C.D. Howe Institute
COMMENTARY

URBAN ISSUES

Sand in the Gears:

Evaluating the Effects of Toronto's Land Transfer Tax

Benjamin Dachis
Gilles Duranton
Matthew A. Turner

In this issue...

The Toronto Land Transfer Tax (LTT), implemented nearly a year ago, has had significant negative effects on the housing market, reducing sales and lowering average house prices.

C.D. HOWE INSTITUTE
1958–2008
INSTITUT C.D. HOWE

The Authors of This Issue

Benjamin Dachis is a Policy Analyst at the C.D. Howe Institute.

Gilles Duranton is Professor of Economics and Noranda Chair in International Trade and Development in the Department of Economics, University of Toronto.

Matthew A. Turner is Professor of Economics in the Department of Economics, University of Toronto.

Rigorous external review of every major policy study, undertaken by academics and outside experts, helps ensure the quality, integrity and objectivity of the Institute's research.

The Study in Brief

On February 1, 2008, the City of Toronto imposed a Land Transfer Tax (LTT) on the sale of real estate within its municipal boundaries. This LTT requires that buyers pay a tax of about 1.1 percent on the purchase of a house in Toronto.

We assess the effects of the LTT on the volume of sales and on prices using data on the sale of single-family homes in the Greater Toronto Area between January 2006 and August 2008. Our data show that the LTT caused a 16 percent decline in the number of single-family homes sold after January 2008 and a 1.5 percent reduction in house values. We calculate that in its first year, the LTT will cause a reduction in household mobility – at least 3,500 families in the municipality of Toronto will stay in houses from which they would have otherwise moved – and an average reduction in selling price of about $6,400 per house.

The reduction in household mobility means that families will be more likely to remain in houses that are too big or too small, or are too far from their workplace or school. The dollar value of this lost mobility is about $1 for every $13 of revenue that the LTT generates for Toronto's coffers, or about $12 million per year. We also find that the LTT has led to significant new administrative expenses.

While an LTT and an ordinary property tax have similar effects on property prices, their effects differ otherwise. Unlike an LTT, an ordinary property tax does not discourage mobility and does not involve the extra administrative expenses associated with the LTT. More concretely, if Toronto raised property tax rates by about 8 percent, then property owners would pay about the same amount of tax as under the LTT. However, because an ordinary property tax does not discourage mobility, they would pay these taxes on houses that suited them better and would be relieved of the extra administrative expenses of the LTT. It follows that the welfare of Toronto residents could be improved if the city reduced its reliance on the LTT in favor of the preexisting property tax.

About the Institute

The *C.D. Howe Institute* is a leading independent, economic and social policy research institution. The Institute promotes sound policies in these fields for all Canadians through its research and communications. Its nationwide activities include regular policy roundtables and presentations by policy staff in major regional centres, as well as before parliamentary committees. The Institute's individual and corporate members are drawn from business, universities and the professions across the country.

INDEPENDENT • REASONED • RELEVANT

Now taxes always generate controversy, and this holds true for the City of Toronto's Municipal Land Transfer Tax (the LTT). After a few months of debate in late 2007, City Council voted to begin collecting the tax in February 2008.

Now, nearly a year after the tax was implemented, it is possible to evaluate the impact of the tax on real estate transactions and prices in Toronto, and to reach conclusions about the desirability of using the LTT as a source of municipal funding.

The Toronto real estate market experienced a decrease in both volume and average price after the introduction of the LTT in 2008. (Figures 1a and 1b show transaction volumes and prices for 2005 through 2008 both inside and outside the City of Toronto.) It is tempting to attribute this decline entirely to the LTT. However, transactions and values also declined in the surrounding municipalities; thus, other forces were also at work. To assess the desirability of the LTT as a source of municipal funding, we must first correctly distinguish its effects from those of other factors affecting real estate markets.

To accomplish this, we restrict attention to real estate transactions near the border of the municipality of Toronto, and compare changes in transaction volumes and values in Toronto with the changes in transaction volumes and values in adjacent municipalities. After the LTT's imposition, transaction volumes and prices in Toronto dropped relative to adjacent areas not subject to the LTT.

More specifically, our analysis indicates that Toronto's LTT caused a 16 percent decrease in the number of single-family home sales (excluding condominiums and apartments). The decrease in transaction volume appears to be larger for houses below average value, and smaller for those above. Our analysis also indicates that Toronto's LTT caused an approximately 1.5 percent reduction in the average sale price of a Toronto home. This amount is close to, or above, the average LTT exaction. The decline in prices appears to be larger for houses above average value, and smaller

for those below. Thus, while the LTT reduces the wealth and mobility of all Toronto property owners, it has a relatively larger effect on the mobility of the less affluent and a relatively larger effect on the wealth of the more affluent.

Both an LTT and an ordinary property tax are expected to have similar effects on property prices. However, unlike an LTT, an ordinary property tax does not discourage mobility and does not involve the extra administrative expenses of the LTT. More concretely, if Toronto raised property tax rates by about 8 to 10 percent, property owners would pay about the same amount of tax as under the LTT.

Nonetheless, because an ordinary property tax does not discourage mobility, they would: (i) pay these taxes on houses that suited them better; and (ii) be relieved of the extra administrative expenses of the LTT. It follows that the welfare of Toronto residents could be improved if the city reduced its reliance on the LTT in favor of the property tax already in place, or increased user fees.

It is reasonable to expect that the effects of Toronto's LTT are similar to the effects of LTTs imposed by the Province of Ontario and by other provinces and municipalities. Thus, our analysis also suggests that welfare improvements are possible if these other governments decrease their reliance on LTTs in favor of regular property taxes. Other municipalities and provinces that currently levy LTTs, or are considering doing so, should consider an alternative tax to raise the equivalent funds.

The remainder of this paper is organized as follows. The next section describes the LTTs in Toronto and elsewhere. Section three addresses the problem of estimating the effect of the LTT on transaction volume. In section four, we calculate the cost of lost mobility from the LTT. In section five, we measure the effect of the LTT on the prices of single-family homes and conclude with a policy assessment of the LTT.

Background and Policy Context

Land transfer taxes are widely applied both in Canada and abroad. Within Canada, the governments of British Columbia, Manitoba, Ontario, Quebec, New Brunswick, Prince Edward Island, and some Nova

Figure 1: Transactions and Prices of Real Estate in the City of Toronto and Surrounding Suburbs, Five Kilometres from Border of City of Toronto

A. Number of Transactions

B. Sale Price
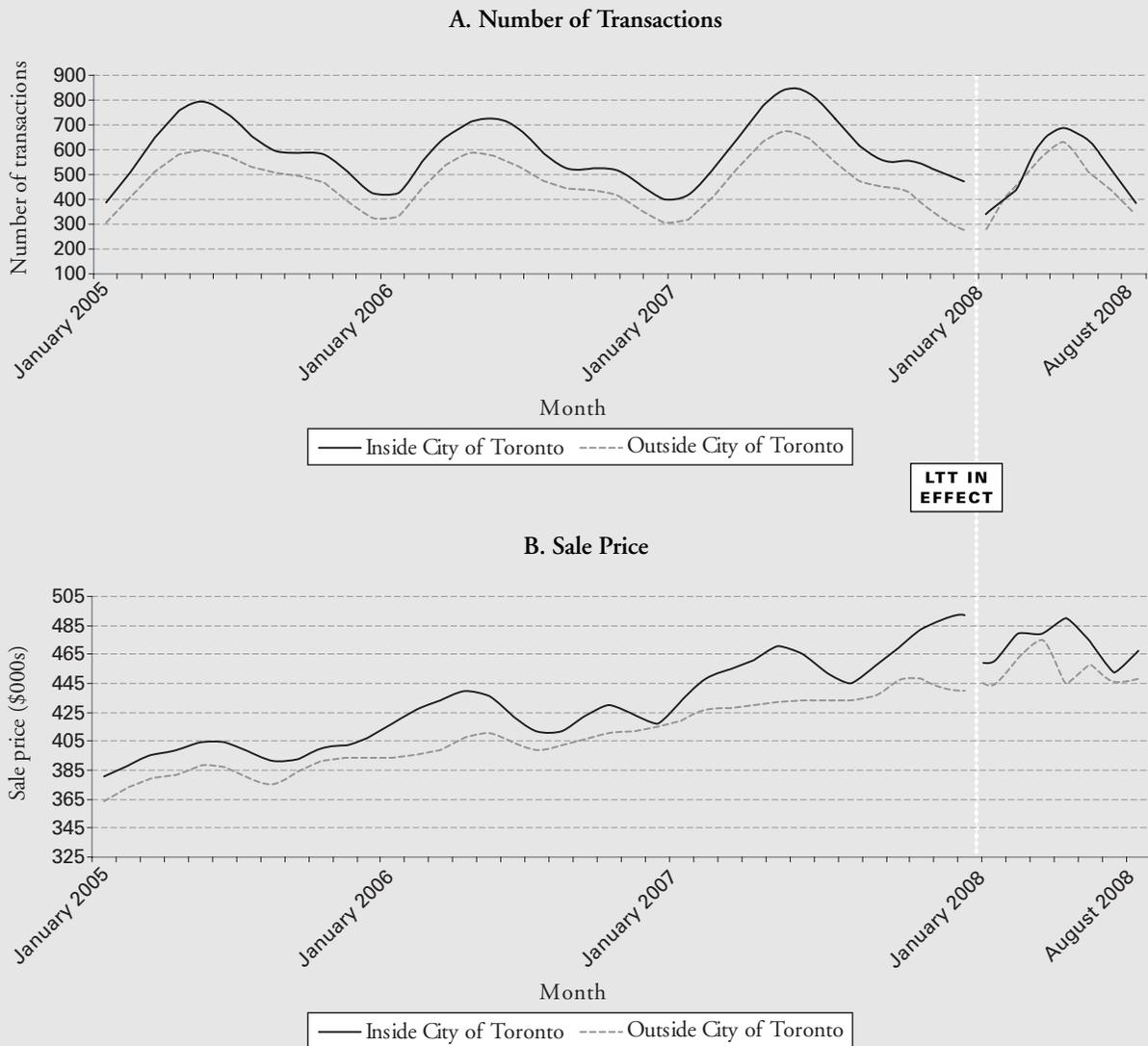
Note: The dashed line in this figure shows the number of sales and the average price of a single-family house in a five-kilometre-wide band just outside the Toronto border between January 2005 and August 2008. The solid line shows the corresponding graphs for the five-kilometre-wide band just inside the Toronto border. There is a drop in Toronto house sales and prices that is not matched by a drop in nearby suburbs not subject to the LTT.

Sources: Multiple Listing Service; authors' calculations.

Table 1: City of Toronto and Province of Ontario Land Transfer Tax Rates			
City of Toronto LTT Rate by Value (Effective Feb. 1, 2008)		Province of Ontario LTT Rate by Value (Effective May 7, 1997)	
dollars	*percent*	*dollars*	*percent*
0-55,000	0.5	0-55,000	0.5
55,000-400,000	1.0	55,000-250,000	1.0
400,000+	2.0	250,000-400,000	1.5
		400,000+	2.0

Note: For the municipal LTT, exemptions are given to first-time homebuyers for the value of a purchase under $400,000. For the provincial LTT, exemptions are given to first-time homebuyers for the value of a purchase under $227,500.

Sources: Municipal Land Transfer Tax, City of Toronto, http://www.toronto.ca/taxes/mltt.htm; Provincial Land Transfer Tax, Historical Land Transfer Tax Rates, Province of Ontario.

Scotia municipalities impose a land transfer tax, while the City of Winnipeg has been granted the power to impose an LTT but has not done so. In the United States, 35 states and the District of Columbia impose some form of property transfer tax, along with many municipalities. Indeed, in many US cities, property sales are subject to both municipal and state taxes.[1] Australian states levy a similar tax with rates up to 6.75 percent, while the UK LTT, called a 'stamp duty tax,' ranges from 1 to 4 percent.[2] Countries in Southern Europe also rely on land transfer taxes. In France, for example, the rate for residential property was above 10 percent during the 1980s, but was reduced to 4.8 percent in 1999.[3]

The City of Toronto Land Transfer Tax

In Ontario, as in most other provinces in Canada, most municipalities are granted specified and limited powers of taxation. *The City of Toronto Act* (2006), which took effect on January 1, 2007, authorized the City of Toronto to impose a number of additional taxes. These newly available levies

included a land transfer tax, as well as taxes on advertising, parking spaces, vehicle registrations, amusement, alcohol and tobacco, and road tolls.

The Toronto City Council first considered a land transfer tax in July 2007 as a response to ongoing revenue shortfalls – reported to be an expected $576 million for the 2008 fiscal year if no new revenue sources were found. The City Council narrowly defeated the implementation of an LTT on July 16, 2007; instead voting to defer a decision until October 2007. In response, the Mayor announced emergency cuts to municipal services until additional revenue could be found.[4] While it considered a number of other possibilities beforehand, on October 22, 2007, City Council ultimately approved an amended LTT, with a more progressive rate structure and an exemption for first-time buyers, to be implemented on February 1, 2008.[5] The final rate schedule for Toronto's LTT is given in Table 1, along with the corresponding provincial tax rates.

The municipal LTT is expected to raise approximately $155 million in 2008 and is projected to raise $240 million once fully implemented (City of Toronto 2008).[6] Of this $240 million, on the basis of

---

1   The highest such tax is in Philadelphia, where the maximum rate is 4 percent, with 3 percentage points going to the City of Philadelphia and 1 percent going to the state. This tax is tied with Toronto's as the highest combined rate in North America.

2   In contrast to other LTTs, the marginal rate is applied to the entire value of the house rather than the value above a certain threshold. On August 2, 2008, the Brown government increased the threshold at which no stamp duty land tax applies from £ 125,000 GBP to £ 175,000. BBC News. August 2, 2008. "Stamp duty axed below £175,000." http://news.bbc.co.uk/2/hi/uk_news/politics/7592852.stm

3   See Friggit (2003).

4   See John Spears and Robyn Doolittle. "Libraries agree to cuts, but police defy mayor; But library board responds to mayor's budget demands by trimming $1.2 million." *Toronto Star,* July 26, 2007, p. A.1.

5   Transactions with agreement of sale after January 1, 2008, and closing date before February 1, 2008, were exempt from the LTT. All transactions with sale date before January 1, 2008, were exempt from the LTT regardless of whether the closing date was before or after February 1, 2008.

6   Municipal Land Transfer Tax (MLTT). Third Quarter 2008 Variance Report. Corporate Finance Division, City Hall.

2007 sales, we project that $150 million will be raised by sales of single-family residential properties. This is not out of line with city estimates since some extra revenue will be generated from condominium sales and commercial properties.[7] The provincial LTT raised approximately $1.4 billion in revenues in 2007/08, but is expected to raise only $1.2 billion in 2008/09.

Toronto's adoption of the LTT as the primary response to its budget deficit was uncertain until the City Council actually approved the tax on October 22, 2007, owing to the wide range of new taxes considered, the close margins on relevant City Council votes and the negative public response to the tax.[8] This fact will be important to our strategy for estimating the effects of the LTT on real estate markets.

Earlier Evaluations of Land Transfer Taxes

While LTTs appear to be quite common, there have been few systematic efforts to measure their effects. Existing studies include the following examples. First, on the basis of fewer than 400 transactions, Benjamin, Coulson and Yang (1993) found that real estate prices fell considerably after an increase in the Philadelphia Real Estate Transfer Tax. Second, a study of the Toronto LTT commissioned by the City of Toronto (Nowlan 2007) argued, from theoretical foundations and hypothetical estimates of the demand and supply for housing, that the LTT would have only a small impact on the Toronto real estate market. Another study of an equivalent European tax showed that an LTT-equivalent with the same rate would decrease mobility by 8 to 19 percent (Van Ommeren and Van Leuvensteijn 2005).

Our study is based on a sample that records the large majority of single-family home transactions in the greater Toronto area for 25 months before the imposition of the LTT and for the first seven months afterward. Thus, we can reasonably hope to arrive at definitive estimates of the LTT's effects.

Measuring the Effect of the LTT on Volume

We first estimate the effect of the LTT on the volume of real estate transactions. Our data describe the sale of 139,266 single-family houses in the greater Toronto area that were listed with the Multiple Listing Service and sold between January 2006 and August 2008.[9] In particular, our study area includes Toronto and all nearby municipalities: Mississauga, Brampton, Vaughn, Richmond Hill, Markham and Pickering. (A map of the study area is provided in the Appendix.) These data are maintained by the Toronto Real Estate Board and are estimated to reflect about 85 percent of all sales of single-family homes (Hendel, Nevo and Ortalo-Magne 2008). For each transaction we observe the sale price, the date when the contract was signed, the date the transaction closed, and the property's postal code.

To determine whether a sale is subject to the LTT, we first verify whether the property is in Toronto by the postal code in the Multiple Listing Service dataset (postal codes that start with the letter M). We use GIS software to determine how far each postal code centroid is from the Toronto border. Figure 2 presents a map of a portion of the Toronto border along with outlines of census tracts and postal codes. In this figure, the Toronto border is a wide light gray line. Census tract boundaries are medium-width lines in medium gray. Postal code boundaries are thin black lines. Postal code centroids are black points. In Toronto, postal codes are typically one block along one side of a street and thus very small. As can be seen from the scale bar in the upper left, postal code centroids are generally within a few hundred meters of a property, and are often much closer. Thus, we can be confident that we calculate properties' locations accurately.

Conditional on a sale being in Toronto, we must also determine whether the sale occurred before or after the imposition of the LTT. Since we observe the date on which the house is sold, this is straight-forward. Any sale that was agreed on after January

---

7   We exclude condo sales and commercial properties from our analysis for numerous reasons. The main one is that for condo sales we have information about the apartment but lack detailed building information. Furthermore, new units are usually sold directly by developers outside the MLS – resulting in large gaps in condo market coverage. A very low share of commercial sales is included in the MLS data.

8   The city ultimately relied on a combination of revenues from the LTT, a property tax increase of 4.08 percent, a personal vehicle registration tax and $200 million in provincial grants to meet the 2008 shortfall.

9   In fact, our data extend back to January 2003. However, since real estate markets in the years 2003-2005 may behave differently than those in the years 2006-2008, we do not rely on these data for our estimate of the effect of the LTT. The technical Appendix provides evidence to support this strategy.

Figure 2: Locating Homes by Census Tract and Postal Code: A Portion of Toronto's Northern Border

Toronto Border   ■ Census Tract Boundaries | Postal Code Boundaries   • Postal Code Centroids
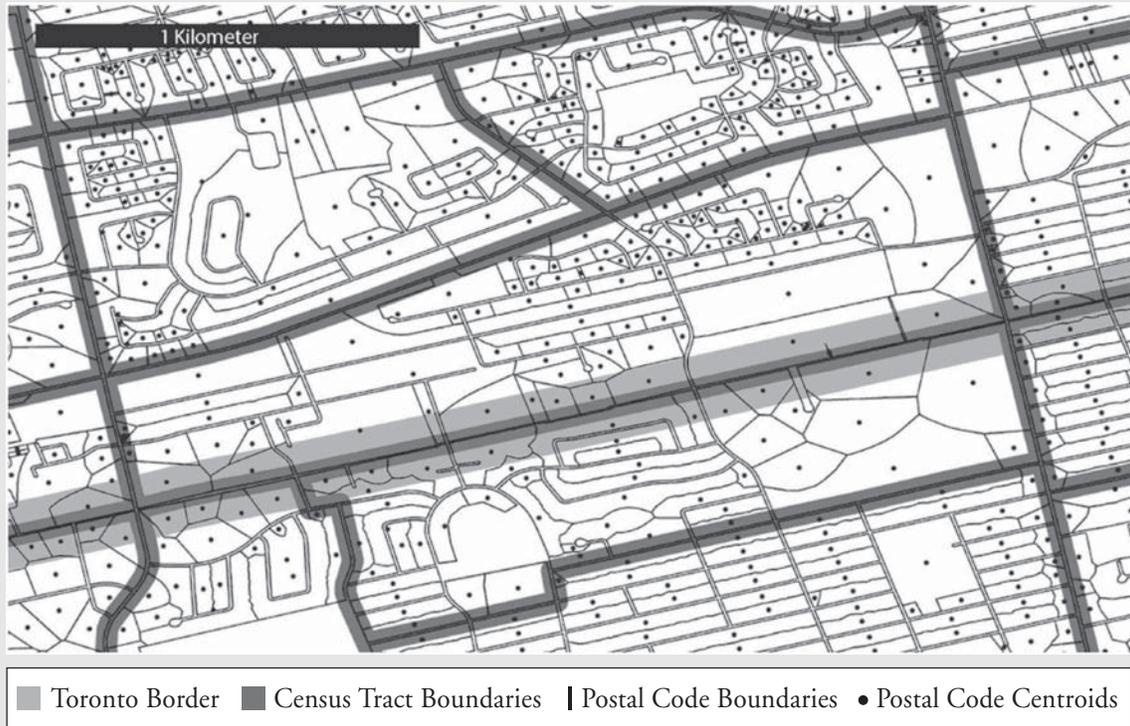
Sources: Statistics Canada Census Subdivision Reference Map; CanMap LDU Boundaries.

1, 2008, and closed after Jan 31, 2008, is assumed to be subject to the LTT.[10]

Method 1: Before and After

We now consider the problem of estimating the effect of the LTT on the number of transactions in Toronto in a typical month.

The simplest strategy for calculating the effect of the LTT is to compare real estate market volume in Toronto before the imposition of the LTT with the corresponding quantity after the imposition of the LTT. We could calculate the effect of the LTT to be,

> Average transactions in Toronto after the LTT –
> Average transactions in Toronto before the LTT.

This is simply the difference between the number of transactions before and after the LTT. The volume of real estate transactions in Toronto and in nearby suburbs was lower in 2008 than in 2007 (see Figure 1). This suggests that comparing the Toronto real estate market before and after the imposition of the LTT will not produce a correct estimate of the effect of the LTT. We should not ascribe a downturn in the regional real estate market to a tax that applies only to Toronto.

Method 2: Toronto Versus the Surrounding Area

A second approach to measuring the effect of the LTT considers only transactions that occur after the imposition of the LTT, and compares the volume of transactions in Toronto with the volume of

---

10 The LTT contains a provision exempting first-time buyers from the LTT on the first $400,000 of a house. Since our measure of the LTT does not identify the small number of buyers for whom this was relevant, our measure slightly overestimates the incidence of the LTT.

suburban transactions. It estimates the effect of the LTT on volume to be,

> Average transactions in Toronto after the LTT –
> Average transactions in suburbs after the LTT.

This estimate is correct if transaction volume is not systematically higher (or lower) in Toronto than in adjacent municipalities for some reason unrelated to the LTT. For example, it seems likely that Toronto suburbs have higher transaction volumes than Toronto because the suburbs contain more new houses or subdivisions. If so, then estimating the effect of the LTT by comparing post-LTT Toronto and suburban transaction volumes will confound the intrinsically higher suburban transaction volume with the effect of the LTT. This leads us to suspect that this approach will underestimate the effect of the LTT.

Method 3: Working with Time and Space

We next consider a "difference-in-differences" estimate, which can correctly estimate the effect of the LTT, even in the presence of time and spatial trends in transaction volume. Specifically, we calculate the change in the average monthly transaction volume that occurs around the time of the LTT; that is, the difference before and after the introduction of the LTT, for Toronto and suburban municipalities. We then calculate the difference-in-differences estimate of the effect of the LTT as the difference between the change in volume in Toronto and the change in volume in suburban municipalities. More formally, the difference-in-difference estimate of the effect of the LTT is,[11]

> $\Bigl($ Average transactions in Toronto after the LTT –
> Average transactions in Toronto before the LTT. $\Bigr)$
>
> *minus*
>
> $\Bigl($ Average transactions in suburbs after the LTT –
> Average transactions in suburbs before the LTT. $\Bigr)$

We estimate the effect of the LTT as the difference between Toronto and suburban changes in volume around the time of the imposition of the LTT. Since this estimate is based on the difference in changes, it is not affected by differences in levels between Toronto and suburban municipalities, nor is it affected by trends in the real estate market provided they affect Toronto and suburban markets equally.

However, the difference-in-differences estimate of the effect of the LTT can be affected by time trends in transaction volume that affect Toronto and suburban municipalities unequally. In particular, suppose that around the time that the LTT was imposed, transaction volume fell faster in the suburbs than in Toronto for some reason unrelated to the LTT. This might occur, for example, if the suburbs contained many buildable parcels early in our study period, but were "built-out" by late 2007. In this case, we would observe a faster decline in the volume of transactions in the suburbs that was unrelated to the LTT. The difference-in-differences estimator would confound this effect with the effect of the LTT and thereby underestimate the effect of the LTT on transaction volume.

How to Precisely Evaluate the Effects of the LTT

We can overcome this problem by considering a "spatially restricted difference-in-differences estimate" of the effect of the LTT. This estimate is identical to the difference-in-differences estimate, but is based only on transactions that lie in a narrow strip centered on the Toronto municipal border. As we consider progressively narrower strips, we expect areas on each side of the border to become more homogeneous. The case for different trends becomes correspondingly less plausible. More concretely, we expect that areas in Toronto within three kilometers of the border would be as likely to have a new subdivision as suburban areas within three kilometers of the border.[12]

---

11 We note that the estimates that we present below actually use local "fixed-effects" rather than the difference-in-differences estimates. The two techniques are intuitively very similar, although the actual formula is superficially different.

12 Decreasing the width of the band we consider increases the similarity of the houses under consideration, but decreases the number of sales that we observe. The first effect increases the accuracy of our estimates, the second decreases it. Our choice of a three-km bandwidth appears to provide the best tradeoff between these two effects.

In light of the discussion above, our preferred estimate for the effect of the LTT is the spatially restricted difference-in-differences estimate.[13] With this said, four issues remain to be addressed.

First, the spatially restricted difference-in-differences estimate works by comparing changes in the level of transaction volumes on either side of the border at the time the LTT was imposed. If some other change was imposed at the same time, then the spatially restricted difference-in-differences estimate would confound the effect of this other event with that of the LTT. For example, if all municipalities surrounding Toronto simultaneously subsidized moving in January of 2008, then our spatially restricted difference-in-differences estimate would confound the effect of the subsidy on moving with the effect of the LTT. However, we verified that except for the LTT, there was no other such major policy change by the City of Toronto or other municipalities. Furthermore, property taxes in surrounding municipalities increased almost exactly in line with those of the City of Toronto.

Second, there is the possibility that our spatially restricted difference-in-differences estimate will confound the effect of the LTT with some other, unobserved and unrelated effect. In other words, our estimate may identify a "spurious correlation." To see how this might happen, suppose that for some reason all real estate transactions in Toronto (but not the suburbs) take place in the last four months of the year. Then, since our data record only the first eight months of 2008, and this corresponds closely to the imposition of the LTT, our spatially restricted difference-in-differences estimate may confound this seasonal variation with the effect of the LTT. To overcome this particular problem, we control for seasonal effects in our estimates.

Third, it is important to note that the imposition of the LTT was relatively sudden and could not have been anticipated, so that the real estate market did not have much time to anticipate the LTT. While there is some evidence that the market was particularly active during the time between City Council's

approval of the LTT and its implementation, from October 22, 2007, to February 1, 2008, we are able to control for this effect in our estimations. Moreover, we can be confident that real estate markets prior to October 2007 did not respond to the LTT. Thus, when we compare market behavior for February through August of 2007 with the corresponding months of 2008, we can be confident of capturing the entire effect of the LTT.

Fourth and finally, we use estimation techniques that reflect the fact that our data are not continuous; that is, for each postal code we record an integer number of transactions, not a continuum. To reflect this feature of our data, we conduct a regression that is tailored for this specific type of data rather than the more common methods.[14] With this said, supplemental results presented in the technical Appendix indicate that our estimate of the effect of the LTT on transaction volume is not sensitive to this choice of technique.

Table 2 presents our preferred estimate of the effect of the LTT. Our dependent variable is the number of single-family homes sold in each month in each postal code located within three kilometers of the Toronto border. The quantity of interest is the mean change in the number of transactions that occurs in a postal code. In addition to the LTT indicator variable we include monthly indicator variables and postal code fixed effects.

This calculation shows that the imposition of the LTT reduced sales by 16 percent and this estimate is different from zero with 99 percent confidence.[15] While we do not describe it here, we experimented extensively with variants of this estimation strategy. Controlling for mean housing characteristics, controlling for particularly high sales in Toronto in the three months prior to the LTT, and considering different widths of border or geographic units of observation does not affect our results. The Appendix provides details.

We focus our attention on a narrow band around the Toronto border to reduce the possibility that our estimate of the causal effect of the LTT is con-

---

13   We note that this estimate is a close cousin of the one that would be obtained by measuring the height of the discontinuity in transaction volumes as plotted in the bottom panel of Figure 3.

14   In the jargon, we use a Poisson regression in place of the more standard "ordinary least squares" linear regression.

15   We have a 95 percent confidence interval of 8 percent to 24 percent. The coefficient reported in the Appendix does not have an immediate interpretation but allows us to calculate the effect of the LTT on transaction volume as reported in Table 2.

Table 2: The Effect of the LTT on Transactions Within Three Kilometres of the Border of Toronto	
	Effect on Number of Transactions
Percent change in transactions due to LTT (per postal code per month)	-16***
Reduction in number of transactions	3,496

***Significant at 99% level of confidence. Coefficients reported in Appendix.

Sources: Multiple Listing Service; authors' calculations.

founded with other factors. However, this does not mean that our estimate of the effect should be understood as applying only to this narrow band. To the contrary, since we have been careful to isolate the causal effect of the Toronto LTT, we expect this effect will be much the same anywhere in Toronto, or in other similar real estate markets.

In particular, we can use the estimated effect of the LTT to estimate, in turn, the number of Toronto households that choose not to move because of the LTT in a typical year. This calculation is straightforward. The average annual number of transactions recorded in our data for 2004-2006 is about 21,200 for Toronto. Multiplying 21,200 by the estimated 16 percent effect of the LTT gives us a decrease of about 3,500 in the number of single-family homes sold in an average year in Toronto. To the extent that the MLS does not reflect all single-family home sales, this estimate understates the decline in sales caused by the LTT. Since we have excluded the sales of condominiums from our analysis, it also does not reflect the effect of the LTT on condominium sales.

It is worth noting that the effect of the LTT may also be seen in the market data for larger bandwidths from the border. The top two panels of Figure 3 describe the average number of transactions as the distance from the Toronto border increases to 10 kilometres.[16] In Figure 3, zero on the x-axis represents the Toronto border. Points to the left of zero are in the City of Toronto and points to the right are in the suburbs. The grey lines in the top panel of Figure 3 describe average monthly transactions between February and August 2007. The

black lines present transaction volumes for February through August 2008, the first seven months after the imposition of the LTT. The bottom panel describes the average year-over-year percentage change in transaction volume around the border. It is clear from these figures that real estate markets responded to the LTT in a way that is consistent with our estimations. In particular, market volume dropped much more dramatically in Toronto than in surrounding suburbs.
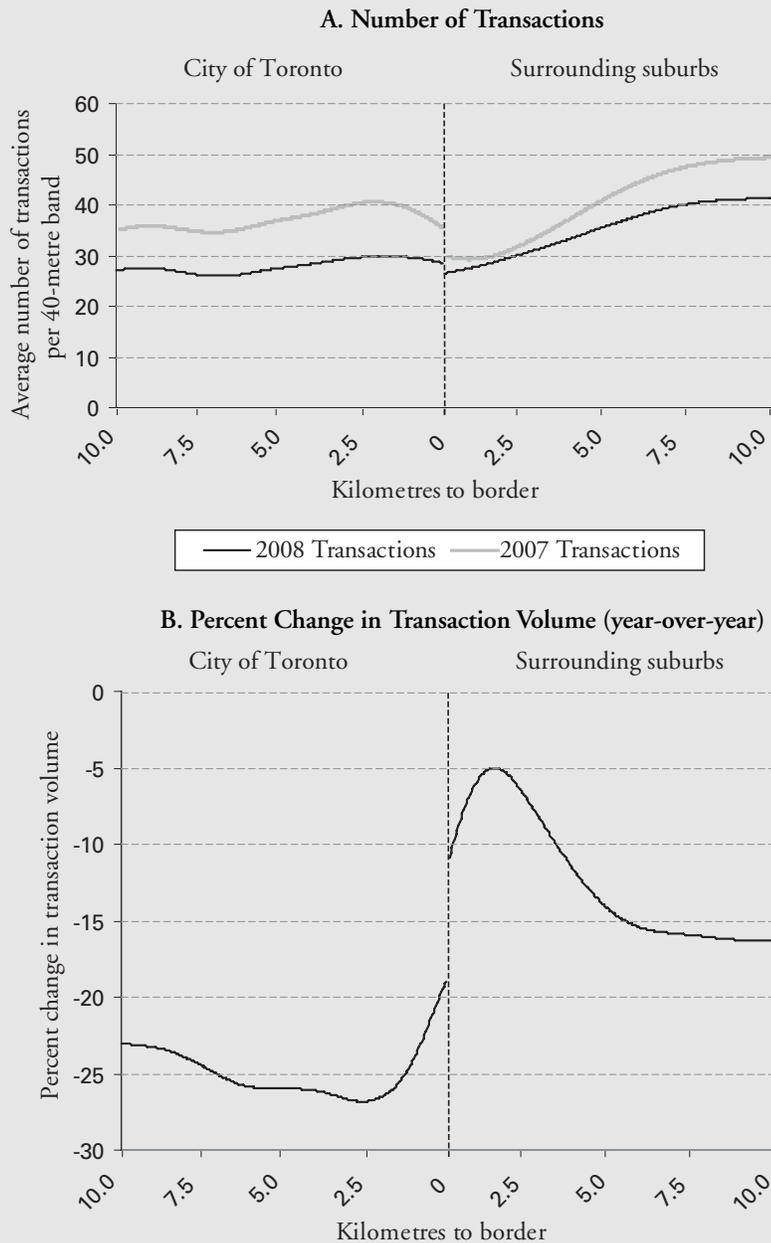
The Cost of Lost Mobility

We have seen that the LTT results in decreases in mobility for Toronto residents. To illustrate the linkage between the LTT and mobility, consider a single-family home whose owners value their friendships in the neighborhood, along with, say, proximity to parks, school, work, or family. Now consider a potential buyer who would like to move into a particular house. To induce the current resident to move, the prospective buyer must pay enough to allow the current resident to buy a comparable house somewhere else and compensate them for the loss of neighborhood attachments.

Now consider a market with thousands of such potential buyers and sellers on each side. Residents differ in how they value their attachments to their neighborhood. Some people place little value on their neighborhood, while others will need significant compensation to leave. By ranking potential sellers according to the amount of money they require before they are willing to move we can construct a conventional supply curve for neighborhood houses. Likewise, some buyers would pay large sums to move into a given neighborhood if

---

16   To put the distances into context, moving from south to north along Yonge St, the far left hand of the graph would start at Eglinton Avenue and would run north into Richmond Hill.

Figure 3: The Effect of the Land Transfer Tax on Transactions Within 10 Kilometres of the Toronto Border

A. Number of Transactions

City of Toronto   Surrounding suburbs

Legend: —— 2008 Transactions   —— 2007 Transactions

y-axis: Average number of transactions per 40-metre band (0, 10, 20, 30, 40, 50, 60)
x-axis: Kilometres to border (10.0, 7.5, 5.0, 2.5, 0, 2.5, 5.0, 7.5, 10.0)

B. Percent Change in Transaction Volume (year-over-year)

City of Toronto   Surrounding suburbs

y-axis: Percent change in transaction volume (0, -5, -10, -15, -20, -25, -30)
x-axis: Kilometres to border (10.0, 7.5, 5.0, 2.5, 0, 2.5, 5.0, 7.5, 10.0)

Notes: Zero on the x-axis is the border of the City of Toronto, points to the left of zero are in the City of Toronto and points to the right are in the surrounding suburban municipalities. Transactions are counted within bands of land measuring 40 metres in width and extending around the border of the city. The grey line in the top panel shows mean transaction volume as a function of distance from the Toronto border for February through August 2007. The black line shows mean transaction volume for February through August of 2008, the first seven months of Toronto's LTT. The bottom panel describes the average year-over-year change in transaction volume around the border.

Sources: Multiple Listing Service; authors' calculations.

Figure 4: Supply and Demand Curve for a Group of Houses in a Neighbourhood

☐ Foregone Transactions Caused by LTT
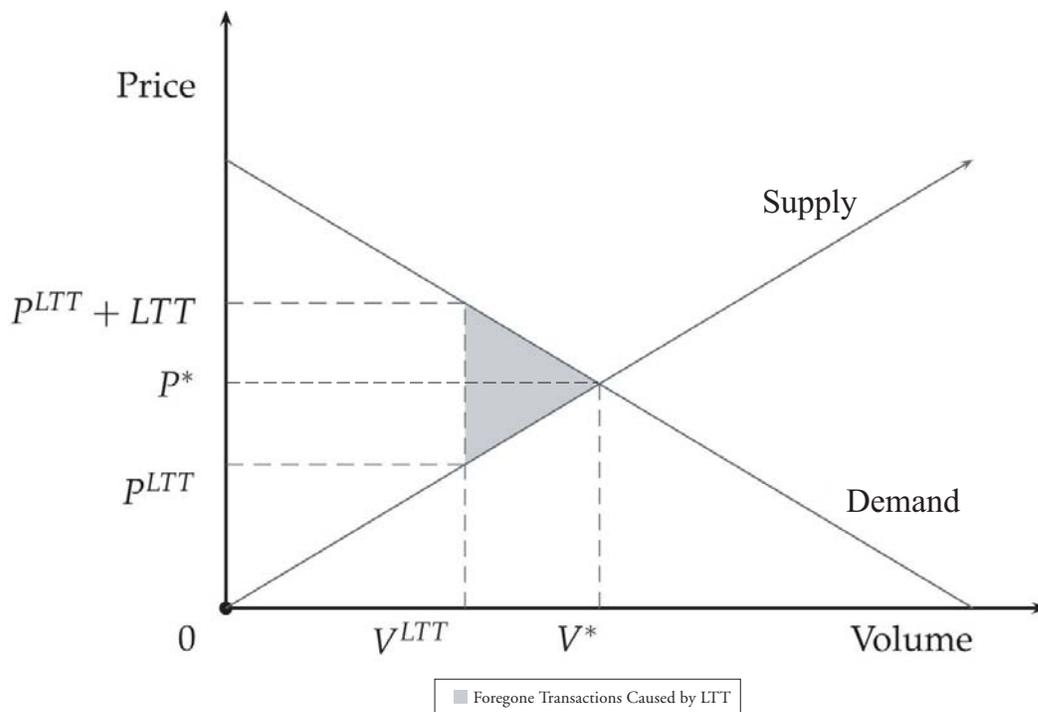
Notes: The area of the shaded triangle gives the value of forgone transactions caused by the LTT. P^* is price before LTT. V^* is volume before LTT. P^{LTT} is sale price after LTT. P^{LTT} + LTT is purchase cost after LTT. V^{LTT} is volume after LTT.

Source: Authors' calculations.

they highly value something in that neighborhood (good schools, for example), while others may not value that same area very highly. Ranking potential buyers according to their willingness to pay gives rise to a demand curve for neighborhood houses.

Figure 4 plots these supply and demand curves. The market price will adjust so that the number of buyers exactly equals the number of sellers for the number of sales, V^*, with a price, P^*.

With the imposition of an LTT on housing sales, a prospective buyer must not only induce the current resident to leave, but must also pay the LTT. This opens a gap between what the buyer pays and what the seller receives. Hence, sellers who would have been willing to move only at the original sale price without the LTT, will no longer be willing to move. Thus, the introduction of the tax prevents the movement of prospective buyers who would value a house in a neighborhood more than the current residents do. In this case, the number of buyers will equal the number of sellers, V^{LTT}, at a lower price

received by sellers, P^{LTT}, but at a higher cost to buyers at price P^{LTT}+LTT.

How Much Does This Cost Residents?

When a transaction that would have otherwise occurred is prevented because of a tax, there is an economic cost. While Figure 4 formalizes our intuition about how the LTT leads to a decrease in the transaction volume, it also provides a basis for measuring the economic cost of this lost mobility. When a house is sold by a seller willing to accept less than what the buyer is willing to pay, and the price is intermediate between these two values, then both are made better off. The magnitude of this welfare gain is simply the vertical distance between the supply and demand curves. If we sum the gains from trade for all transactions forgone because of the LTT – those between V^{LTT} and V^* – the area of the shaded triangle in Figure 4 gives us the dollar value of trades forgone because of the LTT.[17]

17 Since we know that the base of this triangle is simply the magnitude of the land transfer tax, and the height is the number of forgone transactions, we can calculate the area of this triangle, and hence the value of forgone mobility caused by the LTT. The area of this triangle is one half the length of its base, in this case the magnitude of the LTT, times its height, in this case $V^* - V^{LTT}$.

The number of forgone transactions due to the LTT is about 3,500, while the average LTT paid in our sample is $6,712. Using these two estimates, we calculate the value of lost mobility caused by the LTT at about $11.7 million per year.[18] Since the LTT raised approximately $150 million from the transactions observed in our sample, this means that the LTT imposes $1 in economic costs due to lost mobility for every $13 of revenue collected.[19]

In fact, real estate transactions in Toronto are subject to a provincial LTT as well as the Toronto LLT. The Appendix generalizes the analysis developed here to allow for both taxes. This analysis shows that, given the pre-existing Ontario LTT, the cost of lost mobility caused by the Toronto LTT is about three times as large as the estimate here (Dahlby and Wilson 2003).

Measuring the Effects of the LTT on Prices

We estimate that the average amount of LTT paid is about 1.1 percent of the sale price of the average house. Given this, we expect the LTT to have an impact on house prices of about the same magnitude. Consistent with this, an inspection of Figure 1b or Figure 5 suggests that the effect of the LTT on prices will be small. Measuring so small an effect accurately is difficult, even with our high-quality data.

Our strategy for estimating the effect of the LTT on the price of single-family homes is much the same as the one we employed to estimate the effect of the LTT on the number of sales; that is, we use a spatially restricted difference-in-differences estimate.[20] More specifically, for a three-km band around the Toronto border we calculate the effect of the LTT on prices as,

$$\left(\begin{array}{c} \text{Average price in Toronto after the LTT} - \\ \text{Average price in Toronto before the LTT.} \end{array} \right)$$

minus

$$\left(\begin{array}{c} \text{Average price in suburbs after the LTT} - \\ \text{Average price in suburbs before the LTT.} \end{array} \right)$$

The Appendix provides the details of our econometric technique, and discusses supplemental results and robustness tests. Our units of observation are individual transactions that occurred between January 2006 and August 2008 within three km of the Toronto border. The quantity of interest is the mean change in the average price of a Toronto house after the imposition of the LTT. Finally, to reduce the possibility that our estimate of the effect of the LTT reflects a spurious correlation, we include controls for month of year, house characteristics, and allow for a separate trend in Toronto. (See Table 3.)

The results of our estimation indicate that the effect of the LTT on prices is -1.5 percent.[21] In alternative specifications, we obtain point estimates that are consistently negative and as large as a 2.6 percent drop.[22] The Appendix provides technical details.

The initial drop in prices (-1.5 percent) is, in fact, more than the average rate of the LTT (-1.1 percent). This difference is not statistically significant but it is suggestive. The likely reason for this is that the current price of real estate not only embodies the reduction in the first sale after the introduction of the LTT, but also the sales after that. Buyers recognize that when they sell their house, they too will have to sell their home at a lower price than what the next buyer might be willing to pay.

Consistent with the results above, the top panel of Figure 5 shows prices around the Toronto border for February through August of 2007 (the black

---

18 Since we observe the first eight months of 2008, we calculate the average LTT payment by applying the LTT payment formula to all 2007 sales in Toronto.

19 Again, since we do not have information for all of 2008, this estimate is based on all 2007 sales.

20 The estimation of the LTT's effect on price does slightly differ from the problem of estimating the effect of the LTT on volume. Unlike our volume data for which every observation is a small integer, our price data can take a large range of values from a few thousand dollars to millions of dollars. Thus, we use the linear model to estimate the effects of the LTT on price. As with the sales volume regression, we employ geographic area fixed effects to implement the difference-in-differences method.

21 We estimate a 95 percent confidence interval of -0.3 percent to -2.8 percent

22 However, some of these alternative estimates are not statistically significant because of the small size of this price effect.

Table 3: The Effect of the LTT on House Sale Prices

	Effect on Sale Price
Percent change in prices due to LTT	-1.5**
Average reduction in sale price	$6,397

**Significant at 95% level of confidence. Using logarithm of price. Other controls: month, house characteristics, time trend for City of Toronto. Coefficient reported in Appendix.

Sources: Multiple Listing Service; authors' calculations.

Table 4: The Effect of the LTT on Transactions and Price by House Value

House Value	<$400,000	>$400,000
Percent change in transactions due to LTT	-36***	-7
Percent change in prices due to LTT	-0.5	-2.2***

***Significant at 99% level of confidence. Coefficients reported in Appendix.

Sources: Multiple Listing Service; authors' calculations.

line), and for the corresponding period in 2008 (the grey line). The graph is similar to Figure 3. Prices are slightly higher within the City of Toronto than outside and marginally higher in 2008 than 2007. The bottom panel shows the year-over-year change in price as a percent of the 2007 level. We see a distinct drop in the price of houses in Toronto relative to neighboring suburban houses. This drop appears to be at most a few percent.

The effect of the LTT also varies by the value of the house. Houses below the Toronto-average house value of $400,000 had the largest reduction in transaction volume, with a fall of 36 percent. By comparison, houses above $400,000 saw a reduction in transaction volume of 7 percent, which is small enough that we cannot be certain that it is different from zero (Table 4). The opposite is true of prices. Houses below $400,000 saw a negligible fall in prices while more expensive homes saw a reduction on the order of 2.2 percent.
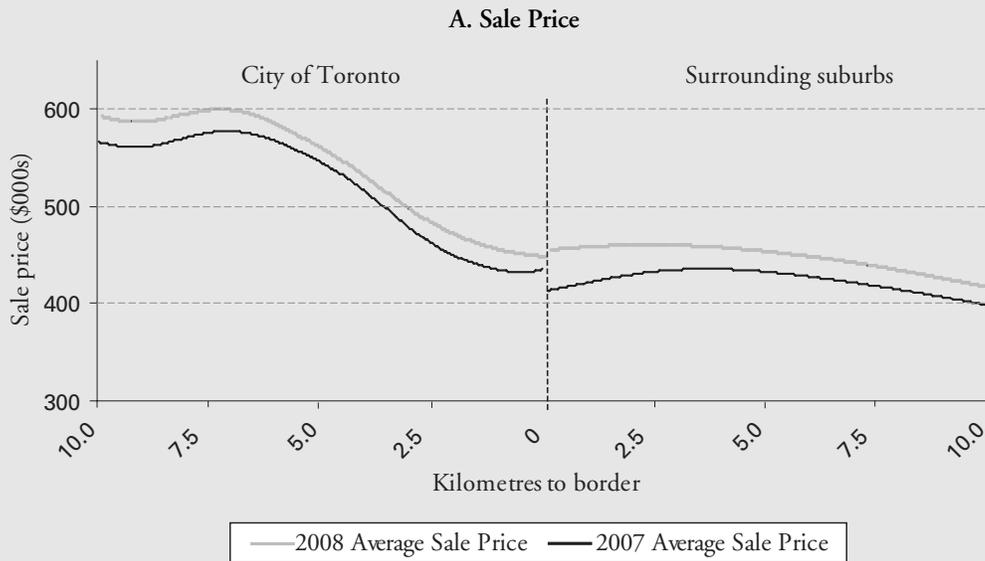
An Assessment of the LTT

In 2007, the City of Toronto raised $1.9 billion in residential property taxes. Based on our estimates above from 2007 sales, we expect the LTT to raise $150 million from MLS-listed single-family house sales (excluding condominiums and commercial properties) for the City once fully implemented in 2009. To replace that revenue with a residential property tax increase would require a property tax increase of about 8 percent.

An ordinary property tax is payable by whoever owns the property. Thus, regardless of whether the property owner moves, the tax on the property is the same. With a land transfer tax, the tax is paid only when the property changes hands. Hence, the LTT provides a disincentive to moving relative to an ordinary property tax.

We have now estimated the number of forgone real estate transactions that result from Toronto's LTT and the value of this lost mobility. Since there is no loss of mobility under the ordinary property

Figure 5: The Effect of the Land Transfer Tax on Prices Within 10 Kilometres of the Toronto Border

A. Sale Price

City of Toronto   Surrounding suburbs

Sale price ($000s)

Kilometres to border

——— 2008 Average Sale Price   ——— 2007 Average Sale Price

B. Change in Sale Price (year-over-year)

City of Toronto   Surrounding suburbs

Percent change in sale price

Kilometres to border

Note: Zero on the x-axis is the border of the City of Toronto, points to the left of zero are in the City of Toronto and points to the right are in the surrounding municipalities. The grey line in top panel shows the average sale price as a function of distance from the Toronto border for February through August 2008, the first seven months of Toronto's LTT. The solid line shows average price for February through August of 2007. The bottom panel describes the average year-over-year change in prices around the border.

Sources: Multiple Listing Service; authors' calculations.

tax, increasing reliance on it and reducing reliance on the LTT, could cut the cost of funding the Toronto city government by at least the value of the lost mobility.

While this clearly argues in favor of reducing Toronto's reliance on the LTT, there are also three other problems with the LTT that do not arise under an ordinary property tax. First, as with the provincial LTT, the municipal LTT can either be filed electronically through Teranet, or in paper format with an affidavit. To file the LTT electronically, one must purchase proprietary Teranet software, which costs at least $595 for a single user. In addition to the costs of software and the time spent by lawyers to file the tax, Teranet charges a fee to collect the LTT revenues.[23] The size of this fee has not been publicly disclosed, but can be estimated by looking at the fees that Teranet charges for other services, such as property searches and land registration. Teranet's fee for land registration is currently set between $10 and $20, depending on the type of transaction. It is reasonable to expect that the fee for processing an LTT payment would be of the same order of magnitude.[24] If the city relied on an ordinary property tax with its pre-existing collection infrastructure, then these administrative costs would be avoided.

Second, the province of Ontario also collects a land transfer tax on property sales in Toronto. Since the Toronto LTT drives down transaction price and volume, it also drives down the tax revenue collected by the provincial LTT. These forgone provincial revenues result in reduced provincial services or in an increase in some other provincial tax. We estimate the decrease in provincial LTT revenue caused by the Toronto LTT at about $25 million.[25] Thus, the Toronto LTT reduces provincial LTT revenue by about $1 for every $6 raised by the City. While an ordinary property tax will affect sales

prices in about the same way as an LTT, it will not affect sales volume. Thus, we expect the effect of an ordinary property tax on provincial LTT revenue to be smaller than that of a municipal LTT.

Third, an ordinary property tax is paid by all property owners in the city. An LTT, in contrast, is paid only by property purchasers. In 2006, there were 666,678 assessed residential and commercial properties, while there were 56,227 property transactions of all types (Nowlan 2007). In other words, the LTT places the burden of funding municipal services consumed by the bulk of property owners on only a small subset of the population. Thus, the LTT appears to be less consistent with ordinary notions of fairness than is an ordinary property tax.

Fourth, the revenue generated by an LTT appears to be more difficult to predict than the revenue generated by an ordinary property tax. Provincial LTT revenues grew by 14 percent over the previous year in the 2007/08 budget but fell by 15 percent in the next budget.[26] Likewise, land transfer taxes were a volatile source of revenue for all cities across Canada, having grown by 22 percent from 2003 to 2004, only to fall by 21 percent just two years later, between 2005 and 2006. In the US, Florida transfer tax revenues fell by half between 2005/06 and 2007/08. San Francisco transfer tax revenues fell by 32 percent from 1999/2000 to 2001/2002 during the dot-com crash.[27] By relying on an LTT rather than an ordinary property tax, Toronto is probably increasing the variability of revenues, and thus increasing the difficulty of formulating city budgets.

Finally, while the LTT is nominally paid by the purchaser, we have seen that the LTT has led to a decrease in average sale price of about the same magnitude as the LTT exaction. Thus, the buyer's after-tax price is nearly unchanged by the LTT. While it is the buyer who writes the check, it is the seller who is poorer. This has two implications. First,

---

23 Teranet is a former provincially owned corporation.

24 See "Teraview 5.4 pricing: software" available online at www.teraview.ca. In their 2008 2nd quarter report Teranet reported a 48 percent increase in "other value-added services" (of which Toronto LTT collection revenues are one part) in the first six months of 2008 compared to the first six months of 2007.

25 To make this calculation, we sum (1) the average amount of provincial LTT on a transaction multiplied by the number of forgone transactions, with (2) the decreased provincial LTT revenue that results from lower sale prices. See the Appendix for a full discussion of the interaction between the provincial LTT and the Toronto LTT.

26 This excludes Ontario electricity payments in-lieu-of-taxes, which are projected to raise $600 million for the province compared to $1.1 billion from the provincial LTT (2008 Ontario Economic Outlook and Fiscal Review).

27 State of Florida, Department of Revenue, Revenue Collection Report, Office of Tax Research. June 2008 & FY 07/08 Summary.

all, or nearly all, of the burden of the LTT is born by current Toronto residents. While there are some taxes, for example a toll on highways used by commuters, which might allow Toronto to fund its city government at the expense of non-residents, the LTT is not one of them. In this regard, an ordinary property tax and an LTT are the same.

Conclusion

The LTT caused a large decrease in the volume of real estate transactions in Toronto. By our estimate, the LTT will cause about 3,500 families per year to stay in houses that are too small, too big, or too far from their places of work or school. Unlike the LTT, an ordinary property tax does not provide a disincentive for moving. This means that a property tax that collected the same amount of revenue as the current LTT would leave Toronto residents better off. While Torontonians would pay the same amount of tax on average, they would do it in houses that suit them better. While it is difficult to assign a dollar value to the lost mobility resulting from the Toronto's LTT, our estimates suggest that

for every $13 of revenue that the LTT collects, it imposes at least $1 of such extra costs. In addition, the LTT involves other costs and side effects not seen with a property tax.

Our data also suggest that the LTT has caused about a 1.5 percent decline in the average sale price of a single-family home in Toronto. This is what we would have expected from a property tax raising a similar amount of revenue, so that an LTT affects residential real estate prices in about the same way as an ordinary property tax.

Funding the municipal government with an LTT has no apparent advantage over an ordinary property tax. The disadvantages of the LTT relative to an ordinary property tax include: millions of dollars per year in lost mobility, substantial additional administrative costs, a seemingly unfair reliance on a small tax base, and increased variance in municipal revenue. Therefore, our data and analysis suggest that reducing Toronto's dependence on the LTT is desirable. Since the Ontario LTT is similar to Toronto's LTT, our data also suggest that reducing the provincial dependence on this tax is also desirable.

Figure A1: City of Toronto and Surrounding Suburbs

Source: Statistics Canada Census Subdivision Reference Map.

STUDY AREA: Our study area is the City of Toronto and the immediately surrounding municipalities of Mississauga, Brampton, Vaughn, Richmond Hill, Markham and Pickering. (See Figure A1).

TRANSACTION VOLUME ESTIMATIONS: Our unit of observation is a postal code month within three kilometers of the Toronto border for each month between January 2006 and August 2008. Our dependent variable is the number of single-family homes sold. The quantity of interest is the mean change in the number of transactions that occurs in a Toronto postal code after the imposition of the LTT. To reflect the discrete nature of our data we use a Poisson regression specification rather than the more standard linear model. To implement the difference-in-differences estimate, we employ postal code fixed effects. Finally, to reduce the possibility that our estimate of the effect of the LTT reflects a spurious correlation, we include controls for month of year. Thus, our estimating equation is,

Postal code transactions in each month = f(LTT, Month of Year, postal code)

where f is the Poisson density.

Table A1 presents the estimation result presented in the text, along with supplemental estimates.

Column 1 presents our preferred specification. This is a Poisson regression with the unit of observation the number of sales within three kilometers of the Toronto border in each postal code in each month between January 2006 and

Table A1 The Effect of the LTT on the Number of Transactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LTT	-0.15***	-0.16***	-0.13***	-0.11***	-0.19***	-0.01***	-0.31***	-0.07
Standard error	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.002)	(0.06)	(0.05)
Month indicator	Y	Y	Y	Y	Y	Y	Y	Y
House characteristics	N	Y	N	N	N	N	N	N
Indicator for Q4 2007	N	N	Y	N	N	N	N	N
Distance threshold	3km	3 km	3km	3km	5km	3km	3km	3km
Geographical unit	Postal code	Postal code	Postal code	Census tract	Postal code	Postal code	Postal code	Postal code
Specification	Poisson	Poisson	Poisson	Poisson	Poisson	OLS	Poisson	Poisson
Houses	All	All	All	All	All	All	<$400,000	>$400,00
Observations	226,995	226,978	226,995	6,705	385,188	297,174	107,645	130,462
Percent Effect of LTT	-16	-17	14	-11	-21	-21	-37	-7

Note. Level of significance, *** p<0.01.

Sources: Multiple Listing Service; authors' calculations.

August 2008. The variable of interest is an LTT indicator variable, which takes the value one for transactions subject to the LTT and zero otherwise. In addition to the LTT indicator variable, we include monthly indicator variables and postal code fixed effects. In column 1 – our preferred specification – the coefficient of the LTT indicator is negative and significantly different from zero at the 5 percent level.

While the Poisson estimator is well suited to predicting count data of the sort we employ here, the resulting coefficients are difficult to interpret. To assess the magnitude of our estimated effect, we calculate the predicted number of sales for all postal codes months subject to the LTT and then calculate the predicted number of sales for these postal codes in the counterfactual case when the LTT is not in effect. Our estimate of the effect of the LTT is the mean, over all postal code months, of the difference between these two quantities. This estimate of the effect of the LTT is given in the last row of Table A1. We calculate the confidence bounds reported in the main text in a similar fashion, but use confidence bounds for the LTT parameter estimate instead of the point estimate.

Columns 2 through 6 check the robustness of our estimate and columns 7 and 8 present results by house value. In column 2, we add several variables describing mean house characteristics by postal code to the specification of column 1. In column 3, we add an indicator variable that is one for Toronto postal codes in the last three months of 2007. In column 4, we use a larger spatial unit of observation, the census tract a house is in, rather than the postal code. In column 5, we consider transactions that lie within five kilometers of the Toronto border rather than three. In column 6, we use an OLS specification rather than Poisson. In every case, our results are close to those of column 1. Column 7 presents results using the main specification for house values under $400,000 and column 8 repeats this but for houses above $400,000.

Table A2	The Effect of the LTT on House Sale Prices log (logarithm)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LTT	-0.015**	-0.007	-0.026***	-0.012*	-0.021***	-0.002	-0.005	-0.022***
Standard error	(-0.006)	(-0.004)	(-0.009)	(-0.007)	(-0.005)	(-0.007)	(-0.08)	(-0.01)
Month indicator	Y	Y	Y	Y	Y	Y	Y	Y
House characteristics	Y	Y	N	Y	Y	Y	Y	Y
Indicator for fourth quarter 2007	N	N	N	Y	N	N	N	N
Distance threshold	3km	3km	3km	3km	5km	3km	3km	3km
Geographical unit	Postal code	Postal code	Postal code	Postal code	Postal code	Census Tract	Postal code	Postal code
Toronto trend	Y	N	Y	Y	Y	Y	Y	Y
Houses	All	All	All	All	All	All	<$400,000	>$400,000
Observations	19,783	19,783	19,785	19,783	32,994	19,783	11,227	8,556

Note: Level of significance, *** p<0.01, ** p<0.05, * p<0.1.

Sources: Multiple Listing Service; authors' calculations.

SALES PRICE ESTIMATIONS: Our unit of observation is an individual transaction that occurred between January 2006 and August 2008 within three km of the Toronto border. We use a standard OLS regression and our dependent variable is the logarithm of the sale price. The quantity of interest is the mean change in price of a Toronto house after the imposition of the LTT. To implement the difference-in-differences estimate, we employ postal code fixed effects. Finally, to reduce the possibility that our estimate of the effect of the LTT reflects a spurious correlation, we include controls for month of year, house characteristics, and allow for a separate trend in Toronto. Thus, our estimating equation is,

Log(sale price) = A + B(LTT) + C(Month of Year) +
D(Toronto trend) +
E(House characteristics) +
(Postal code indicators).

Table A2 presents the estimation of the effect of the LTT on sales price given in the text, along with five supplemental estimations. All are based on transaction level data and use the logarithm of sale price for all transactions within three km of the border as the dependent variable.

In our preferred estimation, presented in column 1, we regress log price on: an indicator which is set to one if the transaction is subject to the LTT; indicator variables for each month to reflect seasonal and yearly changes to prices unrelated to the LTT; a Toronto specific trend, to control for the divergence in the prices of Toronto and suburban homes (this divergence is just barely visible in Figure 5); and an extensive list of house characteristics (binary variables describing: heating; garage; basement; whether the house is attached; number of stories; construction type; the presence of a family room; and fireplace, along with counts of: bedrooms; bathrooms; kitchens; rooms: parking spaces: square feet and lot size.) We see that the coefficient on LTT in this regression is -0.015 and that this coefficient is statistically different from

zero with a high level of confidence. Since the dependent variable is the logarithm of price, to assess the magnitude of this effect, we note that the sample mean price is about $430,000. The logarithm of this price is 12.97. If we subtract the LTT effect, this gives a log price of 12.96. Exponentiation gives a post LTT price of $425,000, a decrease of about 1.5 percent.

Column 2 of Table A2 duplicates the regression of column 1, but omits the Toronto trend. As a consequence of this change, the estimated effect drops to close to zero and is not distinguishable from zero. This suggests that the LTT has affected prices by stopping the divergence of Toronto and suburban prices. Column 3 duplicates the regression of column 1, but drops the controls for housing characteristics. This leads to an increase in the coefficient of the LTT indicator, but a decrease in its significance. This suggests that housing characteristics are correlated with the LTT indicator. Column 4 duplicates the regression of column 1, but includes an indicator for sales that occurred in Toronto during the run up to the imposition of the LTT. Column 5 duplicates column 1, but extends attention to a five-km band around the border rather than three km. This increases our sample size, but does not affect the magnitude of the LTT effect, although it increases the accuracy with which we estimate this effect slightly. Column 6 duplicates the regression of column 1 but the level of geography used is the census tract rather than postal codes. The use of broader geographical units lowers the coefficient on prices and makes it insignificant. Column 7 presents results using the main specification for house values under $400,000 and column 8 repeats this houses above $400,000.

In all, Table A2 suggests that the LTT has had a small negative effect on the price of single-family homes in Toronto.

TAX INTERACTION EFFECTS: We here extend our analysis of the costs of the LTT to reflect the fact that Toronto residents are subject to a pre-existing provincial LTT. This analysis suggests that the cost of lost mobility associated with the Toronto LTT is about three times as large as the estimate developed in the main text.

Figure A1 is based on Figure 4, but illustrates a real estate market equilibrium where the market is subject first to a provincial LTT and then to an identical Toronto LTT. The starting point is the Ontario Land Transfer Tax, LTT_{ONT}. With this tax in place, the volume of sales is V_1 and the price of a property is P_1. If we ignore the interaction of the Ontario LTT with the rest of the federal, provincial, and municipal tax system, then the excess burden of the LTT_{ONT} is the light shaded area.

Introducing the LTT_{TO} doubles the total land transfer tax rate. This causes the volume of transactions to drop to V_2 and the price of a property to decline to P_2. Measured in the usual way, the total deadweight loss of the tax system is now the larger dark shaded area, in addition to the original light shaded area. The excess burden from the LTT_{TO} is much larger than the original excess burden, the light-shaded area.

If the marginal effect on volume of the two taxes is the same then the deadweight loss of the second LTT when there is a pre-existing LTT is about three times as large as when there is no pre-existing LTT.

Figure A2 Supply and Demand Curve for a Group of Houses in a Neighbourhood: The Effect of Multiple Land Transfer Taxes
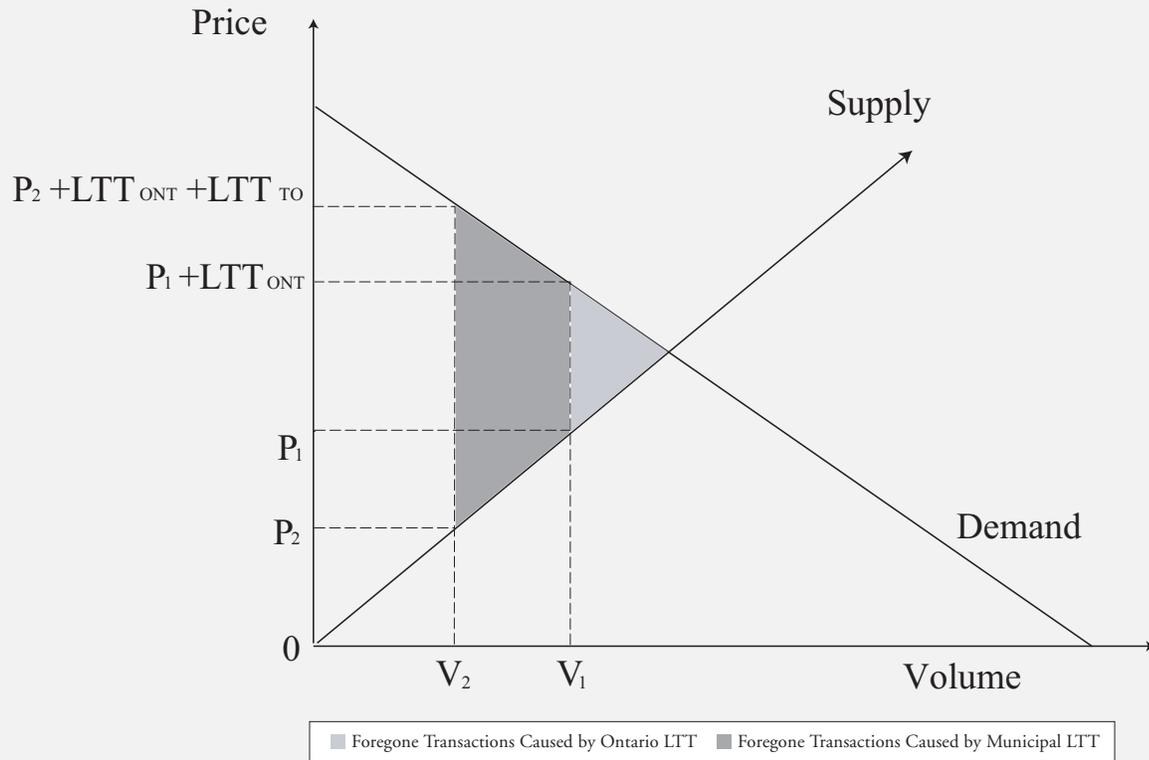
Source: Authors' calculations.

References

Benjamin, John, Edward Coulson and Shiawee Yang. 1993. "Real Estate Transfer Taxes and Property Values: The Philadelphia Story." *Journal of Real Estate Finance and Economics.* 7: 151-157.

City of Toronto. "Municipal Land Transfer Tax (MLTT) Third Quarter 2008 Variance Report." Corporate Finance Division.

CMHC. 1991. "Mobility Characteristics of Canadian Households." Research Highlights. Socio-Economic Series Issue 1.

Dahlby, B., and S. Wilson. 2003. "Vertical Fiscal Externalities in a Federation." *Journal of Public Economics* 87: 917-930.

Friggit, J. 2003. "Droit de mutation et montant des transactions immobilières." Mimeograph.

Hemson Consulting Limited. 2007. "Assessment of Potential New Tax Measures under the City of Toronto Act, 2006." March 2007.

Nowlan, David. 2007. "Economic Implications of the Proposed City of Toronto Land Transfer Tax." Attachment 1 to "New Taxation Measures Supplemental Report – City of Toronto Act 2006," Toronto City Council agenda, July 16th, 2007.

Hendel, Igal, Aviv Nevo and Francois Ortalo-Magne. 2008. "The Relative Performance of Real Estate Marketing Platforms: MLS versus FSBOMadison.com." *American Economic Review*. Forthcoming.

Mintz, Jack, and Tom Roberts. 2006. "Running on Empty: A Proposal to Improve City Finances." C.D. Howe Institute Commentary. C.D. Howe Institute: Toronto.

O'Sullivan, Arthur, Terri Sexton and Steven Sheefrin. 1995. "Property Taxes, Mobility and Home Ownership." *Journal of Urban Economics* 37: 107-129.

Sexton, Terri. 2008. Presentation at Proposition 13 at 30, Institute of Governmental Studies, UC Berkeley, June 6, 2008.

Spears, John, and Robyn Doolittle. "Libraries agree to cuts, but police defy mayor: But library board responds to mayor's budget demands by trimming $1.2 million." *Toronto Star* Jul 26, 2007, p. A.1.

State of Florida, Department of Revenue, Revenue Collection Report, Office of Tax Research. June 2008 & FY 07/08 Summary.

Van Ommeren, Jos, and Michiel van Leuvensteijn. 2005. "New evidence of the effect of transaction costs on residential mobility." *Journal of Regional Science* 45 (4): 681-702.

December 2008   Richards, John, Jennifer Hove, and Kemi Afolabi. *Understanding the Aboriginal/Non-Aboriginal Gap in Student Performance: Lessons From British Columbia.* C.D. Howe Institute Commentary 276.

November 2008   Charlebois, Sylvain, and Richard Pedde. "A Bushel Half Full: Reforming the Canadian Wheat Board." C.D. Howe Institute e-brief.

November 2008   Dodge, David A. "Central Banking at a Time of Crisis and Beyond: A Practitioner's Perspective." C.D. Howe Institute Benefactors Lecture.

November 2008   Laurin, Alexandre, Finn Poschmann, and Robin Banerjee. "International Policy Responses to the Financial Crisis: A Canadian Perspective." C.D. Howe Institute e-brief.

November 2008   Pierlot, James. *A Pension in Every Pot: Better Pensions for More Canadians.* C.D. Howe Institute Commentary 275.

October 2008   Busby, Colin. "Fixing a Persistent Problem: Canada's Regional Pockets of Unemployment." C.D. Howe Institute e-brief.

October 2008   Richards, John. "Closing the Aboriginal/non-Aboriginal Education Gaps." C.D. Howe Institute Backgrounder 116.

October 2008   Adler, Matthew. "Stumbling Forward on Trade: The Doha Round, Free Trade Agreements, and Canada." C.D. Howe Institute e-brief.

October 2008   Card, David, Martin Dooley, and A. Abigail Payne. "School Choice and the Benefits of Competition: Evidence from Ontario." C.D. Howe Institute Backgrounder 115.

September 2008   Stapleton, John, and Richard Shillington. "No Strings Attached: How The Tax-Free Savings Account Can Help Lower-Income Canadians Get Ahead." C.D. Howe Institute e-brief.

September 2008   Alexandroff, Alan S., Gary Clyde Hufbauer, and Krista Lucenti. *Still Amigos: A Fresh Canada–US Approach to Reviving NAFTA.* C.D. Howe Institute Commentary 273.

September 2008   Chen, Duanjie, and Jack Mintz. "Still a Wallflower: The 2008 Report on Canada's International Tax Competitiveness." C.D. Howe Institute e-brief.

September 2008   Dungan, Peter, Jack Mintz, Finn Poschmann, and Thomas Wilson. *Growth-Oriented Sales Tax Reform for Ontario: Replacing the Retail Sales Tax with a 7.5 Percent Value-Added Tax.* C.D. Howe Institute Commentary 273.

September 2008   Dachis, Benjamin. "No Free Ride: The Cost of Essential Services Designation." C.D. Howe Institute e-brief.

September 2008   Cockfield, Arthur, J. *Finding Silver Linings in the Storm: An Evaluation of Recent Canada–US Crossborder Tax Developments.* C.D. Howe Institute Commentary 272.

August 2008   Johnson, David. "Heads of the Class: A Comparison of Ontario School Boards by Student Achievement." C.D. Howe Institute e-brief.

August 2008   Hogg, Peter W. "A Question of Parliamentary Power: Criminal Law and the Control of Greenhouse Gas Emissions." C.D. Howe Institute Backgrounder 114.

August 2008   Kamstra, Mark, and Robert J. Shiller. *The Case for Trills: Giving Canadians and their Pension Funds a Stake in the Wealth of the Nation.* C.D. Howe Institute Commentary 271.

July 2008   Banerjee, Robin, and William B.P. Robson. "Greener Future: Why Canadian Workers Need More Robust Business Investment." C.D. Howe Institute e-brief.

SUPPORT THE INSTITUTE

For more information on supporting the C.D. Howe Institute's vital policy work, through charitable giving or membership, please go to www.cdhowe.org or call 416-865-1904. Learn more about the Institute's activities and how to make a donation at the same time. You will receive a tax receipt for your gift.

A REPUTATION FOR INDEPENDENT, NONPARTISAN RESEARCH

The C.D. Howe Institute's reputation for independent, reasoned and relevant public policy research of the highest quality is its chief asset, and underpins the credibility and effectiveness of its work. Independence and nonpartisanship are core Institute values that inform its approach to research, guide the actions of its professional staff and limit the types of financial contributions that the Institute will accept.

For our full Independence and Nonpartisanship Policy go to www.cdhowe.org.

C.D. Howe Institute
67 Yonge Street
Toronto, Ontario
M5E 1J8