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The effect of agricultural zoning on
land prices, Quebec, 1975-1981

by

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Abstract

In this paper we examine the effects of the agricultural zoning law put in place by the Government of Quebec in December 1978 on the price of land in a suburb of Montreal. Using data from arm's length transactions carried out in Carignan and Saint-Mathias from 1975 to 1981, we estimate, using ordinary least squares, a price per acre determination equation with lot size, distance to Montreal, services (sewers,...) and agricultural zoning (or not) as independent variables. Our results indicate that being zoned for agricultural purposes reduces the value of an acre of land.

Résumé

Dans ce texte nous examinons les effets de la loi du zonage agricole du Québec, proclamé en décembre 1978 sur le prix du sol dans une banlieue de Montréal. A l'aide de données sur les transactions normales faites à Carignan et Saint-Mathias de 1975 à 1981, nous estimons, à l'aide des moindres carrées ordinaires, une équation de détermination du prix par acre avec comme variables indépendantes la dimension du lot, la distance de Montréal, les services disponibles (égouts,...) et le zonage agricole (ou non) du sol. Nos résultats nous indiquent que le zonage agricole réduit le prix d'un acre de sol.

At the end of 1978 a set of zoning restrictions were introduced by the Government of the province of Quebec (Canada) to ensure the protection of agricultural land. This paper examines if that policy creates a price differential between restricted and unrestricted use land. Since Quebec has one of the strongest agricultural land protection policy in North America, the results of such an examination can be useful in indicating to public policy makers in America the effects of such a policy.

The paper is divided in four parts. In the first one the institutional setting and the region examined are presented. In the second, the model and data used are discussed. In the third part, the results of a single equation model are discussed. They indicate that for an urban fringe area, south-east of Montreal (the Carignan/Saint-Mathias area) the effect of agricultural zoning is to reduce the relative price of restricted use land ("green land") with respect to unrestricted use land ("white land").

1. The Institutional Setting and the Carignan/Saint-Mathias Area

The "Act to Preserve Agricultural Land", Bill 90, was presented by the Quebec Minister of Agriculture to the Quebec National Assembly on November 8, 1978 : it became law on December 22, 1978. The law creates the "Commission de Protection du Territoire Agricole" and sets out the process to be used in determining the restricted use areas. That process is as follows :

- 1) The Government sets, by decree, which parts of a region are temporarily designated as restricted use land and which parts are not. This technique was designed to allow the government to freeze development of land instantaneously while allowing it to do so at different dates in different parts of Quebec. In total, six decrees were used to cover the entire province. The first decree passed November 9, 1978, covered the best agricultural land of Quebec and included the Carignan/Saint-Mathias (C.S.M. thereafter).

- 2) Once a decree has been issued, municipalities covered by it enter in negotiations with the Commission to determine the definitive boundaries of the restricted use (green) land and unrestricted use (white) areas¹. These boundaries may differ from the temporary ones set by the decree. In case of disagreement the Commission sets the boundary. This means that in between the issuance of a decree and the setting of the definitive zoning boundaries, there is a period of uncertainty as to what land will be designated as green land : that period should usually not exceed six months. An important criteria used to determine if a parcel will be designated as green or white is its agricultural potential².

As Raciti and Le May (1980) point out, the key features of Bill 90 is that "it amounts to the taking of property rights without reasonable compensation" (p. 51). As a result it is important, in assessing the effects

¹Restricted or unrestricted by the agricultural zoning law. Municipal zoning is, of course, always possible. By exception a farmer may build a house for himself or his children on green land.

²Amongst other criterions one should note that land serviced by water mains or sewers is usually zoned as non agricultural land.

of this law, to examine the effects of restricted use zoning on the price of land¹.

The C.S.M. area is made up of two municipalities contiguous to one another with the Richelieu river as a common boundary. They were selected for this study because of our ease in obtaining² the relevant data but the area is typical of urban fringes area on the perimeter of Montreal in the second half of the seventies, with rapid population growth due to suburbization³.

The C.S.M. area measures 110,6 square kilometers and is part of the St-Lawrence river plain. The soil quality is the same throughout the area⁴ and there are no special topographic features in this part of the plain. The only relevant C.B.D., Montreal, is located on average 25 kilometers away from the C.S.M. area using the main access route to it, the Eastern Township Expressway, to measure this distance⁵. There are no important regional towns in the area.

¹Owners of green land are granted some property tax rebates. See Vaillancourt (1980) for details.

²L. Monty resides in the area : he personally assembled the data used here.

³From 1976 to 1981 its population grew by 35% from 5551 to 7473 inhabitants: the population of the Montreal metropolitan area grew by 1% in the same period (1981 Census of Canada, Population Geographic Distribution Quebec (S-C 93-905) Ottawa : Statistics Canada, Tables 5 and 6.

⁴Class 2 land (Canada Land Inventory classification scheme) with some excess humidity, slow drainage and 2500 thermal units per month.

⁵This expressway is used by an overwhelming majority of residents as their route to Montreal. The network of access road to it was not modified from 1975 to 1981.

2. The model and data

The theoretical underpinnings of the process that determines land values have been the object of study since the work of Von Thunen. More recently Alonso (1964) provided a more complete model of this process. In this study we accept that the price of land depends on its value in various alternative activities and use an empirical model based on the current literature as exemplified by the work of, amongst others, Brigham (1965), Adams et al (1968), Hushak (1975) and Hushak and Sadr (1979). We draw particularly on the latter two papers since they include amongst their independent variables an agricultural zoning variable. We also make use of Grieson and White's (1981) analytical framework when examining the effect of agricultural zoning since it can be classified as an allowable use restriction.

The standard land price determination study uses a one-equation model, linking the price of a unit of land (square feet, acre,...) to the size of the lot, to its distance from the C.B.D. and when appropriate, other cities, and to amenities. The type of functional relationship used (linear, semi logarithmic,...) varies from one study to the next. In this study we explain the value of the natural logarithm of the deflated price of an acre of land using the following independent variables : natural logarithm of lot size, linear distance to Montreal and three sets of dummy variables (water/sewer services, neighborhood quality and zoning)¹.

¹Taxes and municipal expenditures are similar in Carignan and Saint-Mathias, once differences in water and sewer services are controlled for. Hence we did not include fiscal variables.

We choose to use a transcendental function similar to the one used by Hushak and Sadr (1979) since we expect a non linear relationship between the price per unit of land and lot size and since preliminary calculations indicate that this functional form yield the best fit.

For our calculations we use only data from sales of vacant land excluding land zoned at the municipal level for commercial or industrial purpose. As a result we need not take into account municipal zoning (commercial, industrial...) nor do we need to net out the effects of structures, often a difficult task¹. We use data for the 1284 normal sales that took place in the C.S.M. area between January the 1st 1975 and December 31, 1981. Normal sales are arm's length sales; excluded are sales such as those between parents or sales by auction for non payment of taxes. In total excluded sales make up less than ten percent of all sales.

Information used to exclude or not sales as well as the data on price, lot size and date of transaction were taken from the transaction report filed by municipalities with the Quebec Ministry of Municipal Affairs². Data on the absence or presence of water mains and sewers, on the distance to Montreal and on being located in the white or green area.

¹There were no major changes to municipal zoning from 1975 to 1981 in the C.S.M. area. While residential zoning could incompass multi-family dwellings, in practice it is single-family dwelling that are built in the C.S.M. area.

²The "Rapport Analytique et Comparatif des Données du Marché Immobilier".

The dependent variable is the deflated price per acre : this deflation allows us to obtain the real increase in the price of land rather than the one incorporating inflation¹. We use as a deflator the price index for durable goods rather than the Consumer Price Index as Adams et al (1978) did². We do this since we believe that individuals when deciding if the (relative) price of land has gone up will not do so by comparing it to a basket of all other goods and services but to goods who have at least some durability as land does. Hence land is much more comparable to durables such as cars than to non durables such as food³.

We use the logarithm of lot size rather than its reciprocal to account for the non-linear relationship that usually prevail between the size of lot and the per unit price of land because this is the relation with the best statistical fit. We expect a negative relationship between the size of a lot and the price per acre of land since higher unit land prices tend to lead to a more intensive use of land and thus to smaller lots. This implies a simultaneous relationship between the per unit price of land and lot size : we neglect it in our single equation model but examine it in our two-equation model.

¹Using the Consumer Price Index one finds that prices increased 71% in Canada from 1975 to 1981. Since agricultural zoning was implemented from 1979 onwards, the use of non deflated prices would lead (as unreported estimates show) to measurement problems in sorting out the effects of the zoning measure and of inflation.

²When using the CPI one should remove from it the price index for land.

³We could possibly have used data for only one year, 1980 or 1981, to do away, or at least minimize the issues of deflation. However, we preferred using the highest possible number of transaction to minimize the impact that anomalous transactions could have on our results.

Our second independent variable is distance to Montreal. It enters in a linear fashion in our equation. We expect, as is usually the case in studies examining the determinants of land values, a negative relation between the distance to the C.B.D. and the per acre price of land in the C.S.M. area. Since lots in Saint-Mathias are more often serviced (water/sewers) than those in Carignan and further away from Montreal on average, one could observe some correlation between these two variables.

Our third independent variable is the availability of services. Three levels are possible : no services, water main, water main and sewers. We expect a positive relationship between the level of services and the price per acre : we use two dummy variables to measure the level of service with "no services" the omitted category. We must note, however, that the availability of services is linked to both lot size and the zoning variable. It is linked to lot size since municipal zoning requires that unserviced lots be larger so as to permit the installation of a septic tank and in some cases a well¹. It is linked to the zoning variable since serviced lots will usually be zoned for non agricultural use.

Our fourth variable is a four level neighborhood quality index calculated using data collected by municipal assessors. We expect a positive effect of the neighborhood quality on the price of land : we use

¹In Saint-Mathias and Carignan, throughout the period, lots must have a minimum size of 20,000 square feet if unserviced and 15,000 if serviced by a water main. Fully serviced lots (found only in Saint-Mathias) must measure at least 6,500 square feet.

three dichotomous variables with the lowest quality level being the excluded category. We must note that assessors not only use variables such as the socio-economic status of residents, the age of houses in the area and the proximity to wooded areas or to the Richelieu river to determine the quality of a neighborhood but also the price of past transactions and the use of land for agricultural or residential purposes. In the case of prices there is a positive link between past prices of transactions in the area and the level of the quality index but no formal link between the price of the actual transaction and the quality index. In the case of land use, areas with a high percentage of their land used for agricultural level have a lower quality index. Since these areas are more likely to be zoned for agricultural use there is a link between this independent variable and the zoning variable.

Our last independent variable is our zoning variable. It is a dichotomous variable taking the value 0 for unrestricted use zoning (white land) and 1 for agricultural use zoning (green land).

Table 1 presents the mean values or percentage breakdown of our various variables for all lots, green lots and white lots. Not surprisingly one finds that agricultural lots have a lower per acre price, are larger and are further away from Montreal than non-agricultural lots. Furthermore, given the links between zoning, on one hand, and services and the quality index on the other, it is not surprising to find a higher percentage of agricultural lots than of unrestricted use lots in the unserved and level 1 quality index categories.

Table 1
Mean values and distribution of variables

	All lots	Restricted (Agricultural) Use lot (Green lots) ¹	Unrestricted Use lot (white lots) ¹
Deflated lot price (\$)	28,405	13,294	34,569
Lot size (acres)	5,47	17,61	0,52
Deflated price per acre (\$)	6610,82	3652,16	7817,64
Distance to Montreal (kms)	25,08	26,89	24,34
<u>Water/Sewer services</u>			
None (%)	71,0	93,9	61,6
Water (%)	9,7	1,3	13,2
Water and Sewer (%)	19,3	4,8	25,2
<u>Quality of Neighborhood Index</u>			
Level 1 (%)	20,4	69,4	0,4
Level 2 (%)	46,7	14,2	60,0
Level 3 (%)	22,6	12,1	26,9
Level 4 (%)	10,3	4,3	12,7
Number of lots	1289	372	912

Source : Monty (1983, p. 55).

Note : Before 1979, there was no agricultural zoning. However, lots are classified according to the 1979 zoning boundary irrespective of when the recorded transaction took place in the 1975-1981 period. There were 350 transactions in the white area and 65 in the green area from 1979 to 1981.

3. The results

Given the link between the zoning, services and neighborhood quality index variables, we examine the effects of agricultural zoning (table 2), first using the full set of independent variables (equation 1) and then removing either the services (equation 3) or neighborhood quality (equation 4) variables or both (equation 5). We also add to the full set of independent variables a set of six temporal dichotomous variables (equation 2 : 1976 to 1981 inclusively : 1975 is omitted). We do this because the zoning variable takes the value 1 only for transactions carried out in 1979, 1980 and 1981. As a result, it could be correlated with a time-related determinant of land prices that is not amongst the set of independent variables (for example the economic cycle). In that case its coefficient would capture the effects of that variable and thus not give us a correct estimate of the impact of agricultural zoning. We expect that, because of its inelastic supply, the real price of land will increase through time.

Our first independent variable, \ln (lot size) has the expected negative sign and is significant (at the 95% level) in all five equations¹. Its absolute value which varies from .256 to .392 falls in between the values reported for Columbus by Hushak and Sadr (1979) for residential (.638) and agricultural (.176) land parcel. Its absolute value increases as either or both of the services and neighborhood quality variables are omitted. When services are omitted, the effect of an increasing minimum lot size when the level of services declines (because of well and septic tank requirements) is captured by the lot size coefficient. Unserviced

¹We use one-tailed t-test level of significance since we have specific expectations as to the sign of each variable.

Table 2
Regression results, Effect of Agricultural Zoning
on Price per Acre, C.S.M. area, 1975-1981,
4 equations

Variables	All Variables (1)	Present + 6 Dummies (2)	Services Variables omitted (3)	Neighborhood Quality Variables omitted (4)	Services and Neighborhood Quality Variables omitted (5)
Constant	8.733 (66.04)	8.661 (64.17)	7.776 (80.74)	9.782 (94.97)	8.811 (104.43)
ln (lot size) (acres)	-0.256 (-19.76)	-0.252 (-19.73)	-0.277 (-20.95)	-0.306 (-25.09)	-0.392 (-34.52)
Distance to Montreal (Kms)	-0.040 (-8.84)	-0.042 (-9.38)	-0.004 (-1.46)	-0.067 (-15.36)	-0.021 (-6.51)
Restricted use (agricultural) Water/Sewer services (none omitted)	-0.159 (-2.24)	-0.274 (-3.60)	-0.143 (-1.93)	-0.291 (-3.80)	-0.364 (-4.41)
Water	0.255 (4.27)	0.301 (5.06)	-	0.393 (6.20)	-
Water and Sewer	0.685 (10.19)	0.723 (10.91)	-	0.967 (14.48)	-
Neighborhood Quality (level 1 omitted)					
Level 2	0.410 (6.57)	0.349 (5.55)	0.658 (11.05)	-	-
Level 3	0.656 (9.51)	0.589 (8.55)	0.947 (14.58)	-	-
Level 4	1.121 (14.81)	1.02 (13.41)	1.371 (18.45)	-	-
R ²	0.671	0.683	0.645	0.604	0.539
F	328.66	198.58	389.83	392.07	501.74

- t-statistics appear in brackets below the coefficient.

- The number of observations is 1284 in all four cases.

- There are six temporal dummies in equation 2 : 1975 is the omitted year.

The values of the coefficients (t-statistics) are :

1976 : .093 1979 : .336
(1.76) (5.06)

1977 : .132 1980 : .276
(2.55) (4.60)

1978 : .324 1981 : .184
(5.99) (5.06)

lots must be larger than serviced lots but the value of that extra space is lower than that of the basic building lot. When the Neighborhood Quality variables are omitted, the fact that level 1 land is often agricultural type land is captured by the lot size variable since these lots are usually bigger than the others.

Our second independent variable, distance to Montreal has the expected negative sign and is significant at the 95% level in four (1, 2, 4, 5) equations and significant at the 90% level in the other (3). In the first four cases prices decline from 2 to 6% for each additional kilometer from Montreal with 4% the result obtained in our full equation.(1). Hushak and Sadr report for Columbus and Dayton that "land prices decline by about 4% for each additional mile from the urban center" (1979, p. 701). Using a different specification, Hushak reports that "if the property is residential or agricultural, each additional mile from Columbus reduces prices per acre by an estimated 509\$" (1975, p. 117). Using the mean for agricultural and residential sales (calculated from Table 1, Hushak, 1975) one finds that this is equal to 3,6%. Why is the distance coefficient then not as high (in absolute value) or as significant in equation 3? One possible explanation is that there is a greater proportion of serviced lots in Saint-Mathias than in Carignan while Saint-Mathias is further away from Montreal than Carignan. Hence when the services variable is omitted, the positive effect of services on the price of land is reflected in part in the distance coefficient, as shown in equation 3 and, less strongly in equation 5 thus reducing its negative impact¹.

¹In the same vein, one must note that better quality neighborhoods are closer to Montreal as indicated by comparing the results of equations 1 and 3.

Both the Services and the Neighborhood Quality variables have the expected positive signs, are significant and are of the expected relative magnitude¹. Only Adams et al (1968) report using a sewer variable. They found that the presence of a sewer increased the logarithm of the deflated price per acre of residential land in Northeast Philadelphia from .55 to .91 depending on the equation used. We find three comparable values, .685, .723 and .967. When either the Services or Neighborhood Quality set of variables is omitted, one finds that the value of the coefficients of the other increases. This is plausible since better quality neighborhood hold a greater proportion of serviced lots thus making for a positive correlation between the two variables.

Finally, the temporal dichotomous variables (2) indicate that real land prices increased from 1975 to 1979 and then declined in 1980 and 1981. The inclusion of that variable significantly affects only the zoning coefficient : it increases in absolute value when compared to the coefficient of equation 1.

To summarize, the results for our independent variables other than the zoning variable, are in agreement with our expectations and with results extent in the literature, indicating that we have a plausible model of the land price determination process². Our zoning variable also yields the expected sign (negative³) and is significant. It indicates that green land is

¹That is Water and Sewer > Water, and Level 4 > Level 3 > Level 2.

²As our \bar{R}^2 and F-statistics also indicate.

³In the absence of externalities we expect that land in a restricted use zone will have a lower price than land in an unrestricted use zone (Grieson and White, 1981).

worth between 14.7% and 30.5% less than white land¹. The lower impact is obtained using the full model and the highest impact who excluding both the Services and, more importantly, the Neighborhood Quality variables. Hence the fact that serviced lots and lots in better quality neighborhood are more often zoned for unrestricted than for agricultural use has an impact on the measurement of the effects of the zoning restriction. However, it is important to note that in all four equations the effect of agricultural zoning is unequivocally negative.

¹We transform the coefficient in a % using the $e^B - 1$ formula.

Conclusion

Using a standard land price determination equation, we examined the effect of agricultural zoning in Quebec on urban fringe lots in the Montreal area. We found that restrictive use zoning reduced the price per acre of land, otherwise similar to unrestricted land.

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