Forecasting Tax Implications of B2C E-Commerce

by

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1. Introduction

Advances in computing technology have become so commonplace that the scale of achievement can be difficult to comprehend. A useful analogy, suggested by *The Economist*, is that if cars had developed at the same pace as microprocessors over the past two decades, a typical car would now cost less than $5 and do 250,000 miles to the gallon. This revolution in information and communication technologies underlies the emergence of electronic commerce. E-commerce has the potential to be a world-shattering economic development in the 21st Century. Broadly defined, e-commerce is the delivery of information, products, services or payments by electronic media. The prevailing feature defining the evolution of electronic commerce has been the transition from private (closed) networks to open (public) networks such as the Internet. For the most part, transactions on private networks have been business-to-business. According to a report by the OECD (1997), one European retailer annually conducts over US$10 billion worth of transactions electronically and a European automotive manufacturer conducts over US$7 billion worth of business per year via private networks. Availability of the Internet has encouraged both consumers and businesses to engage in increasing numbers of electronic transactions. Currently, business-to-business transactions are dominating Net-Commerce as they have on private networks. Forrester Research estimates business-to-business commerce on the Internet at US$8 billion in 1997, and projects it to grow to US$327 billion by 2001. Moreover, according to *The Economist*, one US-based global conglomerate already does US$1 billion worth of business on its Web site with about 1,400 suppliers and this is only the tip of the iceberg. The challenge facing Canada (and every other digitally connected nation in the world) is to formulate a broad policy agenda on electronic commerce, and, specifically, one that deals with emerging tax issues. Governments must provide a fiscal climate within which electronic commerce can achieve its potential in the global marketplace, weighed against the obligation to operate a fair

and predictable taxation system.

In this paper, Section 2 provides an overview of e-commerce taxation issues and additional dimensions to be considered in cyberspace. Section 3 reviews electronic commerce taxation policies of Canada, the US and the OECD. Section 4 reports the findings of studies that have been undertaken to estimate the impact of e-commerce on various tax revenues. Section 5 discusses issues that must be addressed before effective forecasts may be made and offers, as a simple example, a model that we propose can be used to forecast the impact of e-commerce on Canadian sales-tax revenues. Section 6 contains a summary and some suggestions for further research.

2. The Administration of Taxes and the Expansion of Electronic Commerce

2.1 Four Desirable Principles of Tax Policy

2.1.1 Economic Neutrality and Equity

Fundamental principles of tax policy are that of neutrality and equity. A tax is neutral when it does not induce taxpayers to change their behaviour in response to the tax, and a tax will be considered equitable if the tax burden is distributed fairly among taxpayers. These principles dictate that taxpayers should not be subjected to different taxes which are a function of whether the transactions are Internet based or not. For example, the purchase of standard software through a 'bricks and mortar" retail outlet should be taxed in the same way as its direct download from a vendor's server. Electronic subscriptions to newspapers or magazines should be taxed in the same way as home delivery of the same material.

2.1.2　Administrative Ease

A workable tax system needs to ensure that taxes imposed can be collected with a reasonable level of administration and compliance costs. It should be easy to collect a tax.

2.1.3 Avoid Multiple Taxation

The tax treatment of electronic commerce transactions and of traditional transactions must not confer a competitive advantage to one way of carrying on business. There is a clear possibility that different jurisdictions seeking to tax e-commerce could each impose at tax, thus producing multiple taxes. For example, is the customer's service address, or is the point-of-service origin the appropriate taxation jurisdiction?

2.1.4 Allocation of Tax Base

If revenue is shifted between countries, between provinces, or between states, there may be overall revenue neutrality, but the possible shifts in jurisdiction may have unwanted revenue impacts on individual jurisdictions.

2.2 Income Tax Issues

2.2.1 Reporting

The unregulated nature of the Internet and the anonymity which it provides may make it easier to avoid or evade income tax on profits earned on electronic transactions.

Electronic commerce may increase the incidence of non-compliance with the tax system. Taxpayers who now intentionally avoid taxes often do so by going "underground". Avoidance tactics range from the simple act of not registering as a taxpayer to far more elaborate schemes such as involving dual sets of books. The ease of conducting electronic commerce may increase the number of simple attempts to avoid paying tax. Avoidance may also be made easier as the use of smart cards, electronic cash, electronic wallets and Internet banking with foreign banks all grow and flourish. Tax havens and jurisdictions that offer tax advantages are more accessible to a larger number of people. As well, tax-haven financial institutions are now readily accessible electronically to anyone who wishes to take advantage of secrecy laws to avoid or evade tax.

In addition to aggressive avoidance tactics, unintentional non-reporting may also be a looming problem with e-commerce. Some taxpayers may simply not be aware of their taxpayer or tax-

collector obligations. Borderless transactions may often mean that it is impossible to determine the purchaser's country of residence (or conversely the country of service origin) and so it becomes impossible to know and comply with tax laws of numerous foreign countries.

2.2.2 Inter-jurisdictional Issues

When a customer logs onto the Internet from a site in Canada, visits a music sales site that is being marketed on a German server, purchases MP3 music files (royalties paid to an Australian band) that are owned by a US company, is linked to an Irish server to download the files, and finally makes a payment to a bank in the Cayman Islands, the transaction creates enormous jurisdictional complexity for taxation purposes. The issue is further complicated by the need to determine whether the transaction concerns the provision of services, the sale of goods, or the sale of intellectual property (in the form of digitized media).

The Internet may have a significant impact on the determination of a corporation's residency status, which could potentially result in multiple jurisdiction taxation. Also, the reporting rules for transactions involving affiliated companies (transfer prices) may not be sufficient to track electronic transactions and allocate income and expenses between competing jurisdictions.

2.3 Sales and User Tax Issues

Sales tax is a tax on gross receipts from the sale or lease of tangible personal property as well as certain services. The tax is typically imposed on consumers, but collected by sellers. Where a sale is not subject to sales tax, because the seller is located outside the jurisdiction to which delivery is made, the sale is usually subject to use tax, a tax imposed directly on the consumer by the jurisdiction in which the purchased property or service is used.

Many of the issues which have been identified above with respect to income tax are also relevant to those which arise with respect to consumption taxes. The growth in electronic commerce may lead to a shift in the current tax collection points for intangibles and services. Uncertainty is bound to arise over the application of current sales taxes applied to virtually invisible trans-

border transactions. Conflicts may become apparent between sales taxes of different jurisdictions or between sales tax authorities. Compliance burdens for businesses could increase as a result.

3. Current Public Policy on Electronic Commerce Taxation

3.1 Canada

Canada is committed to developing a coordinated tax and legal framework to promote electronic commerce [Government of Canada, (1998 a), (1998b), (1998c)].

Four electronic commerce technical advisory groups were formed in the spring of 1998,

namely: 1. Taxpayer Service, 2. Compliance and Administration, 3. Interpretation and International Co-operation, and 4. Consumption Taxes. Revenue Canada has expressed a commitment to ensuring that electronic commerce activities are properly taxed without placing an unreasonable compliance burden on taxpayers and the Department claims it will provide guidance to taxpayers on electronic commerce matters.

3.2 United States

The President of the United States approved *A Framework for Global Electronic Commerce* in July, 1997. The document covers electronic commerce policy issues in the areas of taxation, electronic cash, privacy, security, copyright protection, consumer protection, and market access. The essential message in the *Framework* is that the US government wishes to see e-commerce flourish.

Specific principles governing the development of domestic and international tax policy require that any new tax policy should:
1. not hinder commerce, discriminate among types of trade, or create incentives that will change the nature of transactions or their locations;
2. be simple, transparent, capable of capturing the overwhelming majority of appropriate revenues and easy to implement;
3. minimize burdensome record keeping and costs for all parties, and

4. be able to accommodate tax systems used by international partners.

Since the *Framework*'s release, a number of fragmented initiatives have evolved in the US Congress passed the Internet Tax Freedom Act[1] in 1998. Unlike the implication of the name of the Act, the legislation does not mean that electronic vendors are free to go about their business without the onerous constraints imposed by the "taxman." The Act offers little to Web-based business, and can potentially result in higher taxes on Internet-based transactions. The Advisory Commission on Electronic Commerce (ACEC) was formed and met in June 1999. Thus far, the ACEC has focused almost entirely on sales tax issues such as the ability of the states to collect sales tax from remote sellers. Tax neutrality is the goal of discussions.

3.3 OECD

Much of the policy statements released in both Canada and the US have their foundations in work being done via the OECD. The OECD is undertaking an enormous strategy to accelerate establishment of the necessary rules for frictionless international electronic transactions. Three electronic commerce conferences have been held in order to generate an international policy framework to foster and promote electronic commerce:

1. The first conference – *A Global Marketplace for Consumers*, Paris France, March 1997 – focused on consumer issues and impediments.

2. The second – *Dismantling the Barriers to Global Electronic Commerce*, Turku, Finland, November 1997 – focused on private sector impediments and the roles of the private sector and governments in addressing the impediments.

3. The third and final conference – *The Borderless World: Realizing the Potential of Global Electronic Commerce*, Ottawa, Canada, October 1998 – was held for officials at the ministerial level and was meant to formulate governments' response to the identified marketplace impediments and needs.

A series of follow-up meetings at OECD headquarters in Paris on 11-13 October 1999 evaluated progress since Ottawa on a range of issues and discussion revolving around the next steps

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[1]Internet Tax Freedom Act, 105th Congress, Second Session, H.R 4328 Title XI. Effective October 1 1998 and ending three years after date of enactment.

needed. The policy framework is still very much in progress. However, the Turku conference resulted in a general consensus on the following points relating to taxation:

1. Any taxation proposals should ensure neutrality and a fair sharing of tax revenues, avoid causing double taxation (or no tax) and avoid excessive compliance costs.
2. There is a preference for existing taxes to be applied to the electronic commerce environment.
3. Tax-compliance issues are more pressing than tax policy issues.
4. Governments and businesses should work cooperatively to develop solutions to tax problems.
5. Governments must move to a globally seamless approach to tax administration.
6. Tax should not be a barrier to the development of electronic commerce.
7. Electronic commerce should not be allowed to undermine taxation systems.
8. A bit tax[2] is not desirable

The messages sent by leaders and policy makers of the worlds economies is clear: e-commerce will be facilitated and encouraged to burgeon. The messages being sent are that governments should recognize the unique qualities of the Internet, should avoid placing undue restrictions on electronic commerce, and if government involvement is necessary, it should be done in a minimalist fashion that facilitates electronic commerce.

The current rhetoric is also magnanimous when it comes to international cooperation and global commerce. However, if the growth of e-commerce leads to significant tax revenue loss and rising non-compliance to taxation laws, there may well be a shift in the focus of public policy away from minimal interference and toward stringent control.

What does the future hold? To understand the variety of prospective roadways that will lead the information superhighway to the future, potential lost revenue and non-compliance must be estimated. Forecasts of the impact of e-commerce will enable policy-shift forecasting.

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[2] A bit tax is a consumption tax levied on the transmission of digital information. The primary objection to a bit tax is that a "transaction tax" is levied on the flow of electronic information, without regard to the value of that information.

4. Current Empirical Estimates of the Impact of E-Commerce on Tax Revenues

4.1 Taxation on Electronic Commerce

There has been little work published that attempts to evaluate the impact of taxation on Internet commerce. Discussions of the impact of prices on Internet use can be found in the works of Mackie-Mason and Varian (1994) or in McKnight and Bailey (1998). Issues of borderless transactions are raised by the growth of electronic commerce. According to economic theory, it is expected that consumer sensitivity to tax rates will be stronger for those living along geographic borders. The cost of arbitraging tax rates across locations is low and this can impact tax policy [Gordon and Neilsen (1997), Braid (1997) and Trandel (1994)]. Empirical work on tax elasticities in border states has confirmed these theoretical hypotheses [Fox (1986) and Holmes (1998)]. Can these 'real world' results be 'digitized'?

4.2 Tax Revenue Impact Estimates

There has also been little work published to date on taxes and the Internet. What has been written has provided conceptual frameworks [Mclure (1997 and 1999), Fox and Murray (1997), Hellerstein (1997)]. However, the assertion that e-commerce is not currently hurting US state and local tax revenues is supported by a recent study by Ernst & Young [Cline and Neuberg (1999)]. The study shows that in 1998, tax-free Internet sales amounted to only about $170 million in lost sales taxes. By contrast, over $4 billion in sales taxes were lost during the year to mail-order sales. According to the study, 80% of e-commerce is business-to-business, and not subject to sales and use tax.[3] In addition, 63% of Internet-based purchases by consumers involve US tax-exempt services, such as travel and financial services. Finally, according to the study, less than one percent, or $20 billion, of total consumer spending has been retail Internet spending The concern on current sales tax losses [Graham, (1999), Goolsbee and Zittrain, (1999)] may be

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[3] The impact on a value-added tax (VAT) common in Europe would be much more pronounced.

misplaced, but the issue is not today's sales and use tax losses, but tomorrow's. No one would be investing in money-losing Amazon believing that current levels of e-commerce would extend indefinitely into the future. By all accounts, e-commerce will expand dramatically in the future, and that is when tax jurisdictions will feel real pain.

4.2 Behaviour Shifts Due to E-Commerce Taxation

Goolsbee (1999) presents an empirical analysis of how local taxation affects the decision of consumers to initiate Internet purchases. His results do suggest that taxation plays a role in e-commerce. Higher tax jurisdictions have higher Internet purchase rates, and, further, the impact of taxes on Internet commerce appears to be greatest for online products that, a priori, are most likely to save the buyer from paying taxes. The author does acknowledge that the future may see substantial losses of sales and use tax revenues under the current US tax regime. Interestingly, his solution is to make all Internet-based sales tax free for a few years to encourage growth of e-commerce, but to make the sales taxable in the future.

E-commerce may also have significant impacts on other tax revenues. It is possible that firms may locate in low tax areas in order to reduce overall labour costs. Indeed, some firms my have virtually no physical location, with the server being located in some tax shelter. Such locational behaviour is difficult to predict. However, some policy coordination may be required if a sizeable misallocation of resources is to be avoided.

5. Forecasting the Tax Revenue Impact of E-Commerce

5.1 Estimating the Impact of E-commerce on Sales Tax Collections

In this section we present a simple model to illustrate the potential impact of the growth of electronic commerce on Canadian sale tax revenues. The model used is of the form:

$$ST_1 = \alpha + \beta_1 CM_1 + \beta_2 Import_t + \beta_3 DGST + \beta_4 t + \beta_5 EC_t + \varepsilon_t \qquad (1)$$

where ST_t represents total sales taxes collected in period t; CM_t is consumption of domestically produced goods and services; $Import_t$ is consumption of imported goods and services; DGST is a dummy variable (equal to unity from January 1991 on) reflecting the changes to the Canadian sales tax system associated with the introduction of the goods and services tax and the abolition of the manufacturers sales tax; t is a time trend; EC is the estimated value of electronic commerce in period t; and ε_t is a random error term assumed to be iid. The data for ST, CM, and Import have been taken from the Canadian System of National Accounts as reported on CANSIM[4]. The data for EC have been estimated on the basis of data obtained from the OCED(1999).

Ideally, one would wish to estimate tax revenue using a much more disaggregate model (Fullerton, 1988). Tax rates vary considerably between the various provinces and the tax treatment of various goods and services differs at both the provincial and federal levels. Additionally, it is difficult to estimate the expected tax losses due to locational shifts and tax incentives at this level of aggregation. However, lack of any reliable estimates of regional electronic commerce activities prevents such analysis. Equation (1) has been estimated using quarterly data from 1961 to 1999 and the results are reported in Table 1.

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[4] CANSIM is Statistics Canada's computerized database.

Table 1: Estimation Results for Equation (1)			
Variable Name	Coefficient	Standard Error	T-Ratio
CM	0.069662	0.0026629	26.160
T	-30.138	5.3868	-5.5948
DGST	-1077.1	236.60	-4.5526
EC	-0.044398	0.016829	-2.6382
IMPORT	0.060698	0.0026955	22.518
CONSTANT	-723.62	142.42	-5.0807
Durbin-Watson = 0.3243 Von Neuman Ratio = 0.3264 RHO = 0.83800			
Residual Sum = -0.19213E-10 Residual Variance = 0.38810E+06			
Sum of Absolute Errors = 75764.			
R-Square Between Observed and Predicted = 0.9954			

Since many of the variables in equation (1) are nonstationary, we must test whether it forms a co-integrating relationship before relying on it for out-of-sample predicting. One commonly used test of this fact is to test the residuals of equation (1), ε_t for stationarity. This may be done by estimating the following equation:

$$\left(\varepsilon_t - \varepsilon_{t-1}\right) = \gamma\varepsilon_{t-1} + \mu_t \qquad (2)$$

where the ε's are the residuals from equation (1) at time period t and t-1 respectively, and μ_t is an independent random error term. For equation (2) to be stationary, γ must be strictly less than zero, but greater than minus unity. The results of the estimation of equation (2) are given in Table 2.

Table 2: Regression Results for Equation (2)			
Variable Name	Coefficient	Standard Error	T-Ratio
LE	-0.16200	0.044736	-3.6213
Durbin-Watson = 2.3881 Von Neuman Ratio = 2.4039 RHO = -0.19481 Residual Residual Sum = 1403.8 Residual Variance = 0.11272E+06 Sum of Absolute Errors= 34300. R-Square Between Observed and Predicted = 0.0798			

The results presented in Table 2 clearly indicate that equation (1) does form a co-integrating relationship which may be used to make predictions concerning the level of sales tax revenues expected in Canada.

5.2 Forecasting the Exogenous Data

In order to make out-of-sample predictions using equation (1), the values of the exogenous variables must be found for the full forecast period. Data for consumption and imports have been forecast using univariate ARIMA models of the form:

$$\left(1 - \varphi_1 B - ... - \varphi_p B_p \right) Y_t = c + \left(1 - \vartheta_1 B - ... - \vartheta_q B_q \right) \varepsilon_t \tag{3}$$

Both series require one difference in order to be rendered mean stationary. The exact form of the models used are ARIMA (4,1,3) for domestic consumption and ARIMA (4,1,2) for imports. The time trend and the dummy variables have been assumed to be deterministic throughout the forecast horizon.

The data on electronic commerce present a greater challenge. The known data are available for a very short time horizon and are subject to considerable variation and uncertainty. Methods for extrapolation of the series into the future are not obvious. Clearly not enough data are available for the reliable fitting of a time series model as has been done for the other key exogenous

variables. The technique chosen in this paper is a modified form of models suggested for the forecasting of new product demand. Parker (1994), Mahjan and Wind (1988) and Easingwood (1989) have all suggested methods for prediction of new events when only preliminary data are available. The key to most such procedures is to estimate the rate of penetration of the new product and the potential maximum rate of usage or penetration. In this case we treat direct business-to-consumer electronic commerce as the new product analog, and model the growth as a percentage of total consumer sales. Various functional forms have been suggested, including the logistic curve, the Gompertz curve, and the Bass model from marketing literature (Bass [1980]).[5]

In this study we have used each of these applied to the OCED estimated benchmarks and forecasts for business-to-consumer electronic commerce and to an analog version using total direct marketing including mail orders, telemarketing, etc. The base case reported uses a combination of the individual projections, as suggested by Mahjan and Wind (1988).[6]

5.3 Forecasts of the Impact of E-Commerce on Canadian Sales Tax Collections

Based on these estimates, we have evaluated the value of EC to be approximately $1 billion for Canada in 1999, representing about 1/5 of one percent of total consumer transactions. Given our estimate of sales-tax leakage of -0.044, the tax loss due to electronic commerce is currently about 44 million dollars. By 2005 we project business-to-consumer electronic commerce to be in the range of $31 billion or approximately three percent of total consumer transactions. If the parameters of the tax function are not changed, the resultant prediction of lost sales-tax revenues would be $1.3 billion or roughly two percent of the expected level of sales tax collections.

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[5] All these models yield S-shaped growth curves that become asymptotic to some maximum utilization or adoption rate. The main difference is with respect to the point of inflection of the growth curve. The point of inflection occurs at a penetration rate of 50% for the logistic curve, 37% for the Gompertz curve and at an empirically determined level in the Bass model. For details see Easingwood (1989).

[6] Although not used in this paper, consumer intension surveys and neural networks may effectively be applied to the issue of forecasting e-commerce growth.

6. Summary and Conclusions

This paper has examined some of the issues involved in attempting to forecast the tax implications of the rapid expansion of electronic commerce, which has already been observed over the past few years and which is predicted to accelerate in the next decade.

It has been noted that the current levels of e-commerce do not pose much of a threat. However, most forecasts indicate that e-commerce is on the verge of a take-off that may revolutionize the retail sector. Governments are beginning to take the threat seriously, but are still moving with glacial speed. Adam *et al.* (1999) note that the US government took nearly a hundred years to coordinate its tax policy with the development of mail-order business.

The paper has also attempted to provide some preliminary empirical estimates for the Canadian economy. First, a simple regression model designed to be applied to the forecasting of future Canadian sales tax revenues has been presented. Second, drawing from the literature on new product forecasting, we have attempted to suggest methods that could be used to predict the future rate of growth of the electronic commerce sector. These methods include the use of consumer surveys, neural network systems, and specific growth models of the logistic, Gompertz, or Bass variety.

On the basis of the model developed in the paper, we project that by 2005 business-to-consumer electronic commerce will be in the range of $31 billion, or approximately three percent of total Canadian consumer transactions. If the parameters of the tax function are not changed, the resultant prediction of lost sales-tax revenues would be $1.3 billion, or roughly two percent of the expected level of Canadian sales-tax collections. Compared with estimates produced by the OECD, our estimates appear to be conservative.

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