# Examining Divergence Risks of Planning Forecasts

Research Report
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CANADIAN CENTRE FOR
ECONOMIC ANALYSIS

## About the Centre for Economic Analysis

The Canadian Centre for Economic Analysis (CANCEA) provides objective, independent and evidence based analysis dedicated to a comprehensive and collaborative understanding of the short and long term risks and returns behind policy decisions and economic outcomes.

CANCEA serves municipalities, regions, provinces and industries that seek a best-of-breed understanding of the issues facing them using expertise combined with a many variable computational socio-economic policy evaluation platform.

## About This Report

In keeping with Canadian Centre for Economic Analysis's guidelines for funded research, the design and method of research, as well as the content of this study, were determined solely by the Canadian Centre for Economic Analysis.

Statistics Canada data and relevant literature was used to inform the computer simulation models used to produce the results of this report. All quantitative methods used are documented herewith.

The interpretation and reporting of the results of the mathematical modelling contained within this report do not necessarily represent policy position or the opinion of CMHC.

Forecasts and research often involve numerous assumptions and data sources, and are subject to inherent risks and uncertainties. This information is not intended as specific investment, accounting, legal, or tax advice.

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# 1.0 INTRODUCTION

Ontario's Places to Grow program is designed to help regions plan for growth over the next 25 years. At the high level, it includes forecasts of population and job growth, as well as population and job density targets for various land uses such as around major transit stations and urban growth centres. After the original growth plan was released in 2006, two amendments were released in 2012, followed by the most recent update in 2017.

Ten years after the original Places to Grow plan was released, it is a good time to examine some of the challenges and observations associated with the program, and to investigate the risk that municipalities might be exposed to under the growth plan.

# 2.0 GENERAL COMMENTS ON PLACES TO GROW

The Places to Grow program provides rules on where development can occur and criteria, such as densities, that should be met. For each municipality in the Greater Golden Horseshoe (GGH) it includes population and job targets for each region.

In order to meet some of the targets, significant changes in behaviour must occur. For example, according to the 2017 update, in order for the region of Durham to meet its population target by 2041, its average annual rate of growth (in percentage terms) from 2016 to 2041 will have to be 1.4 times higher than over the previous 15 years. A greater challenge involves meeting the targets for jobs.

## 2.1 EMPLOYMENT RATES

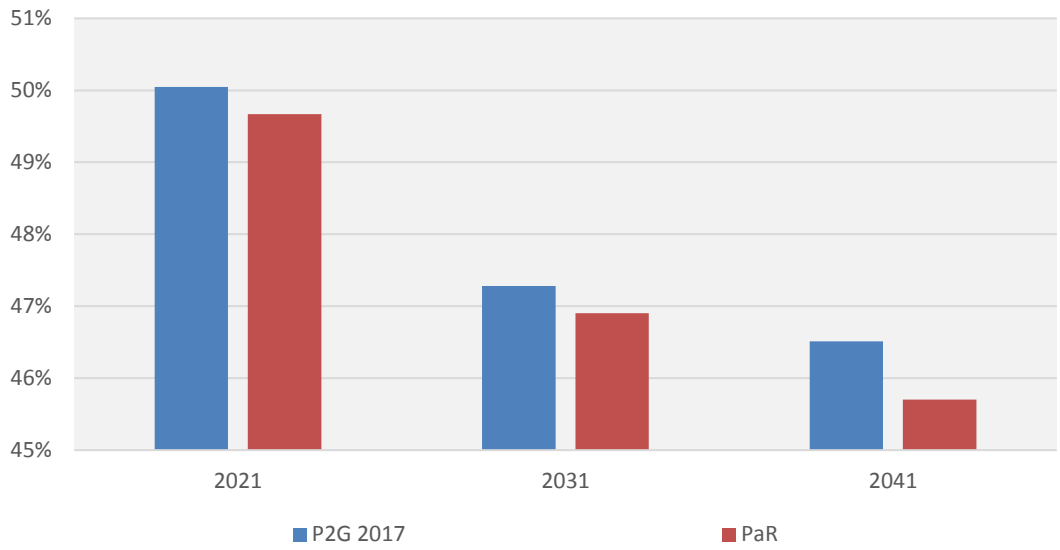
In addition to population, the number of jobs in each region is a key planning metric. Note that for jobs, Places to Grow concerns itself with the location that a person works, not where an employee might live. Therefore, the number of jobs in a region is only loosely connected to the population of the region. For example, the City of Toronto has a net inflow of commuters resulting in a greater than average ratio of jobs to resident population. In contrast, Durham has a large net outflow of commuters resulting in a much lower ratio of jobs to resident population.

This ratio of jobs to resident population should not be confused with the employment rate which is the fraction of the resident in a region which are employed in any region. However, since there is relatively small number of people who commute from outside the GGH to work inside the GGH (and vice versa), over the entire GGH, the employment rate and ratio of jobs to population are similar.

Across the GGH, the population, number of jobs, and age-dependent participation rates are tightly coupled and even a small difference in assumptions about employment rates can be significant. For example, a 1% difference in aggregate employment rate is equivalent to over 130,000 jobs by 2041 for a GGH population of 13.5 million people. Proper age-specific rates and employment trends are critical and small variations in

labour force participation for a given population can result in very different estimates for the number of jobs. For example, Figure 1 compares the estimated aggregate employment rates (defined as the number of people with jobs divided by the total population) from Places to Grow 2017 and Prosperity at Risk. Different assumptions about the age distribution of labour force participants, family structure and age of immigration (among other factors) give rise to different job estimates.

**Figure 1** Average employment rates in the Greater Golden Horseshoe




## 2.2 2012 Amendments

An additional challenge associated with Places to Grow is its ability, or lack thereof, to adapt to changing dynamics. For example, when the 2012 Amendment #1 was released in 2012, it contained population data that was out of date. At the time of release, the population and job forecast required to be used for planning purposes included values for 2011, but the values were inconsistent with 2011 census data (Table 1). In addition, the planning targets for 2021 and 2031 were unchanged from 2006 despite five more years of data. As a result, municipalities may be required to plan for population and job targets they expect might not occur.

**Table 1** Comparison of Census and Places to Grow 2012 Amendment #1 population for 2011

| | Population in 2011 | | | Jobs in 2011 | | |
|---|---|---|---|---|---|---|
| | Census | P2G 2012 #1 | Difference | Census | P2G 2012 #1 | Difference |
| Toronto | 2,705 | 2,760 | 2.0% | 1,726 | 1,540 | -10.8% |
| Peel | 1,341 | 1,320 | -1.5% | 736 | 730 | -0.8% |
| York | 1,066 | 1,060 | -0.5% | 559 | 590 | 5.6% |
| Halton | 627 | 660 | 5.3% | 258 | 260 | 0.9% |
| Durham | 536 | 540 | 0.8% | 254 | 230 | -9.6% |
| Hamilton | 517 | 520 | 0.5% | 266 | 280 | 5.4% |

With the Places to Grow 2012 Amendment #2, the outdated 2011 information was removed and the 2021 forecasts did not change. However, the 2031 forecasts did change. It is unclear how the forecast model is able to maintain exactly the same 2021 projections for population and jobs while allowing the 2031 forecasts to vary.

## 2.3 2017 Update

The 2017 update presents the same population and job targets as the 2012 Amendment #2, even maintaining the 2021 projections that were originally presented in the original 2006 Places to Grow. The stability of the 2021 forecast implies that no consideration of the evolution of the Ontario population and economy over the last decade was considered in the 2017 update.

# 3.0 DIVERGENCE RISKS

In general, it is safe to state that the outcomes of a 25 year demographic and jobs forecast will not be realized exactly. Numerous factors, both internal and external, will change over that timeframe that would result in divergence from the initial expectations. Therefore, planning and building today to exactly meet the 25 year forecast *will* result in a mismatch between the population and job requirements and the development plan. However, the key question is how large of a mismatch could it be? If it is small, there is not a problem. In contrast, if it is large, it may even put the finances of the municipality at risk if the region had significantly invested in infrastructure in anticipation of jobs that do not arrive.

To understand the risks, it is necessary to investigate how the province and its municipalities could evolve under various influences. Of particular importance are those over which the planners and municipalities have limited control.

## 3.1 Sensitivity Parameters

There are several key factors which will influence the population and job growth in Ontario. For this analysis, the focus is upon immigration, labour force participation rates, housing location preferences, and changing industry mixes.

### 3.1.1 NET IMMIGRATION TO ONTARIO

International immigration policy is largely a federal government policy which is outside the control of the Ontario government and municipalities, but is the largest factor supporting population growth in the province. Historically, immigration policies have varied both in number of immigrants and the type of immigrants given preference (i.e., family class or economic). In order to capture a reasonable range of immigration policies, the variation in net immigration rates is assumed to have a normal distribution with 95% confidence interval chosen to align with the Ontario Ministry of Finance 'high growth' and 'low growth' scenarios. Age, sex, and family structure profiles are maintained with an overall scaling applied.

It is assumed that any changes in immigration are applied to all regions in proportion to regional population. For each simulation, a random net immigration rate is chosen from the distribution. The result is a distribution of total population by 2041 with varying age and sex distributions.

### 3.1.2 LABOUR FORCE PARTICIPATION RATES

Jobs can only be created if people exist to fill them, and are willing to work. The labour force participation rate depends on numerous household decisions regarding retirement preferences, household savings, commuting options, and expected life spans. Therefore, for a given population, a range of participation rates is possible. In order to account for this uncertainty, participants' decisions to enter or leave the labour force (by age and sex) are assumed to follow a random walk (drift + noise) based on the past 15 years of behaviours. As shown in Figure 2, in addition to an aging population, the employment rates in older age groups have been increasing while those in younger age groups have been decreasing. In each scenario, the relative size of commuting flows between regions are assumed to persist.

**Figure 2** Change in employment rates by age group


### 3.1.3 LOCATION PREFERENCES AND TYPE OF HOUSING STOCK

Variations in housing stock and typology along with other factors such as transit accessibility and overall community appeal can result in different municipalities being more or less appealing to residents and jobs. Even if all of the regions within the GGH have planned for their allocation of the total GGH jobs and population, the competition between regions to attract residents and jobs may result in undershooting or overshooting the expectations. For example, if households with more members than expected settle in one

region, the overall population could be larger than planned. Similarly, if jobs are enticed to a different municipality due to greater transit investment, expected jobs growth may not materialize.

In the status quo scenario, it is assumed that each region has an equal attraction in accordance with historical trends. Since it is not known how the municipalities may vary, for each scenario, we randomly add a bias of between -10% and +10% to region as a proxy for:

- Housing stock preference and availability;
- Transit accessibility;
- Prices; and
- Other local amenities.

As the population grows, people will tend to settle in 'more attractive' regions at the expense of 'less attractive' ones.

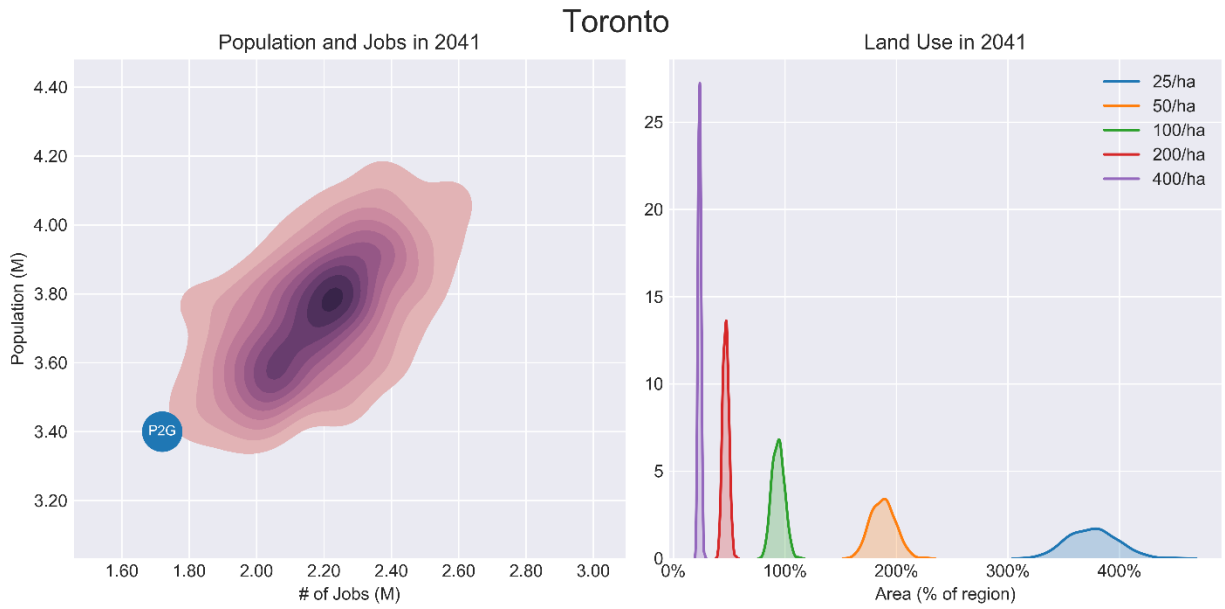
### 3.1.4 INDUSTRY CHANGES AND LAND USE

As the industry structure in Ontario evolves, both by mix of industries and changing technologies in current industries, land use requirements will change. However, the nature of these changes are quite uncertain. In addition, there is no unified land use plan for the GGH to calculate population and job densities. Therefore, it is more practical to turn the problem around and ask, if the combined population and job density were at a specific target, how much land would be required to accommodate them.

## 3.2 RESULTS

Prosperity at Risk is calibrated such that it is consistent with the Ontario Ministry of Finance's demographic forecasts. (See Appendix A.) Using this calibration as a baseline, a suite of 200 stochastic simulations were run for the entire province with parameters adjusted randomly for each simulation as described in the previous sections. For each of the municipalities in the GGH, the final population and number of jobs in the regions are calculated. Due to the stochastic nature of the simulations, there is a distribution of both. For example, the left-hand panel of Figure 3 shows the distribution of potential population and jobs in the City of Toronto (shaded contours), along with the Places to Grow forecast (blue dot). Basically, this indicates that any outcome within the shaded region is possible with relatively minor changes to behaviours and policies. Furthermore, for the City of Toronto, the Places to Grow estimate is less than any of the Prosperity at Risk outcomes.

**Figure 3** Range of outcomes for the City of Toronto for population and jobs (left) and density (right)




Given the wide range of development options available to municipalities and significant variations of land use within a municipality, it is difficult to forecast average densities without detailed land use models. However, for a given number of residents and jobs, the land area required to accommodate a given average density can be calculated. The right-hand panel of Figure 3, shows the distribution of land area required (as a percentage of total land area of the municipality) required under various assumptions of combined population and job density. Note that this area includes land which may be reserved for other uses such as recreation or greenbelt. The figure shows that the average density across the City of Toronto must be at least 100 people and jobs per hectare by 2041 in order to physically fit the expected number of people and jobs coming into the region. In practice, it may have to be higher once the non-developable land is excluded.

Figure 4 and Figure 5 show same outcomes for the rest of the GTHA municipalities and outer ring municipalities respectively.

**Figure 4** GTHA municipalities

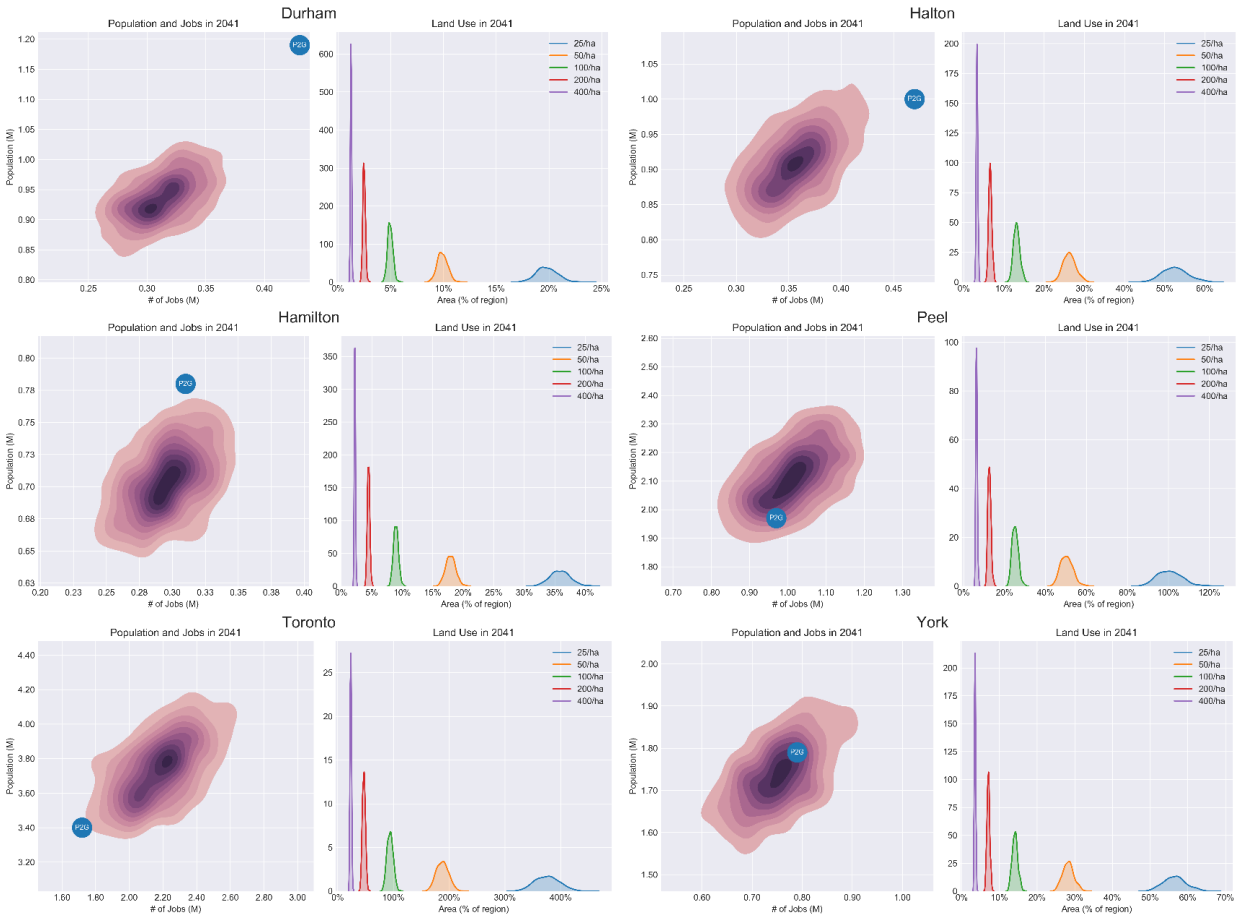
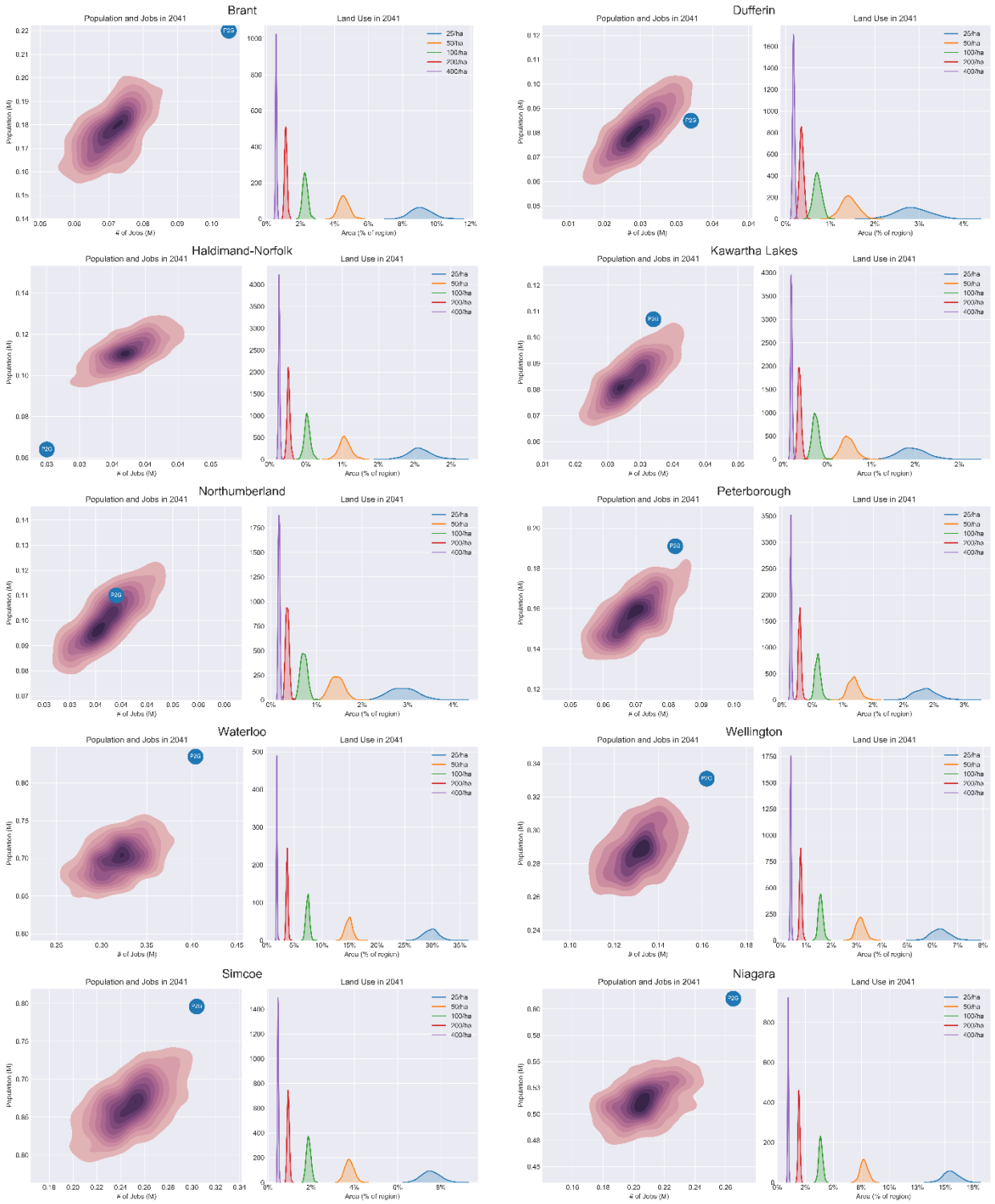


**Figure 5** Outer ring municipalities



The differences between the Places to Grow point projection and the distribution of outcomes simulated by Prosperity at Risk further highlight the challenges of planning to a specific model outcome. Even in the regions where the Prosperity at Risk expectation is aligned with the Places to Grow forecast (such as York or Northumberland), there is significant variation around the mean.

# 4.0 CONCLUSIONS

Long-term demographic and jobs forecasts are unlikely to be reached exactly. Changes in external factors, such as federal immigration policy, or internal factors such as transit development, can influence where people settle and where industries locate. If municipalities plan to a specific target, it may result in stranded debt from over building of infrastructure with expected development charges not arriving, or insufficient infrastructure and services if greater population or jobs arise. In addition, if population growth does not align with the planning expectations, it may result in competition between regions to either attract or repel additional people or jobs which could impede inter-region planning efforts.

As an alternative to planning to a specific target, a more holistic, risk-management approach could be taken which would allow overall development goals to be reached but account for the natural uncertainties in the process. This could include:

- Considering best-case/worst-case scenarios to ensure mitigation strategies are in place if population or job growth diverge from expectations;
- Understanding the connections between growth planning and other government policies (both provincially and federally) such as immigration, housing and rent control regulations, and transit development; and
- Developing a transparent, responsive framework that can quickly adapt to changing conditions.

# A. BASELINE DEMOGRAPHICS

The status quo model is calibrated such that the average population in 2041 aligns with the Ontario Ministry of Finance demographic forecasts. As shown in Figure 6 and Figure 7, average Prosperity at Risk forecasts (solid black line) align quite well with MoF forecasts (orange line). The stochastic uncertainty in Prosperity at Risk outputs is shown by the shaded region.

**Figure 6** Baseline demographic model aligned with Ontario Ministry of Finance forecasts

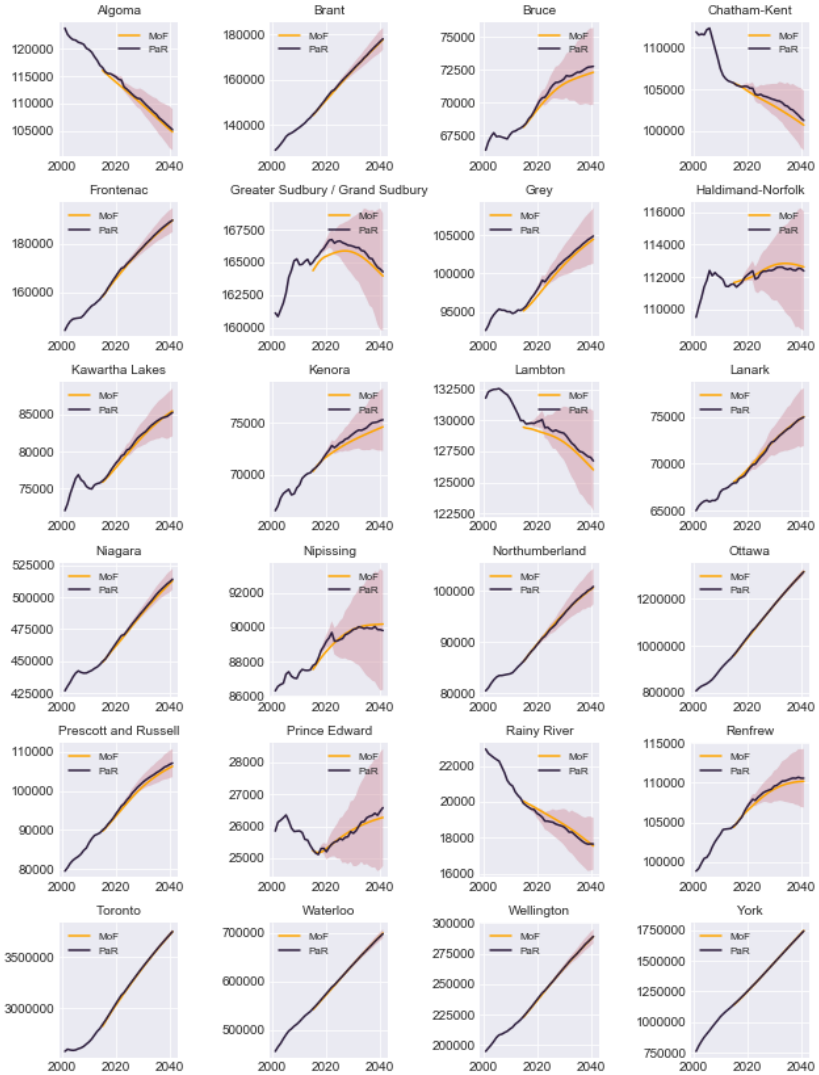


**Figure 7** Baseline demographic model aligned with Ontario Ministry of Finance forecasts