Seasonal Variation in Marriage License Applications*

An Exploratory Analysis with Open Data Toronto

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IN PROGRESS What was done:Marriage License data from Toronto between 2011 and 2024 was analysed to determine weather holidays influence the number of applications. What was found: Months associated with popular holidays like February (Valentine's day) and December (Christmas), show an increase in marriage license applications. Why this matters:Understanding these patterns can help city officials anticipate changes in demand for marriage-related services and allocate resources accordingly, ensuring that civil centers are prepared for these seasonal shifts. It also gives us an insight into how emotional and culturl influences during holidays can drive personal descisions.

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^{*}Code and data are available at: https://github.com/fatimahsy/Pandemic-Marriages-.git.

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1 Introduction

The Data Section 2 of this paper explores the opendatatoronto data and outlines tools and methods used to analyze the data and some preliminary observations observed. The Results Section 3 introduces more observations found from the data analysis. The Discussion Section 4 ties back the findings to its real world relevance. Lastly, the Conclusion Section 5 summarizes key findings and outlines future areas of study.

2 Data

2.1 Tools

We use R Core Team (2024) and Gelfand (2022) * ggplot2 (Wickham 2016) * dplyr (Wickham et al. 2023) * readr (Wickham, Hester, and Bryan 2024) * tibble (Müller and Wickham 2023)

2.2 Variable Descriptions

Variable	Description	Data Type
CIVIC_CENTRE	Code representing the civic center where the marriage	Character
	license was issued	
MARRIAGE_LICENSES	Number of marriage licenses issued in that month	Numeric
YEAR	Year when the marriage licenses were issued	Integer
MONTH	Month when the marriage licenses were issued	Integer
DATE	Date constructed from year and month for easier time	Date
	series analysis	

Table 1: Variable Overview

2.3 Dataset Overview

Some of our data is of Marriage licences (Figure 3) from Gelfand (2022).

Civic Centre	Number of Marriages	Year	Month	Date
ET	80	2011	01	2011-01-01
NY	136	2011	01	2011-01-01
SC	159	2011	01	2011-01-01
TO	367	2011	01	2011-01-01
ET	109	2011	02	2011-02-01
NY	150	2011	02	2011-02-01

Table 2: Sample of Toronto Mariage Liciences

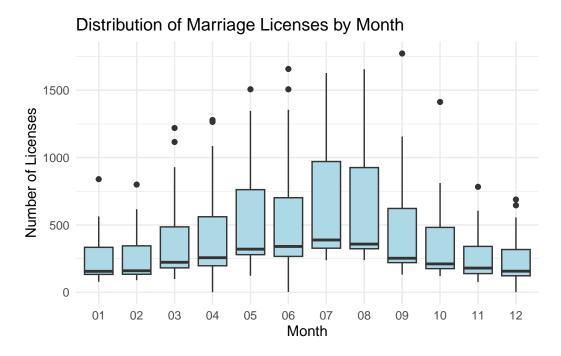


Figure 1: Figure 1: Distribution of Marriage Licenses by Month

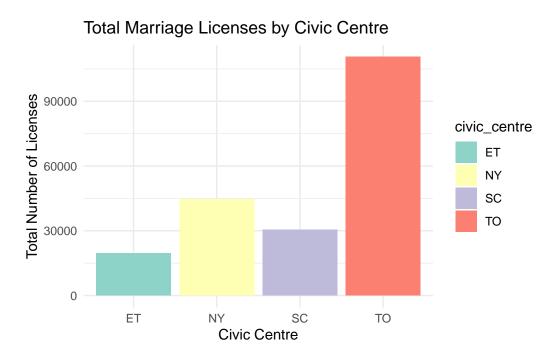


Figure 2: Figure 2: Total Marriage Licenses by Civic Centre

The scatter plot (Figure 3) displays the number of marriage licenses issued in Toronto over time, spanning from before 2015 to approximately 2025.

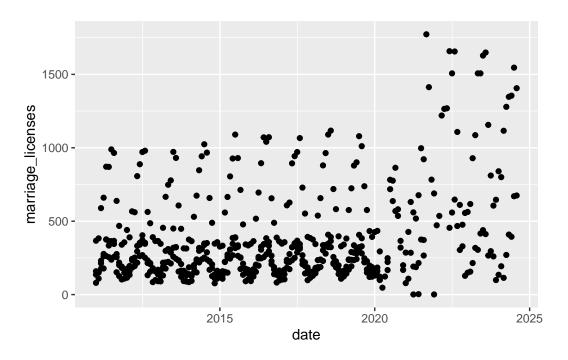


Figure 3: Marriage Licinces By Date

3 Results

3.1 Seasonal and Holiday Trends

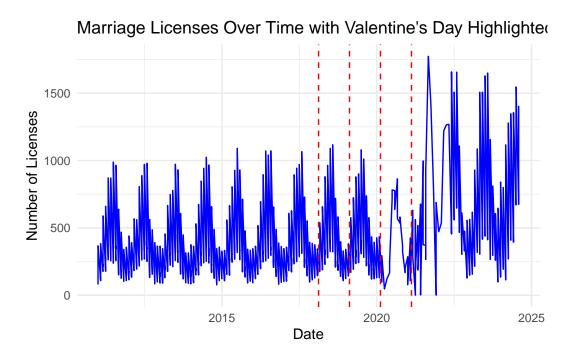


Figure 4: Figure 3: Marriage Licenses Over Time with Valentine's Day Highlighted

Heatmap of Marriage Licenses by Year and Month

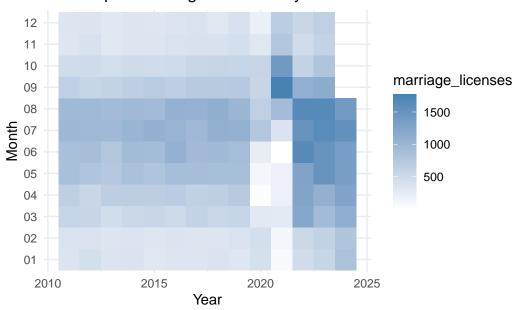


Figure 5: Figure 4: Heatmap of Marriage Licenses by Year and Month

Table 2: Table: Total Marriage Licenses Issued in February for Each Year

Year	February Licenses
2011	796
2012	879
2013	725
2014	717
2015	730
2016	830
2017	770
2018	820
2019	873
2020	908
2021	535
2022	536
2023	773
2024	993

Table 1: Total Marriage Licenses Issued in February for Each Year



Figure 6: Figure 1: Total Marriage Licenses Issued in February (2011-2023)

Table 3: Table: Total Monthly Marriage Licenses by Year

2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
742	902	763	785	739	725	742	815	777	895	364	472	712	975
796	879	725	717	730	830	770	820	873	908	535	536	773	993
1210	1227	990	1062	1160	1073	1251	1137	1222	616	916	1220	1144	1230
1376	1232	1360	1294	1344	1395	1298	1322	1444	47	752	1265	1404	1549
1885	1650	1581	1682	1663	1774	1774	1748	1735	123	705	1269	1812	1756
1824	1843	1579	1806	1927	2011	1889	1918	1738	637	895	2113	1923	1749
1943	2015	1999	1962	2184	2047	1945	2169	2117	1500	1372	2066	2067	2216
1933	1930	1821	1845	1855	2059	2046	2197	2005	1413	1560	2303	2061	2081
1321	1143	1229	1280	1391	1356	1437	1400	1426	1433	1773	1575	1422	NA
1013	1065	940	1001	1010	986	1109	1182	1126	1117	1413	915	1107	NA
816	826	709	673	758	753	836	905	907	686	783	805	866	NA
785	785	679	785	752	747	787	717	855	368	690	684	745	NA
	742 796 1210 1376 1885 1824 1943 1933 1321 1013 816	742 902 796 879 1210 1227 1376 1232 1885 1650 1824 1843 1943 2015 1933 1930 1321 1143 1013 1065 816 826	742 902 763 796 879 725 1210 1227 990 1376 1232 1360 1885 1650 1581 1824 1843 1579 1943 2015 1999 1933 1930 1821 1321 1143 1229 1013 1065 940 816 826 709	742 902 763 785 796 879 725 717 1210 1227 990 1062 1376 1232 1360 1294 1885 1650 1581 1682 1824 1843 1579 1806 1943 2015 1999 1962 1933 1930 1821 1845 1321 1143 1229 1280 1013 1065 940 1001 816 826 709 673	742 902 763 785 739 796 879 725 717 730 1210 1227 990 1062 1160 1376 1232 1360 1294 1344 1885 1650 1581 1682 1663 1824 1843 1579 1806 1927 1943 2015 1999 1962 2184 1933 1930 1821 1845 1855 1321 1143 1229 1280 1391 1013 1065 940 1001 1010 816 826 709 673 758	742 902 763 785 739 725 796 879 725 717 730 830 1210 1227 990 1062 1160 1073 1376 1232 1360 1294 1344 1395 1885 1650 1581 1682 1663 1774 1824 1843 1579 1806 1927 2011 1943 2015 1999 1962 2184 2047 1933 1930 1821 1845 1855 2059 1321 1143 1229 1280 1391 1356 1013 1065 940 1001 1010 986 816 826 709 673 758 753	742 902 763 785 739 725 742 796 879 725 717 730 830 770 1210 1227 990 1062 1160 1073 1251 1376 1232 1360 1294 1344 1395 1298 1885 1650 1581 1682 1663 1774 1774 1824 1843 1579 1806 1927 2011 1889 1943 2015 1999 1962 2184 2047 1945 1933 1930 1821 1845 1855 2059 2046 1321 1143 1229 1280 1391 1356 1437 1013 1065 940 1001 1010 986 1109 816 826 709 673 758 753 836	742 902 763 785 739 725 742 815 796 879 725 717 730 830 770 820 1210 1227 990 1062 1160 1073 1251 1137 1376 1232 1360 1294 1344 1395 1298 1322 1885 1650 1581 1682 1663 1774 1774 1748 1824 1843 1579 1806 1927 2011 1889 1918 1943 2015 1999 1962 2184 2047 1945 2169 1933 1930 1821 1845 1855 2059 2046 2197 1321 1143 1229 1280 1391 1356 1437 1400 1013 1065 940 1001 1010 986 1109 1182 816 826 709 673 758	742 902 763 785 739 725 742 815 777 796 879 725 717 730 830 770 820 873 1210 1227 990 1062 1160 1073 1251 1137 1222 1376 1232 1360 1294 1344 1395 1298 1322 1444 1885 1650 1581 1682 1663 1774 1774 1748 1735 1824 1843 1579 1806 1927 2011 1889 1918 1738 1943 2015 1999 1962 2184 2047 1945 2169 2117 1933 1930 1821 1845 1855 2059 2046 2197 2005 1321 1143 1229 1280 1391 1356 1437 1400 1426 1013 1065 940 1001 10	742 902 763 785 739 725 742 815 777 895 796 879 725 717 730 830 770 820 873 908 1210 1227 990 1062 1160 1073 1251 1137 1222 616 1376 1232 1360 1294 1344 1395 1298 1322 1444 47 1885 1650 1581 1682 1663 1774 1774 1748 1735 123 1824 1843 1579 1806 1927 2011 1889 1918 1738 637 1943 2015 1999 1962 2184 2047 1945 2169 2117 1500 1933 1930 1821 1845 1855 2059 2046 2197 2005 1413 1321 1143 1229 1280 1391 1356 1437<	742 902 763 785 739 725 742 815 777 895 364 796 879 725 717 730 830 770 820 873 908 535 1210 1227 990 1062 1160 1073 1251 1137 1222 616 916 1376 1232 1360 1294 1344 1395 1298 1322 1444 47 752 1885 1650 1581 1682 1663 1774 1774 1748 1735 123 705 1824 1843 1579 1806 1927 2011 1889 1918 1738 637 895 1943 2015 1999 1962 2184 2047 1945 2169 2117 1500 1372 1933 1930 1821 1845 1855 2059 2046 2197 2005 1413 1560 <td>742 902 763 785 739 725 742 815 777 895 364 472 796 879 725 717 730 830 770 820 873 908 535 536 1210 1227 990 1062 1160 1073 1251 1137 1222 616 916 1220 1376 1232 1360 1294 1344 1395 1298 1322 1444 47 752 1265 1885 1650 1581 1682 1663 1774 1774 1748 1735 123 705 1269 1824 1843 1579 1806 1927 2011 1889 1918 1738 637 895 2113 1943 2015 1999 1962 2184 2047 1945 2169 2117 1500 1372 2066 1933 1930 1821 1845</td> <td>742 902 763 785 739 725 742 815 777 895 364 472 712 796 879 725 717 730 830 770 820 873 908 535 536 773 1210 1227 990 1062 1160 1073 1251 1137 1222 616 916 1220 1144 1376 1232 1360 1294 1344 1395 1298 1322 1444 47 752 1265 1404 1885 1650 1581 1682 1663 1774 1774 1748 1735 123 705 1269 1812 1824 1843 1579 1806 1927 2011 1889 1918 1738 637 895 2113 1923 1943 2015 1999 1962 2184 2047 1945 2169 2117 1500 1372</td>	742 902 763 785 739 725 742 815 777 895 364 472 796 879 725 717 730 830 770 820 873 908 535 536 1210 1227 990 1062 1160 1073 1251 1137 1222 616 916 1220 1376 1232 1360 1294 1344 1395 1298 1322 1444 47 752 1265 1885 1650 1581 1682 1663 1774 1774 1748 1735 123 705 1269 1824 1843 1579 1806 1927 2011 1889 1918 1738 637 895 2113 1943 2015 1999 1962 2184 2047 1945 2169 2117 1500 1372 2066 1933 1930 1821 1845	742 902 763 785 739 725 742 815 777 895 364 472 712 796 879 725 717 730 830 770 820 873 908 535 536 773 1210 1227 990 1062 1160 1073 1251 1137 1222 616 916 1220 1144 1376 1232 1360 1294 1344 1395 1298 1322 1444 47 752 1265 1404 1885 1650 1581 1682 1663 1774 1774 1748 1735 123 705 1269 1812 1824 1843 1579 1806 1927 2011 1889 1918 1738 637 895 2113 1923 1943 2015 1999 1962 2184 2047 1945 2169 2117 1500 1372

Table 2: Total Monthly Marriage Licenses by Year

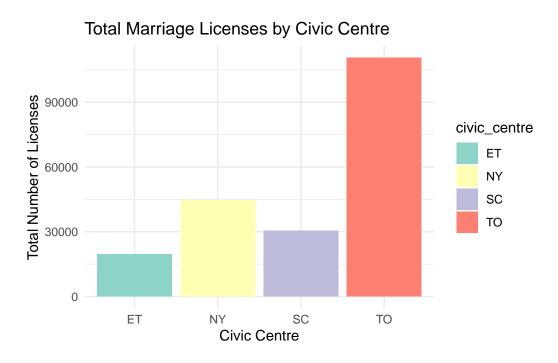


Figure 7: Figure 5: Total Marriage Licenses by Civic Centre

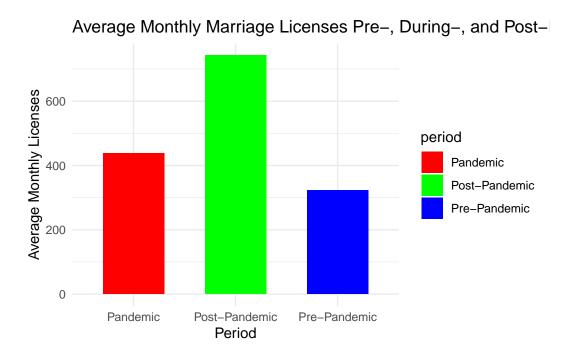


Figure 8: Figure: Average Monthly Marriage Licenses Pre-, During-, and Post-Pandemic

Table 4: Table: Total Marriage Licenses Issued in December for Each Year

Year	December Licenses
2011	785
2012	785
2013	679
2014	785
2015	752
2016	747
2017	787
2018	717
2019	855
2020	368
2021	690
2022	684
2023	745

Table 3: Total Marriage Licenses Issued in December for Each Year



Figure 9: Figure 2: Total Marriage Licenses Issued in December (2011-2023)

- 3.2 Civil Center Comparison
- 3.3 Patterns
- 4 Discussion
- 5 Conclusion

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Appendix

References

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