federal Government

The Canadian federal government earns seigniorage by its ability to sell non-interest bearing paper currency through the Bank of Canada, and coins through the Royal Canadian Mint. The paper currency, or ‘notes’, and coins are sold to chartered banks and other financial institutions for their face value, and a small part of the proceeds is set aside for operation of the Mint and the Bank of Canada. The remainder goes to the federal government via the Receiver General of Canada. Essentially, the government is able to finance part of its activities with no repayment and at a zero interest rate, instead incurring the relatively modest cost of managing and maintaining the nation’s currency.

In calculating the generation of seigniorage, we can distinguish coins from notes which differ in terms of life expectancy of circulation: we can conveniently think of coins as having an indefinite life while notes are replaced on average every two years for the five- and ten-dollar bills, every three years for the twenty-, five years for the fifty-, and seven years for the one-hundred dollar bills.[4]

II.1. Foregone Seigniorage from Minting Coins

Consider first the $1 coin called the 'loonie'. The Ministry of Finance pays the Royal Canadian Mint approximately 12 cents to produce and distribute these coins which are sold to financial institutions for $1.[5] The profit of 88 cents accrues to the government via ownership of the Mint which is a Crown Corporation, meaning it is owned by the Canadian government. This seigniorage benefit to the government is the difference between the face value of coins and the cost of providing them. In the event that coin production ceases, the federal government will lose the future flow of profits, that is, the seigniorage flow they would have been enjoying. In addition, if the stock of existing coins is withdrawn from circulation, the federal government will also lose most of the face value of coins held by the public, that is, the accumulated seigniorage.

We can estimate the seigniorage loss from cessation of production and sale of newly minted coins from monetary aggregate data provided by the Bank of International Settlements, BIS. According to the BIS the outstanding value of Canadian circulating coins at the end of the years 2004 to 2008 are $4.27 billion, $4.47 billion, 4.69 billion, 4.88 billion and $5.07 billion.[6] The flow from new mintage is seen to be very close to $200 million per year. As we have mentioned, loonies cost 12 percent of their face value. The smaller denominations of coins probably cost a little more vis-à-vis their face value. Toonies – the Canadian two-dollar coin - probably cost about the same as, or perhaps slightly more than, loonies: they have more complex design. In the absence of the cost of each denomination we might therefore consider the average cost of coins taken together relative to their face value as approximately 15 percent. The seigniorage lost by elimination of the further mintage of coins might therefore be assessed at approximately $170 million per year.[7] (This is the annual revenue of $200 million from new coin sales minus the 15 percent cost of providing them.)

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[4] The life expectancy will increase as the old bills, which while referred to as paper money are actually cotton, are replaced with plastic. This is designed to reduce per year production costs, reduce counterfeiting, increase profits and increase seigniorage. See Y. Bouhdaoui, D. Bounie, and L. Van Hove, (2010), unpublished. http://ssrn.com/abstract=1652173

[5] The cost estimates we use can be found in http://www.baileycapitalfund.com/seign.php

[6] http://www.bis.org/publ/cpss88.htm

[7] Ideally, we would use cost estimates from the Canadian Mint. Note also that if it were not for the many limited edition commemoratives sold by the Royal Canadian Mint we could have cross-checked the seigniorage estimate with the profit made by the Crown Corporation.

In addition to losing the flow of seigniorage from newly minted coins the federal government will also have to redeem coins already in circulation if it wishes to eliminate anonymous means of exchange. If coins are removed from circulation by purchasing them in the market and crediting the sellers' bank accounts, the face value will be paid. More generally, it will cost the federal government a one-time payment equal to the face-value of all coins in circulation: all the loonies, toonies, pennies, nickels, dimes and quarters. There is a minor offset against the face value of redeemed coins from revenue generated by the sale of the extracted metal from the melted coins. On the other hand, the federal government faces an administrative cost of crediting bank accounts of the public redeeming their coins or exchanging them for an equivalent value preloaded card. This cost should be small, possibly being offset by the revenue from the sale of melted coins.

The face value of coins in circulation at the end of 2008 was $5.07 billion. It is useful to express this as a flow so we can later compare the lost seigniorage of the federal government with the flow of fiscal benefits enjoyed by all levels of government from the elimination of cash, such as extra tax revenue from reducing the sizes of the underground and illicit economies.

The purchase of $5.07 billion of coins would swell the national debt, requiring $5.07 billion of additional debt financing. We can think of the equivalent annuity on a consol with a capitalized value of $5.07 billion. Using a 5 percent interest rate, the $5.07 billion is equivalent to an annual flow of $253.5 million. Adding this to the $170 million lost on foregone seigniorage from cessation of newly minted coins puts the federal government's annual loss from elimination of coin-based payments at $423.5 million. In fact it may cost a little less due to lost coins that cannot therefore be redeemed, continued holdings of coin collectors, and receipts for the metal derived from melting coins. Table 1 shows the lost seigniorage of the Royal Mint in billions of Canadian dollars.

II.2. Lost Seigniorage from Paper Currency

Because of the limited life-span of banknotes, the loss to the federal government from elimination of paper currency is calculated differently than it is for coins. In the case of paper currency we can think of the seigniorage as the value of the *net* income stream of interest payments saved, if there is a fiscal deficit against which the seigniorage can be applied, or interest earned if there is a surplus. For example, when the government issues and sells a $20 bill to a chartered bank, whereas the bill pays no interest, the $20 received by the Bank of Canada, net of production and distribution costs, can be invested in the financial markets. Indeed, in the Bank of Canada balance sheet the securities purchased constitute an asset that offsets the liability to replace each $20 bill – albeit with another $20 bill. If the interest rate is 5 percent the interest earnings on the $20 bill is one dollar

per year.[8] The paper currency costs 6 cents to produce and has a life expectancy of three years, suggesting a replacement production cost of 2 cents per year. In addition there are distribution costs of a further 2 cents per year, for a total production and distribution cost of approximately 4 cents per year. The annual seigniorage gain from each newly circulated $20 bill is hence 96 cents per year.[9]

As in the case of coins, if paper currency were to be eliminated it would be necessary to withdraw the existing circulating currency – involving the crediting of the redeemers' bank accounts or pre-loaded cards - as well as to cease supplying any further paper currency. Both represent a cost to the federal government versus the status quo.

In buying up all paper currency the amount the government would have to raise or pay out of accumulated surplus is, as of the end of the first decade of the new millennium, approximately $58.8 billion. According to the Bank of Canada's webpage cited in footnote 8, this would represent an annual interest expense of $1.7 billion per year that can be thought of as what the government would have to spend annually if it were to retroactively lose its historical interest-free source of funds. Offsetting this is the benefit the federal government would enjoy by no longer having to manage that amount of currency in terms of replacing worn out bills. In 2009 the Bank of Canada spent $366 million on general operating expenses.[10] The currency management function represented 37 percent of this, or $137 million. Subtracting this saving in operating cost from the interest cost of redeeming the existing notes means that eliminating the existing currency in circulation would represent a net loss of ($1,700 million - $137 million) = $1,563 million per year.[11] This is shown in Table 1.

The Bank of Canada's annual loss from the redemption of existing circulating currency must be added to the annual seigniorage loss from not issuing new currency in the future. The average annual increase in the value of currency in circulation year-end to year-end from 2004 until 2008 was $2.37 billion.[12] This represents the bulk of the annual seigniorage loss due to cessation of creation of new currency, if that were to occur. However, this is offset ever so slightly by the saving in the future cost of managing this $2.37 billion: the cost of replacing worn-out bills. The $137 million Bank of Canada cost of currency management used above is with regard to the $58.8 billion stock of existing

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[8] The example is based on http://www.bankofcanada.ca/about/backgrounders/seigniorage/

[9] The federal government shares seigniorage profit from paper currency with successful counterfeiters. Given the estimate of counterfeit in circulation of 19 cents per Canadian, an amount that is likely to decline as plastic bills replace paper, we can ignore this in our discussion. See John F. Chant (2004).

[10] All values are from http://www.bankofcanada.ca/about/backgrounders/seigniorage/

[11] There are more direct ways of calculating the foregone seigniorage from eliminating currency if the necessary data had been available. The path we have taken is the result of using the estimates available from the Bank of Canada.

[12] http://www.bis.org/publ/cpss88.htm

currency. The annual rate of addition to circulating currency is (2.37/58.8), or approximately 4 percent per year. With management of the $58.8 billion total circulating currency costing $137 million per year, this suggests an annual saving of (2.37/58.8) × $137 million or $5.52 million from not having to manage any new currency.[13] Subtracting this saving of $5.52 million, from the $2.37 billion, the annual loss of seigniorage from cessation of new currency is $2.365 billion. [14] This is added to the annual cost from redeeming existing currency which we have calculated above as $1,563 million, or $1.563 billion. That is, the seigniorage loss from both ceasing to provide currency and from turning existing currency into interest bearing debt is $(1.563 + 2.365) billion = $3.928 billion per year.

Adding the $3.928 billion lost seigniorage from the elimination of paper currency to the $0.4235 billion that would be lost from the elimination of new and existing coins means a loss to the Canadian federal government from elimination of cash of $4.3515 billion per year. This is a little more than a quarter of one percent of Canada's current GDP. This estimate is smaller than, although similar in magnitude to, the 0.4371of a percent of GDP estimate of Canada's seigniorage by Reid W. Clark (1998) who estimated seigniorage for a wide spectrum of countries.

III. Undermining the Underground Economy: How Big Is It?

The presence of some citizens evading tax can cause a feedback loop by which there is further tax evasion. This can follow from resentment about the unfairness of others getting away without paying their fair share, or simply because of dissatisfaction with the level of public services received: the perception of not receiving value for money contributes to public pressure for lower tax rates. The potentially vicious cycle from tax evasion underlines the potential importance of eliminating access to cash which provides the anonymity on which the underground economy depends. All alternative means of payments leave a trail that the tax enforcers and criminal investigators can follow. (We lump together the tax and criminal authorities because studies of the size of the Canadian underground economy combine these activities.)

By its very nature the underground economy is not directly observable, and so estimates of its size must depend on variations in the influence of possible causes – such as changes in tax rates or avoidance opportunities – or consequences – such as the

[13] That is, currency management costs are assumed to have increased at 4 percent per year in line with the 4 percent growth in amount of currency being managed.
[14] We see that taking the annual seigniorage loss from forfeiting the ability to print currency as the face value of currency currently printed, and ignoring the saving in managing the currency, would have been a good approximation.

turnover velocity of cash, particularly high-denomination banknotes.[15] It is perhaps the result of attempting to know the unknown, and the fact that very different lines of investigation have been followed and definitions used, that estimates vary to an astonishing degree. Indeed, according to Pierre Lemieux in his study, *The Underground Economy*, the range of estimates is between 1.4% and 100% of official GDP![16] If this were indicative of the level of imprecision of measurement, any estimate of the elimination of anonymous cash on tax revenue would be meaningless. Fortunately, there is far greater agreement than this wide range of estimates might suggest.

An evaluation of the size of the Canadian underground economy that has been subject of a great deal of attention and scrutiny is David Giles and Lindsay Tedds' *Taxes and the Canadian Underground Economy.*[17] They estimate an unmeasured economy that escapes tax that varies from a low of 3.46 % of GDP in 1976 to a maximum of 15.64% in 1995. These percentages apply to the official GDP, that is, the published GDP, not the published plus the missing GDP.

Giles and Tedds use a MIMIC econometric model (multiple indicator, multiple cause) first used to measure the size of an underground economy by Frey and Weck-Hannemann (1984). This method involves consideration of the underground economy as a latent variable, or index, which itself cannot be observed, but which has causes and effects which can be measured. This makes it an obvious choice for considering the unobserved economy. Despite its apparent suitability for the purpose, the MIMIC model has been challenged, largely on the grounds that it may be measuring something other than the size of the economy, instead perhaps representing some other variable that is correlated with the hidden income, such as the value of transactions. One challenge in particular by Trevor Breusch (2005) claims that the values found for the size of the underground Canadian economy by Giles and Tedds (2002) are a matter of chance.

Giles and Tedds' estimates have also been questioned by Roderick Hill (2002) who argues that rather than use a latent variable approach, estimates of the size of the underground economy are more reliably based on what he calls "tax-induced currency holdings". This is currency holdings in excess of those due to above-ground factors such as spending, cash paid bills, wages and so on that give rise to use of cash. This is multiplied by the number of times per year – or velocity – that the tax-induced holdings are used. This provides an estimate of the annual tax-induced hidden income.

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[15] This has prompted the use of latent variables to judge the size of the underground economy. See Roderick Hill (2002).
[16] Lemieux (2007) *ibid.* Executive Summary.
[17] David E. A. Giles and Lindsay M. Tedds (2002).

The tax-induced currency approach relies on the anonymity of cash. This approach has been taken by researchers of the hidden economies of the United States and a wide range of other developed economies, including the study of 18 OECD countries by Friedrich Schneider (2000). A major difficulty in applying the tax-induced currency approach is determining the velocity of currency in the underground economy, which is almost certainly less than in the above-ground economy. According to Roderick Hill, when allowance is made for overstatement of velocity, estimates for the Canadian hidden economy are closer to 4 percent than to Giles and Tedds' 15 percent of official GDP.[18]

The underground velocity-adjusted estimate of the hidden economy is of similar magnitude to that of the study by Statistics Canada for the year 1992, the most recent available investigation by this agency. A variety of research methods went into this study of which it was said as recently as November 2007, "Presented as a maximum for 1992, Statistics Canada's estimate appears credible as an estimate of today's underground economy."[19] The various sources used, which included surveys, currency holdings and wear-and-tear of large denomination bills, resulted in an estimate of 5.2 percent of GDP, consisting of 4.2 percent of official GDP for the irregular economy and 1.0 percent for the black market, illegal economy. We will use these estimates as the basis of our calculation of the impact on government fiscal revenue of the elimination of anonymous cash from the Canadian economy.

In the calculation of the fiscal consequences of scrapping cash the size of the hidden economy is assumed to represent the sizes of hidden income *and* hidden sales. That is, we assume the proportion of income evading tax with or without cash is the same as the proportion of sales evading tax with or without cash. Ideally, when calculating the fiscal revenue implications of scrapping cash, a distinction should be made between hidden income and hidden sales: there is no reason they would be hidden to the same extent. Both income and sales provide sources of fiscal revenue for the provinces and the federal government. Unfortunately, we lack information on the proportion of hidden income versus that of hidden sales. However, we are able to allow for coverage differences of these two taxes. In particular, sales taxes are not applied to residential rent (or rental equivalent), non-restaurant food, interest payments and many medical and educational expenses. Incomes generated by these activities are subject to income tax. That is, while we are unable to allow for differences in hidden income versus hidden sales, in what follows we do allow for a broader application of income tax than sales tax.

IV. Undermining the Underground Economy: Fiscal Revenue Implications

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[17] Hill, 2002, *ibid.* For more on the importance of the assumptions made about velocity, as well as the role of marginal income tax rates, see Roderick Hill and Muhammed Kabir (1996).
[18] Lemieux, *ibid*. p.7.

The elimination of cash is not going to bring black market, illegal transaction such as those involving drugs and smuggled cigarettes into the light of day: none of this underbelly of the hidden economy will become part of the tax base. This means that the 1.0 percent of the economy involving illegal transactions according to Statistics Canada is lost as a source of revenue, whether cash is scrapped or not. It is from the "irregular" part of the economy, the house painter, roofer, firewood deliverer, domestic service provider and gardener which Statistics Canada estimates at 4.2 percent of the economy, that extra fiscal revenue will be forthcoming. Of course, this is not all going to become part of the tax base even if payment has to be made in a traceable form such as by the use of debit or credit cards. This is because:

- The vender might take the calculated chance that they won't be caught, and sell the good or service using a potentially traceable payment method, hoping to fly under the radar.
- The vender or buyer may decide it isn't worth selling or buying the product or service after the tax is factored in.
- They might use a foreign currency, most likely the U.S. dollar.
- They may resort to barter.

The question is to what extent each of these reduces the 4.2 percent of the GDP that in their absence would be accessible to the Canada Revenue Agency in a world without anonymous money. We consider them in reverse order.

Barter is never likely to be more than a negligible part of the economy, even with further growth of web-based arrangements such as E-Bay and Craig's List which can bring trading parties together, but for which transactions are in any case overwhelmingly settled electronically. Mutually beneficial direct barter exchange must overcome the need for a double coincidence of wants, the indivisibility problem faced with lumpy goods, perishability when needs are separated temporally, and the various other problems that have given rise to indirect exchange. Hence, virtually none of the potential tax base from the 4.2 percent of the official GDP would be lost to newly encouraged barter due to the absence of paper currency and coins if they were eliminated.

As for the use of US dollars or other foreign currency were Canada to act alone with the elimination of cash, there is certainly the possibility that there will be some resort to these alternative currencies. However, the possibility of being discovered as a tax evader when accepting, depositing or spending foreign currency is greater than being discovered when using Canadian currency. This is because, by law, all foreign currencies taken to a bank in amounts in excess of $10,000 must be duly reported and explained on a disclosure form. Indeed, smaller amounts, however small, must be reported to the

authorities if there is suspicion of any unlawful activity. Retailers would hesitate accepting a large amount of foreign paper money with the costs and risks of conversion, including counterfeit. Resort to foreign currency is therefore likely to occur among those with smaller and relatively infrequent transaction to settle. While we are forced to guess how much of the irregular economy will switch to foreign currency it is likely small, perhaps no more than 10 percent of the 4.2 percent of irregular underground GDP, that is, 0.42 of one percent.

If a buyer is not willing to buy the product or service when tax is going to have to be paid, or if the seller/provider is not willing to supply it, then tax revenue is not gained if underground economic activities are unearthed by the elimination of cash. For example, if a roofer would rather be idle than repair roofs when they have to pay income tax and sales tax, or if the homeowner leaves their leaky roof rather than pay sales tax, then tax revenue is not gained by tracking down offenders. If the roofer switched to aboveground activities, tax would be collected. Note also that the cost of foregone maintenance can be higher than the sales tax, making the matter one of delaying work, not of avoiding it entirely. Of course not all underground activities are as essential as roof repair. So, while we have to guess how much work would never be done and none done in its place if cash were scrapped, this would likely be rather small, probably less than 10 percent of the current irregular underground economy, or another 0.42 of one percent of official GDP.

Finally, we come to the size of that part of the underground economy which continues to attempt to evade tax even though the participants are no longer protected by the cloak of an anonymous means of exchange. Instead, they continue with their transactions, settling with a traceable form of payment with the hope they will somehow skip detection. The insistence on cash payment by suppliers who are currently evading tax suggests this would not be too common. If it is not common now to hope to escape tax even when a traceable means of payment is being used, we can expect this practice to remain uncommon. If it is a further 10 percent or 0.42 percent of the irregular economy, then of Statistic Canada's 4.2 percent we are left with approximately 3.0 percent of GDP. That is, based on the admittedly conjectural assumptions we have made, tax revenue is enhanced by 3 percent of GDP becoming visible to the Canada Revenue Agency as a result of the elimination of the anonymous means of exchange.

In terms of dollar amounts, 3 percent of GDP, which for 2010 was $1.625 trillion, is $48.75 billion. The next question to answer is how much tax would be paid on the estimated extra $48.75 billion. (Remember, in the absence of the required information we are assuming the scrapping of cash will bring to light the same 3 percent of sales as it does for the country's income.

V. Tax Revenue from Unearthed Activities

The estimation problem is easy to state but difficult to execute. If $48.75 billion of irregular activities are uncovered by eliminating cash, the revenues for the provincial and federal governments are the respective average tax rates applying to the *incremental* tax bases multiplied by $48.75 billion. We express it this way to make it clear that the average tax rates that newly disclosed income and sales face are rates that apply at the margin of the income or sales that would otherwise have been declared. For example, trades people who have been willing to offer certain customers a lower price for cash would likely have declared some of their sales and income. That is, they would have been reporting, but under-reporting. If the elimination of cash has them moving from under-reporting to more fully- or even fully-reporting, the relevant average tax rates applying to the extra declared income and sales are made up from the marginal rates starting from the otherwise under-reported income and sales levels. (Sales tax revenue is relatively easy to deal with as the percentage rates are flat.)

We would like to know not only the total tax collected on the $48.75 billion of incrementally revealed income and revealed sales, but how this tax revenue is divided between the federal and provincial government treasuries. This is complicated by the different cutoff levels for income tax rates in different provinces as well as the different income and sales tax rates that apply in different provinces.[20] Rather than select an entire range of possibilities according to where taxpayers live and how much they earn or buy, let us consider the revenue from incrementally declared income and sales for a Canadian taxpayer living and working in Ontario.

For the 2011 tax year the federal tax rate after basic deductions is 15 percent on income from $0 to $41,544. From $41,545 to $83,008 the federal rate is 22 percent. The Ontario provincial personal income tax rate is 5.05 percent on income of $0 to $37,774, and 9.15 percent on income of $37,775 to $75,550. This means that an individual declaring an incremental income due to elimination of cash, who previously declared an income of between $41,545 and $75,550, will face a combined tax rate of 31.15 percent (=22% + 9.15%) on the previously hidden income, provided their income does not rise above $75,550. The Ontario rate rises to 11.16 percent on income above $75,550. Therefore, incremental declared income above $75,551 but below $83,008 faces a combined rate of 33.16 percent (22% + 11.16%). The *average* rate in the income range in the interval $75,551 and $83,008 is the average of 31.15 and 33.26 percent with weights on the two rates depending on precisely where in the interval the declared income falls. For simplicity, if we work with an average of 33 percent combined tax rate, and think of this as 22 percent and 11 percent, we have a two-thirds, one-third split of the total 33

[19] For the different rates see http://www.cra-arc.gc.ca/tx/ndvdls/fq/txrts-eng.html

percent tax on the disclosed previously unreported income between the federal and Ontario governments.

Based on the assumptions made to translate the 4.2 percent estimate of the hidden informal economy according to Statistics Canada, into a 3.0 percent or $48.75 billion higher income tax base, and assuming Ontario is representative of provinces, we have a combined governmental revenue benefit from income tax of 0.33×$48.75 billion, or $16.1 billion. According to the two-thirds, one-third spit, this is divided between the federal and provincial governments respectively as $10.74 billion and $5.36 billion. These amounts are shown in Table 1.

It is not only income tax that will be more difficult to avoid or evade in a cashless Canadian economy. The base of another important source of fiscal revenue that will expand is the reported value of sales that are subject to the federal Goods and Services Tax, GST, and the provincial sales tax, PST. These two important sources of fiscal revenue have been combined in most provinces into the Harmonized Sales Tax, HST. HST is collected by the federal government with the provincial component then being transferred back to the provinces. HST is a value added tax making evasion difficult: with credit being given for tax paid along the production chain, there is generally a trail to follow for all intermediate transactions.

The federal sales tax rate is 5 percent in each province. Since the tax is a value-added tax that can be considered as applying only to final sales, and since it does not apply to approximately 50 percent of final spending, we calculate the tax as 5 percent of 50 percent of GDP. If elimination of cash results in a 3 percent improvement in venders paying GST who would otherwise have evaded it, fiscal revenue of the federal government is increased by 0.03×0.05×0.50×$1,625 billion=$1.219 billion.

The provincial sales tax rate, which for some provinces is incorporated in HST and collected by the federal government on behalf of the provinces, varies from zero in Alberta to 10 percent in Nova Scotia. In Ontario, which represents almost a third of the Canadian economy, the sales tax rate is 8 percent. In order to determine the combined increase in provincial fiscal revenue of all provinces collectively let us use this 8 percent rate as being the average for the country. With 3 percent more vendors reporting their sales, and with an 8 percent tax rate applying to 50 percent of GDP, combined provincial fiscal revenue is increased by 0.03×0.08×0.50×$1,625 billion=$1.954 billion.

We recall that the seigniorage loss from the elimination of currency and coin is $4.35 billion per year, with all of this being a loss for the federal government. It follows that the net benefit to the federal government from income and sales taxes and after allowance for lost seigniorage is ($10.74 + $1.22 - $4.35) = $7.61 billion per year. It follows that despite the moral hazard that the federal government may consider only its

own costs and benefits and ignore the provincial tax benefit of ($5.36 + $1.95) = $7.31 billion, it is worthwhile going ahead with the elimination of anonymous cash. And we have yet to consider benefits from reduced crime and associated saving in human costs from undermining the drug trade.

VI. Drug Trade in a Cashless World.

In the murky world of the illicit drug trade cash reigns supreme. One could scarcely imagine addicts producing their credit cards or writing a personal check to purchase cocaine, and it is even more difficult to imagine drug dealers accepting them. No business relies so much on payments anonymity as the market for illicit substances. Of course, even if all cash were eliminated some costs would remain. Existing addictions would continue. Thefts from pharmacies would not come to an end, and indeed would likely expand as drugs disappear on the street with dealers having no way to profit from their criminality, or at least doing business without risk of being caught. However, there is little doubt that the costs of this insidious business would eventually shrink in a world without cash.

The definitive study of the costs of substance abuse in Canada is that of J. Rehm and the approximately dozen contributors to the study titled, *The Costs of Substance Abuse in Canada 2002*, published simultaneously in March 2006 by numerous Canadian federal and provincial government departments and agencies.[21] The study examines the morbidity, mortality and economic costs due to the abuse of alcohol, illegal drugs and tobacco in Canada for the year 2002. The investigation attributes 1,695 deaths to illegal drugs. In addition it finds 554,131 criminal offences attributable to illegal drugs, which is 22.1 percent of the total number of criminal offences in Canada in 2002. The economic costs are studied using a modified human capital approach. Estimates are cross checked with sensitivity analysis using two other approaches. The key finding for our purpose is that illegal drugs impose a cost to Canada of $8.2 billion, 20.7 percent of the total cost of substance abuse. The cost includes losses due to effects on productivity, healthcare and law enforcement.

Of the $8.2 billion annual total cost of illicit drugs to Canada, the largest component, $5.87 billion, is from lost productivity. From the fiscal perspective of government, the focus of this investigation, the benefit from elimination of anonymous money via a reduction in lost productivity from reducing the trade in illegal drugs depends on the extent to which the productivity loss is reduced, and the extent to which this translates into higher income and sales. In turn the effects on tax revenues of the federal and the provincial governments depend on the extent to which incomes and sales of workers and firms increase, and the tax rates applying to these increased incomes and

[20] See J. Rehms et al., (2002).

associated sales. For example, if the drug trade is cut in half and this expands productivity and incomes by $4.1 billion, at an average income tax rate of 25 percent on the extra incomes the combined income tax revenues of the federal and provincial governments expand by $1.025 billion. Using the two-thirds, one-third split of income taxes this means $0.684 billion for the federal government and $0.342 billion for the provinces.

In addition to the added tax revenue from higher income due to reduced lost productivity there are revenue gains from GST and PST. Let us assume all the $4.1 billion extra income is spent, with sales tax applying to approximately 50 percent or $2.05 billion. GST is 5 percent, meaning extra sales tax revenues for the federal government of (0.05×$2.05) = $0.1025 billion. Using the Ontario sales tax rate as being representative for Canada, the provincial tax revenue increase is (0.08×$2.05) = $0.164 billion, which means combined sales tax increases for the federal and provincial governments via productivity of (0.684 + 0.342 + 0.1025 + 0.164) = $1.2925 billion.

The Rhems *et al* study of the costs of substance abuse calculated the direct health costs of illegal drugs as $1.13 billion. If the absence of an anonymous means of exchange cuts this in half, given that healthcare is funded approximately 50 – 50 by the federal and provincial governments, this is a fiscal benefit of the federal and provincial governments of $0.282 billion.

The balance of the total $8.2 billion cost of illicit drugs is the estimated $2.33 billion cost of law enforcement. This cost was attributed to $1.43 billion for policing, $0.57 billion for “corrections” (primarily incarceration), and $0.33 billion in court costs. Employing the assumption that these expenses will be reduced in half there are savings of $0.715 billion for policing, $0.285 billion for corrections and $0.165 for court costs.

Policing costs are incurred by all levels of government, municipalities, provinces and the federal government. It is difficult to disentangle the costs of the various responsible bodies. For example, Ontario and Quebec have their own provincial police forces while in all other provinces areas outside of major cities are generally policed by the Royal Canadian Mounted Police (RCMP). However, there are a lot of transfer payments for rendering policing services. For example, provincial and local jurisdictions policed by the RCMP contribute towards their cost. It would require a major study of its own to determine a proper attribution of costs and so for the purpose of this study we will allocate the saving of policing equally to the three levels of government. This means $0.238 billion in savings from a 50 percent reduction in the cost of illegal drugs for each governmental level.

The other two components of the costs of law enforcement associated with illicit drugs are corrections and court costs. To a reasonable approximation, when focusing on

the costs associated with illegal drugs, corrections are largely federal and court costs are largely provincial. Assuming these are cut in half by eliminating cash we have savings of $0.285 billion via corrections for the federal government and $0.165 billion for the provinces via reduced court costs.

VII. Conclusion

The preceding estimates are summarized in Table 1, where we can see that all levels of government gain from elimination of traditional cash, with the federal and provincial governments gaining more or less the same amount. The seigniorage loss from the elimination of coins and paper currency is limited to the federal government. Despite this, the federal government nevertheless gains via increased tax revenue and reductions in the health and legal costs of illicit substance abuse. Provincial governments share in the benefits via improved tax revenue and savings in costs. It is important that the federal government gains despite losing seigniorage because there should not be a moral hazard problem from diverging fiscal interests.

Putting the numbers in perspective, the combined fiscal improvement of the three levels of government of $17.94 billion is a little more than one-percent of Canada's GDP in 2010 of $1,625 billion. It is also equivalent to approximately 50 percent of the federal fiscal deficit for the budget year 2010-2011 of $36.2 billion.[22]

Of course, these estimates are based on assumptions regarding the impact of the removal of coins and paper currency on behavior. However, the assumptions we have made, such as the size of the underground economy and the costs of illicit substance abuse, are conservative and based on accepted research. Digital payments technology is central to this conclusion. It is no longer necessary to use cash in a digital age. It is time to consider the benefits of innovations in payment technologies. It is hoped that this paper focusing on Canada provides a template for other countries to see whether it is time to scrap cash.

Undoubtedly, despite the potential benefits of taking advantage of new, pervasive digital technologies to replace cash, some will complain at the loss of privacy involved in the use of traceable means of exchange. However, privacy must be offset against the unfairness of the tax system that allows some to avoid paying their fair share of taxes and the criminal elements involved in extortion and addiction that rely on anonymous money.

[22] http://www.budget.gc.ca/2011/glance-apercu/brief-bref-eng.html

Table 1: Annual Gain (+) or Loss (-) of Canadian Governments from Elimination of Coins and Paper Currency, billions CDN dollars.

			Federal	Provincial	Municipal
Seigniorage			**- 4.35**		
Bank of Canada		**- 3.93**			
New Notes	**- 2.37**				
Existing Notes	**- 1.56**				
Royal Can. Mint		**- 0.42**			
New Coins	**- 0.17**				
Existing Coins	**- 0.25**				
Income Tax Revenue		**+16.10**			
Federal			**+ 10.74**		
Provincial				**+ 5.36**	
Sales Tax Revenue		**+ 3.17**			
GST			**+ 1.22**		
PST				**+ 1.95**	
Illegal Drugs		**+ 3.02**			
Productivity	**+ 1.28**				
Income Tax			**+ 0.68**	**+ 0.34**	
Sales Tax			**+ 0.10**	**+ 0.16**	
Direct Health	**+0.56**		**+ 0.28**	**+ 0.28**	
Law Enforcement	**+ 1.18**				
Policing			**+ 0.24**	**+ 0.24**	**+ 0.24**
Incarceration			**+ 0.29**		
Court Costs				**+ 0.17**	
TOTAL		**+ 17.94**	**+ 9.20**	**+ 8.50**	**+ 0.24**

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