

**Technical Report:**  
**City of Toronto Licensed Child Care Demand and  
Affordability Study**

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## 1. Introduction

This is a detailed technical report explaining how the child care demand and affordability models have been constructed, and how additional data was gathered through eight focus groups and a survey of families in the City of Toronto.

## 2. The Study Team

Dr. Gordon Cleveland is the Principal Investigator on this project, and Professor Michael Krashinsky is Co-Investigator. Sue Colley is Project Manager, and Christine Avery-Nunez is Project Co-ordinator. EKOS Research Associates provided assistance with focus groups and a survey of Toronto families.

Gordon Cleveland is an Economist in the Department of Management at the University of Toronto Scarborough and has recently been Honorary Senior Fellow at the Graduate School of Education, University of Melbourne. He is also a collaborating investigator with a research team of educators and psychologists at University of Quebec at Montreal and Laval University studying early education and child care services in Quebec. With co-authors, he has studied the costs and benefits of universal good-quality child care services in Canada, the financing of child care systems in OECD countries, the effect of child care costs on mothers' employment, the determinants of the wages of child care workers, the determinants of quality in early childhood care services, the structure of costs in early childhood centres, and the impact of non-profit status on the production of quality in child care.

Professor Michael Krashinsky received his PhD in Economics from Yale University, having written a dissertation on child care. Since coming to the University of Toronto, where he is a Full Professor, he has published five books and monographs related to child care, as well as numerous articles on that topic. Prof Michael Krashinsky and Dr. Gordon Cleveland have worked together in the

Department of Management at University of Toronto Scarborough since 1992, and have worked collaboratively on a large number of research projects.

Sue Colley is an early learning and child care policy expert, researcher, developer and advocate with sharp analytic, problem-solving and decision-making skills and the ability to design and implement innovative programs. She was Executive Director of the Ontario Coalition for Better Child Care from 1985-90 and Chief of Staff to Minister Frances Lankin when she was Chair of Management Board, Minister of Health, and then Minister of Economic Development and Trade. In her role as Project Director of the Integration Network Project at the Institute of Child Study, OISE/University of Toronto, Sue was involved in numerous consultations with governments, stakeholders, advocates and the child care community across Canada to successfully put the issue of integration between child care and education on the national agenda.

Christine Avery-Nunez is the former Director of Operations and Managing Director of the Atkinson Foundation. Christine has over 18 years grant-making experience and has managed large scale partnership projects with municipal (Toronto First Duty) and Provincial (Early Learning Advisor) levels of Government. She is currently working as a private consultant providing communications, project management and research support to 8 Canadian Foundations in the area of early childhood education and care as well as Philanthropic Foundations of Canada.

EKOS Research Associates Inc. is an Ottawa-based social research company. It conducts research using a wide range of leading-edge quantitative, qualitative and Internet-based approaches.

### **3. The Main Components of the Study: Demand and Affordability Simulation Models, Focus Groups, and a Survey of Toronto Families**

The fundamental objective of the project has been to develop a behavioural microsimulation model of licensed child care demand and a model for measuring and analyzing the affordability of licensed child care in the City of Toronto. The demand model is able to simulate the future demand for licensed child care as the characteristics of Toronto's population change. It can produce simulations of changes in demand as provincial and city policies change. The affordability model is able to measure and simulate changes in the affordability of licensed child care as incomes and prices change. Demand and affordability measures can be provided for 140 neighbourhoods in the City of Toronto – neighbourhoods that the City uses for planning the provision of services.

The Study Team planned four components of its investigation into studying the demand and affordability of licensed child care in the City of Toronto.

- I. We built and estimated a model of the demand for licensed child care in the City. This became two models, with a separation between children below compulsory school age and those above it. For those in the preschool age category, the model looks at the influence of factors such as the price of child care, the eligibility for subsidy, the potential earnings of the main caregiving parent, the age of the youngest child in the family, the number of children in the family, the immigrant status of families and the ethno-cultural background of families. All of these factors affect the demand for licensed child care and the decisions about employment, which are linked decisions, especially when children are not yet in grade school. Using Canadian data sets, the effect of these factors on the demand for child care and employment were estimated, and these estimates were incorporated in a model that allows the City of Toronto to calculate future demand for licensed child

care. A somewhat similar model, but without the link to employment decisions, was built to calculate the demand for schoolaged licensed child care.

- II. We built a simulation model to calculate the ability of Toronto families to afford licensed child care services. This model incorporates two measures of affordability; one is based on the potential earnings of the main caregiving parent and the other is based on family income. Both of these measures account for the effect of taxes, child benefits, and child care tax deductions or credits on the affordability of child care services. This simulation model can calculate the expected effects of different potential policy changes on the affordability of child care for representative Toronto families.
- III. We held eight focus groups in different communities across Toronto to hear stories and experiences directly from Toronto families. The communities included Jane-Finch, Woodgreen, Rexdale, etc. etc.
- IV. We designed a survey on the child care and employment patterns of Toronto families in 2016 to supplement and update the information available to us from Canada-wide surveys on the same subjects. We contracted with EKOS Research Associates to recruit the sample and conduct this survey. The information provided is particularly useful for analyzing the characteristics of full-fee users of licensed care.

## 4. Details of Child Care Demand and Employment Modelling

### Theory

Any simulation model is constructed according to a recipe provided by theory – in this case the theory about how child care and employment decisions are made and therefore about what are the main factors affecting those decisions.

In fact, child care and employment decisions are part of a network of related decisions about child-rearing and the general well-being of the family, but it is not possible to model this entire network of decisions all together. Our model adopts an approximation. In each family there is presumed to be a main caregiving parent who takes responsibility for key decisions about child care arrangements. The employment decisions of that main caregiving parent are therefore intimately linked to the decisions about child care arrangements, particularly for children before compulsory school age. Those child care and employment decisions are conditioned on factors that are already decided at the time these child care and employment decisions are made. In particular, if this main caregiving parent has a spouse, it is assumed that the spouse's employment decision is already made and therefore the spouse's amount of income is already determined; child care and employment decisions of the main caregiving parent<sup>1</sup> can be made taking these factors as pre-decided.

The main caregiving parent makes linked decisions about the amount of employment she<sup>2</sup> will seek (full-time, part-time or not currently employed) and simultaneously about the type of child care she will use for her children who are

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<sup>1</sup> We do not intend to suggest that the “other” parent has no interest in the child care and employment decisions that we are modeling. The decisions might be made separately by the main caregiving parent, or they might be made jointly by both parents in a two-parent family. The only requirement of our model is that it is reasonable to look on this as a two-stage decision – first, about the employment of a parent who is not the main caregiver for the children and second, the child care and employment decisions related to the activity of the main caregiving parent.

<sup>2</sup> The main caregiving parent is most frequently the mother, but may be a sole parent father or one member of a same sex two-parent family.

younger than compulsory school age (0-5 years inclusive). The types of child care available are grouped into three categories: licensed care, unlicensed or unregulated care by a non-relative, and care by parents or relatives of the child. If the main caregiving parent is not currently employed, it is assumed that she provides primary child care for the child. As a result, our model seeks to estimate the factors that lead the main caregiving parent to choose from seven possible combinations of employment and child care (the cross-Canada percentages of children 1-5 years of age who are in each cell are shown in parentheses):

1. full-time employed and using licensed child care (19%),
2. full-time employed and using unregulated non-relative child care (10%),
3. full-time employed and care provided by parents or relatives of the child (16%),
4. part-time employed and using licensed child care (7%),
5. part-time employed and using unregulated non-relative child care (4%),
6. part-time employed and using care provided by parents or relatives of the child (15%), and finally,
7. the main caregiving parent is not currently employed and provides the primary care for the child (29%)

Each of these alternatives represents a quite different strategy for managing life with young children. Some strategies use more money, but then that money needs to be earned. Some strategies use more time, with correspondingly less income. Some strategies use substantial amounts of parent or relative time to provide child care, but this is combined with the earning of income (and the dramatic reduction of any other uses of parental time). Because these alternatives represent different strategies of caring for young children, decisions about using these alternatives are differentially affected by different factors.

There are two main stages to the building of our simulation model; the discussion in this section focuses mainly on the first. The first stage is to statistically

estimate the effect of a wide range of factors on the decisions made by main caregiving parents about child care and employment. The second stage is to apply those estimates to a database that provides detailed information about families in the City of Toronto. This second stage constructs a child care and employment simulation model for Toronto.

## **Data**

The most recent Canadian dataset with detailed data about child care and employment decisions and also information about the wide range of factors that are possible determinants of those decisions is from 2010-11. This is already half a decade old. It is worth noting that maintaining and updating these demand and affordability models will require that the Government of Canada prioritizes more regular collection of improved data on child care and employment.

The dataset we use for estimation is the Survey of Young Canadians (SYC) 2010-11. This is a large dataset (we end up with over 7800 children younger than compulsory school age in our main regressions), similar in content to the National Longitudinal Survey of Children and Youth. It asks detailed questions about the type and hours of child care used and the child care expenditures of families for the selected child. It does not provide usable information about two important features of child care in the set of choices facing any family: the quality and availability (or convenience of access) of different alternatives.

One other important feature of the SYC is that its information about child care and employment decisions comes from across Canada. To accurately estimate the impact of facing different prices of licensed child care and different levels of employment income and other incomes, we need a dataset with substantial variation in these variables. The SYC gives us this.

While the SYC is very good for the estimation stage of the model, it is not adequate as the base for a simulation model. In order to build a simulation

model for the City of Toronto, the sample size of the Survey of Young Canadians is too small. We want a simulation model that can provide substantial geographical and social detail about families making different child care and employment decisions. The National Household Survey of 2011 has over 24,000 families having children 0-5 years of age in its sample from the City of Toronto. Therefore, we import the estimated regression coefficients from the Survey of Young Canadians into the National Household Survey in order to simulate the current and future behaviour of Toronto families.

## **Methods**

### ***Price Modelling and Subsidies***

Prices of child care matter a lot to the decisions that families make. When the price of licensed care is high, few families are able and willing to use licensed care. When prices are substantially lower, as in Quebec, families line up to gain access to these services. Our regression model, estimated in the SYC, seeks to estimate the causal impact of the market price of child care on the decisions that families make. However, in a survey like the SYC, sometimes this price is observed and sometimes not.

For instance, if the main caregiving parent decides to use parent or relative care while being employed, or if the main caregiving parent decides not to be employed, then the SYC questionnaire does not ask this parent about the price of the licensed care she decided not to use. But this does not mean that the price of licensed child care had no influence on her decision...far from it. It is likely that the high price of child care relative to her relatively modest expected employment earnings has had a big effect on these decisions.

As a result, we have to estimate the price of child care this family would have faced at the time the child care/employment decision was made. We do this with a child care price regression. In particular, because of our focus on licensed

child care, we take information on weekly child care expenditure per child from families in the SYC dataset who were using licensed child care for a substantial number of hours per week and who do not receive child care subsidies. These expenditures are regressed against age of child variables, geographic variables and some provincial regulatory/financial variables likely to affect the local price of licensed services.

The predictions from this regression give us a range of different per-child prices faced in different local areas across Canada for licensed child care for children of different ages. Families differ in the ages and number of children they have. We aggregate the per-child prices across these children in the family to calculate the aggregate price of licensed child care that each family would have faced when making child care and employment decisions. The Child Care Expense Deduction and other tax-related benefits depend upon the amount spent on child care. We model the earnings of the main caregiving parent in order to calculate the expected value of the Child Care Expense Deduction; this allows us to calculate the net price that each family faces in making its child care and employment decisions<sup>3</sup>.

Ideally, our model would have included prices of both licensed and unlicensed child care. However, we found that these prices are very strongly positively correlated in local markets across the country, so our regression model cannot distinguish between them. We hypothesize that private providers of unlicensed child care generally set their prices based on prevailing prices of licensed care. This degree of correlation makes it impossible to separately estimate the effects of licensed and unlicensed care – the price of licensed care stands in for both, because they generally move together.

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<sup>3</sup> In fact, the treatment of child care through the Child Care Expense Deduction is not intended by the tax department as a way of reducing the price of child care. Instead, it is a means of adjusting the taxation of employed mothers relative to non-employed mothers through ensuring that a major cost of employment is not treated as taxable income, but is instead deductible from employment income.

Not all families face the full price of licensed child care when making these linked decisions. In all provinces except Quebec, there are long-established programs to subsidize the licensed child care costs of low- to moderate-income families where the parents are engaged in employment or training. Some additional families receive child care subsidies for other child- or family-related reasons. Provinces vary considerably in the eligibility criteria for receiving subsidy (different income levels and definitions in different provinces) and in the amount of funding that is available. In some provinces, subsidies are made available for most or all of those families who apply and meet the eligibility criteria. In other provinces, funding covers only a modest proportion of those who apply and/or are eligible. Further, the degree of knowledge about subsidy and subsidy rules varies considerably amongst those potentially eligible. As a result of all these factors, it is difficult to model and estimate the impact of subsidy eligibility on child care and employment decisions. For this reason, the regression estimates from the Survey of Young Canadians are best interpreted as estimates of the child care and employment choices families would make in the absence of child care subsidies. As will become clear below, we use data provided by the City of Toronto to incorporate the effects of child care subsidy into the simulation model based on the National Household Survey.

### ***Wage Modelling***

Broadly, two types of income are expected to affect the child care and employment decisions made by the main caregiving parent: the employment income that she could earn if she decides to be employed, and all other income for the family. The amount of employment income she earns depends on the employment decisions she makes. The other income, whether it is the income of her spouse, or various government benefits that may be available (e.g, the Canada Child Tax Benefit, the GST/HST refundable tax credit, etc.) is available

to her family even if she decides not to enter the labour force<sup>4</sup>. We expect these two types of income to affect her decisions in different ways. This section discusses her employment-related income, which we refer to as her wage.

The Survey of Young Canadians does not have good information about the wage that main caregiving parents get from employment. There are two problems: one related to the data that does exist, and the other to the data that does not exist.

The Survey of Young Canadians does collect information about the total amount of annual income that a parent received in the previous twelve months. However, there is no breakdown of the amount that is due to employment or from other sources. So it is difficult to calculate with reasonable precision the employment income that a parent receives for a certain amount of work.

The second problem, very familiar in labour economics, is that no data is collected from persons not employed in the last twelve months about the employment income they could have earned had they been able and willing to get a job. However, this information – the wage you could have earned – is crucial to the child care and employment decisions that parents make. We expect that those who could only have earned very modest employment incomes are more likely to stay out of the labour force. It is precisely the low potential employment earnings that lead to the decision to not be employed.

Our solution to these problems is to use the 2010 Labour Force Survey, which does have good information on employment incomes and worker characteristics. We estimate the relationship that exists between human capital characteristics – education levels, age, geographical location – and employment incomes for workers with substantial labour force attachment during the year. Using an ordered probit Heckman correction, we are able to estimate the wages that all main caregiving parents (including those not currently in the labour force) could earn if they were able and willing to be substantially employed.

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<sup>4</sup> However, the amount of this other income will fall as her wage income rises. This reduction affects the net value of her wage income.

These predicted wages are then included in the multinomial logit regression of seven alternative child care and employment strategies that families can adopt. To be more precise, these predicted wages are fed through a program called CTACS (Canadian Tax and Credit Simulator) to calculate the after-tax earnings that correspond to the gross wage that our regression has predicted for each individual. We expect that it is the after-tax earnings of individuals that will motivate their behavioural decisions, rather than gross (pre-tax) earnings.

### ***Other Determinants of Child Care Demand and Employment***

The other potential determinants of child care demand and employment are modeled as invariant to the decisions made by the main caregiving parent.

These factors include:

1. the other income in the family (principally the spouse's income but also including a number of government benefits for both sole parent and two parent families),
2. the age of the youngest child in the family,
3. the number of children 0-5 years of age,
4. whether the principal caregiving parent has a post-secondary education or not,
5. whether the principal caregiving parent is a sole parent or not,
6. whether the main caregiving parent is Canadian-born or a recent immigrant (and how recent), and
7. the ethno-cultural-visible minority background of the main caregiving parent

Each of these factors is expected to affect differentially the decisions families make about child care and employment strategies. For instance, families with larger numbers of children are more likely to decide to not be employed (unless subsidy is available). Families who have very recently immigrated to

Canada are less likely to be employed than families who immigrated a while ago, or families in which the caregiving parent is Canadian-born. Families in which the main caregiving parent has a post-secondary education are more likely to use licensed child care and be employed. And so on.

Many of these variables have more than one path of influence on the child care and employment decisions of families. For instance, having a younger child will increase the price that families would have to pay to use licensed care, but many parents also have strong feelings about what types of care are most appropriate for very young children. The variable listed above “age of the youngest child in the family” will pick up the second of these effects; the price of child care will pick up the first.

### ***Estimation Details***

We have data on over 7,800 children younger than compulsory school age in the Survey of Young Canadians. We use this data to estimate the ways in which key determinants affect families’ decisions about employment and child care. Our estimation model is a multinomial logit, that estimates the demand for child care and the main caregiving parent’s decision about employment. There are seven possibilities, and a range of determinants affect the probability that a family chooses each of these alternatives.

The three child care modes are licensed child care, unregulated child care by non-relatives, and parental or relative care. The three possible labour force statuses are employed full time, employed part time and not employed.

Therefore, each family is faced with seven possible alternatives:

1. Licensed child care/full time employment	2. Unregulated non-relative child care/full time employment	3. Parental or relative care/full time employment
4. Licensed child care/part time employment	5. Unregulated non-relative child care/part time employment	6. Parental or relative care/part time employment
7. Parental care/ main caregiving parent is not employed		

The probability of being in each cell is determined by several factors, broadly the characteristics of the child care arrangement (CC), income resulting from the labour force status (YM), the characteristics of the parents (PA) and the characteristics of the children (CH).

We could think of the estimation stage of the demand model as the statistical estimation of equations that have this form<sup>5</sup>:

$$P(1)_i = A + B1*CC_i + B2*YM_i + B3*PA_i + B4*CH_i + E_i$$

, where \* means “multiplied by” and E is the random error term.

In this equation  $P(1)_i$  is the probability that family “i” (some particular family) ends up in the 1st cell (one of the seven possible child care/labour force

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<sup>5</sup> In fact, assuming that the equation above can be abbreviated as  $BX$ , with  $B$  as a vector of coefficients and  $X$  as a vector of explanatory variables, the logit form of the probability of choosing the  $n$ th employment/child care combination is  $\frac{\exp(B_n X_{in})}{\sum_n \exp(B_n X_{in})}$ , where the summation shown in the denominator is the sum over all possible combinations, and where  $\exp$  refers to taking the exponent of the real number “e”, which is approximately 2.718

combinations).  $A$  is a constant term.  $CC_i$  is a vector of variables related to the child care arrangement in the  $J$ th cell, such as price (and quality and availability, if this data were available).  $B_1$  is a vector of coefficients that it is the job of the statistical regression to estimate; these coefficients are multiplied by the price, quality and availability of the child care arrangement in calculating the probability that cell  $J$  will be chosen by this family. In a similar way,  $YM_i$  is a vector of variables related to the labour force status in the  $J$ th cell (e.g., the expected wage earned in that labour force status).  $B_2$  is a vector of coefficients that it is the job of the statistical regression to estimate; these coefficients are multiplied by the expected wage in calculating the probability that cell  $J$  will be chosen by this family.  $B_3$  and  $B_4$  have a similar meaning; they are the coefficients to be estimated associated with the characteristics of the parents and the characteristics of the children.

Our statistical techniques will estimate the values of  $A$ ,  $B_1$ ,  $B_2$ ,  $B_3$  and  $B_4$  for 6 of the 7 child care/employment choices. All the estimated probabilities are relative probabilities, so probabilities are estimated relative to an omitted category (the 7<sup>th</sup> cell). So, for instance, if parental care/not employed is the omitted category, our statistical estimates of  $A$ ,  $B_1$ ,  $B_2$ ,  $B_3$  and  $B_4$  for “licensed child care/full-time employment” estimate the effect that each of the variables has on the relative probability of being in licensed child care/full-time employment rather than in parental care/no employment. For instance, a high price of licensed child care would make this relative probability smaller. And a greater availability of licensed child care would make this relative probability larger.

According to economic theory, mother’s employment decisions are affected by her net wage after taxes, by child care costs, by the amount of non-labour income to which she has access, the amount of leisure time she has available and factors that affect the development of her children. The variation in these decisions across the population is affected by differences in the self-

perceived value of each person's household time. This value of household time is correlated with a host of family characteristics such as number of parents, number and ages of children, the mother's education, and her ethnic/cultural or immigrant background.

There are other relevant variables that we do not have information about, for instance the availability and quality of each possible child care arrangement, and details about the jobs represented by different employment choices. These may be important factors, but they are omitted because of lack of information in our data.

Primary caregiving parent's wage is predicted using selection-corrected OLS regressions of the natural log of mothers' wages on a series of explanatory variables. Variables in the wage equation include the age and age-squared of the mother, mothers' education, immigrant status of the mother, her ethnic/cultural origin, urban/rural location and province. Some variables are included in the selection equation, but not the wage equation, for instance, the number and ages of children in the family, on the assumption that these factors would affect the probability of being employed but not the wage once employed.

## **5. Statistical Estimates of Factors Affecting Child Care Demand**

The multinomial logit estimates of the effect of different factors on choices among the seven possible child care/employment alternatives are difficult to directly interpret. There are a couple of ways of evaluating the statistical results.

First, we can think about statistical significance of the estimates on major variables. Our estimates of the effects (on child care demand and employment decisions) of the major variables are all highly significant.

This is true of child care price, the net income of the main caregiving parent, other income in the family, the number of children 0-5 years of age, and the age of the youngest child in the family. The one (partial) exception is the percent of families who are, according to the income limits in each province, potentially eligible for child care subsidies. Obviously, simply being potentially eligible for (some) subsidization does not predict very well whether a particular family will end up with subsidy and using licensed child care. We therefore do not rely on this measure of subsidy eligibility in predicting the impact of subsidy in our simulation model.

A second way of assessing our estimates of child care demand and employment is to look at measured elasticities of key variables. Economists particularly like this shorthand way of assessing statistical results, but others will not necessarily be familiar with this measure. Still, since the comparison between the results of different models is often made by comparing elasticities, this is a useful method for some purposes. Table 1 shows several key price elasticities; their meaning and interpretation is discussed below. All elasticities shown are strongly statistically significant.

**Table 1**  
**Key Price Elasticities from Statistical Estimates of Child Care Demand and Employment**

<b>Description</b>	<b>Size of elasticity</b>	<b>Details</b>
Elasticity of Licensed Child Care Demand to Price of Licensed Care	- 1.14	Across all observations
Elasticity of Licensed Child Care Demand to Price of Licensed Care	- 1.04	Measured at means of explanatory variables
Elasticity of Full-time Employment and Licensed Child Care to Price of Licensed Care	- 0.32	Measured at means of explanatory variables
Elasticity of Employment and Licensed Child Care to Price of Licensed Care	- 0.14	Measured at means of explanatory variables
Elasticity of Parent and Relative Care to Price of Licensed Care	0.35	Across all observations
Elasticity of Non-employment to Price of Licensed Care	0.37	Measured at means of explanatory variables

Table 1 shows that price matters for key decisions. The use of licensed child care has an elasticity of about minus one. An elasticity measures the ratio between the percentage changes in two things. In the case of the first two rows of Table 1, this is the ratio of the percentage change in the use of licensed child care and the percentage change in its price. An elasticity of minus one means that a 5% rise in the price of licensed child care is expected to lower the probability of using licensed child care by about 5%. Across an entire population, this would mean a 5% drop in demand for licensed care.

The third row shows the elasticity of full-time employment to the price of licensed child care. Again there is a negative sign, which means that higher prices are associated with less full-time employment (or lower prices of

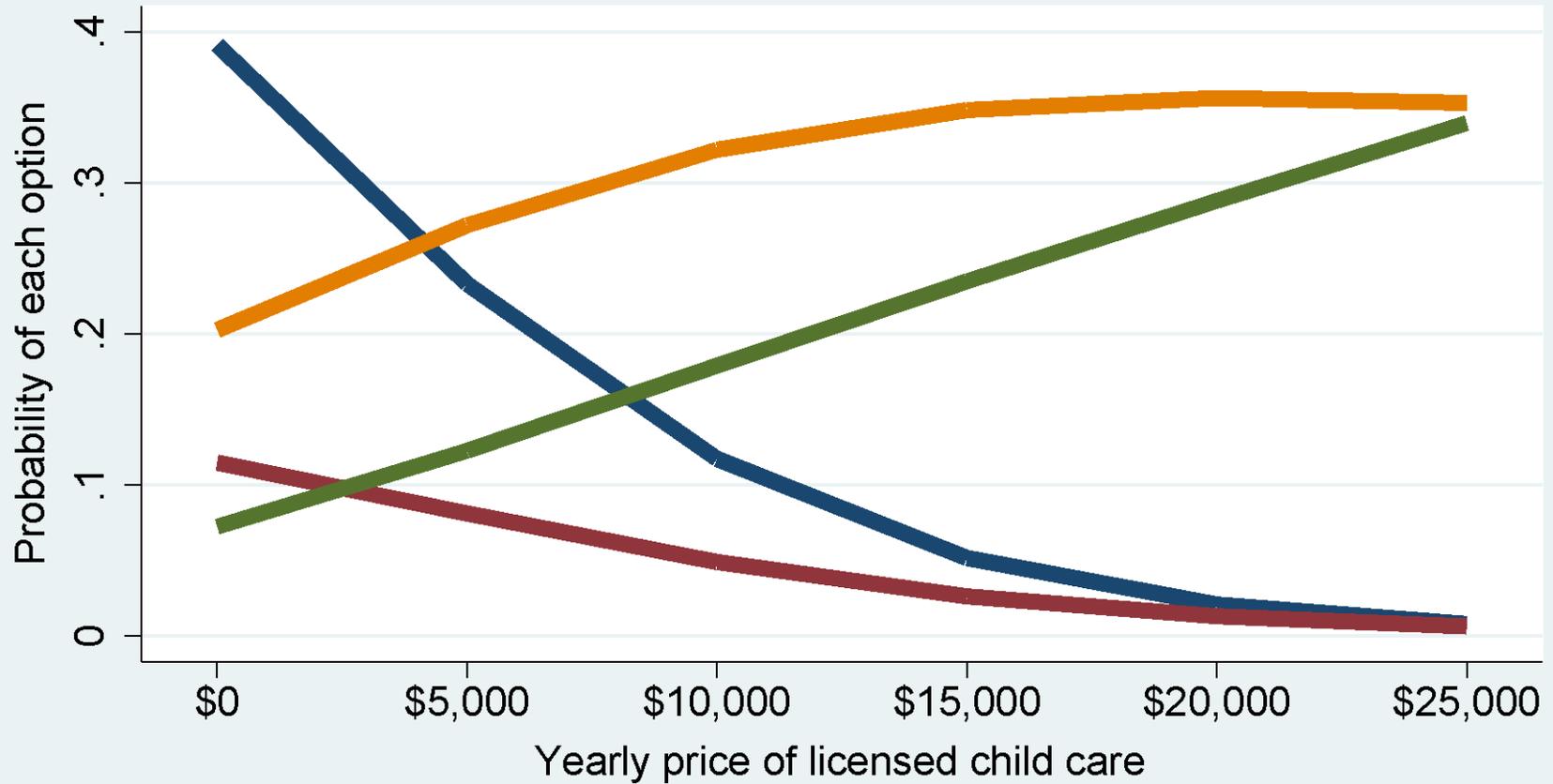
licensed care are associated with greater amounts of full-time employment). The size of this elasticity is about 0.3, which means that a 10% rise in licensed care prices would be associated with approximately a 3% fall in full-time employment of main caregiving parents. The row below gives more information. Here is the elasticity of all employment, whether full-time or part-time, to the price of licensed child care. This elasticity is -0.14, which means that a 10% rise in the price of licensed child care would be associated with a fall of about 1.4% in all kinds of employment of main caregiving parents.

What we see from these elasticities, and the two remaining rows, is that a lot of things happen when the price of licensed care changes. The biggest change is in the use of licensed care (in the opposite direction to the change in price). But that does not mean there is a change in employment or in full-time employment by the same proportion. There are a set of substitutions that occur, that we can see better when we look at the charts below.

By far the easiest way to see what the statistical results show us is to look at some charts that show the simulated effects of various changes. A few key charts are shown in the next several pages. The most important thing to understand is that these charts represent “simulations”. In other words, they use our estimated statistical results to consider hypothetical changes in certain variables. The results they show are entirely based on our statistical estimates, and they represent the key statistical input that we use in a simulation model for the City of Toronto. However, these particular charts are not based on City of Toronto data; they are based on cross-Canada data. The City of Toronto population may be different in various ways from the Canadian population and that will be reflected in the City of Toronto simulation model. Again, let’s start by looking at a chart, and discuss the interpretation of it below the chart.

Let’s start by looking at the effect of the price of licensed child care, but now not through elasticities, but through a chart showing simulated effects.

## Effect of Full Fee Price on Child Care and Employment



This is a complicated graph, but a very rich one, that tells us a lot about what the statistical estimates show. On the vertical axis, the probability is measured – probability is a number between zero and one. On the horizontal axis is the aggregate annual price for the family of purchasing licensed child care – running between zero and \$25,000.

Look at the blue line, which the legend below the graph refers to full-time employment and the use of licensed child care. And keep your eye as well on the brown line, which is part-time employment combined with the use of licensed child care. As our eye moves from left to right across the diagram, we are looking at a higher and higher price of licensed child care. At very low prices, full-time employment combined with licensed child care has a probability of about 0.4 – in other words, about 40% of families would be expected to use this particular employment/child care strategy. Another 10% of families (a 0.1 probability) would instead go for part-time employment and licensed child care.

We see that as the price of licensed care rises, the probability of both of these alternatives falls, until out at \$25,000, the probability of either one is near zero. In other words, affordability matters dramatically to the use of licensed care.

But, if not licensed care, what would families do? Most of the answer is shown in the other two lines on the graph. If the price of licensed care rises, two other strategies become more attractive under the circumstances – families are forced into other alternatives. The gold line represents not being employed – in other words, a situation where the main caregiving parent decides to drop out of the labour force and care for her preschool child herself. As licensed care prices rise towards \$25,000 per family, this option moves from a probability of about 0.2 (20%) to a probability of over 0.35 (over 35%).

But many mothers will not want to suffer the loss of income associated with being out of the labour force (and the long term losses in job experience and employability). So many parents who are the main caregiving parent in their

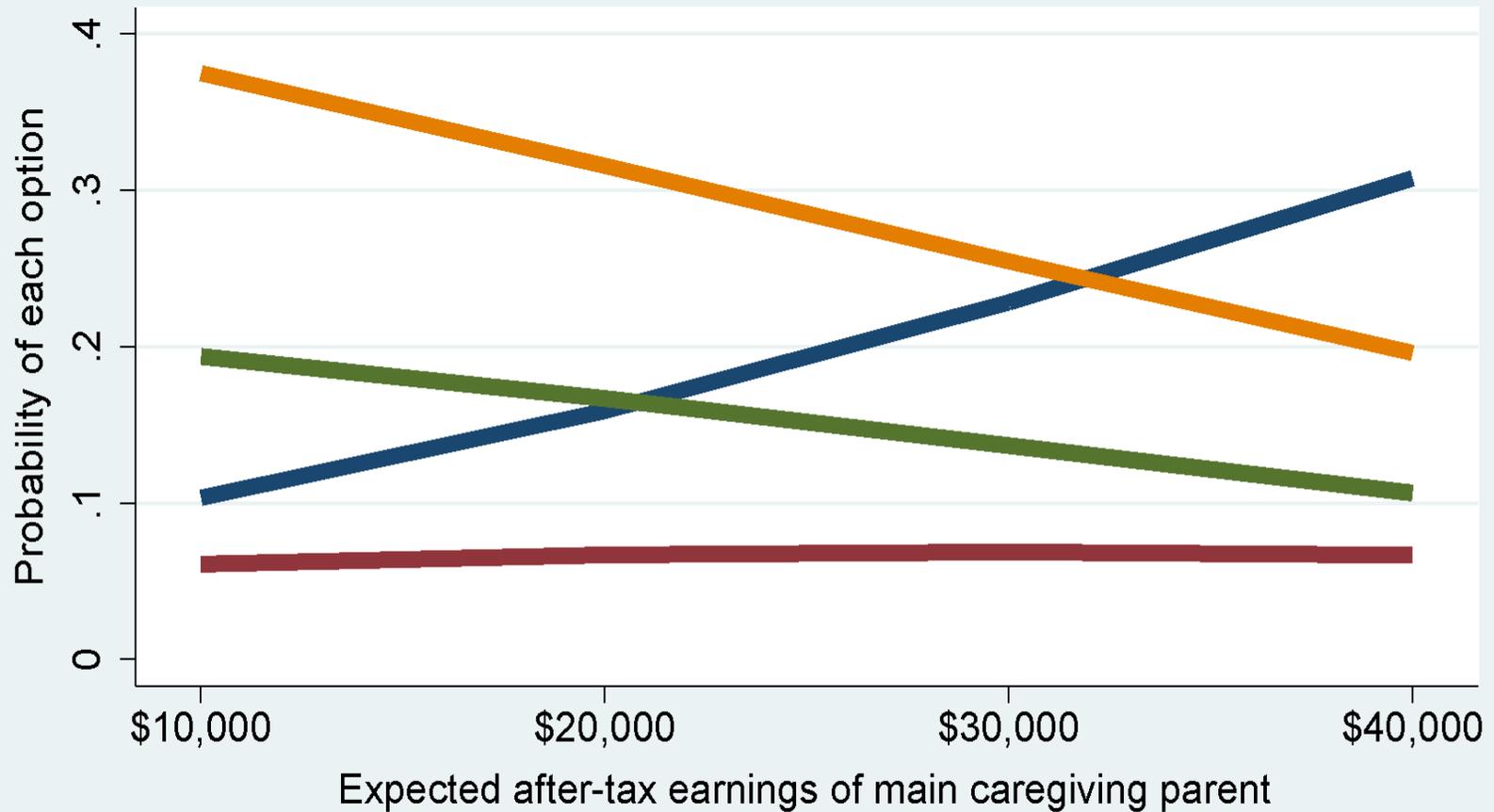
family will decide to try to combine employment with looking after the child themselves (or in combination with a relative).

The green line on the graph represents an employment/child care strategy in which the parent is employed less than 30 hours per week (part-time) and children are cared for exclusively by parents and/or relatives. Often this will be accomplished by off-shifting, so that two employed parents work different shifts or on different days and times of the week, so that children can be cared for by parents, without purchased child care. This is easier to accomplish when children are already in school-based kindergarten for part of the day. As your eye follows the green line from left to right, you can see that the probability of part-time employment combined with parent or relative care rises dramatically from less than 10% (0.1) to nearly 35% (0.35).

This graph shows four possible alternative strategies facing any family – combinations of an employment decision for the main caregiving parent and a type of child care arrangement. However, there are a total of seven in our model. So, three are missing. We can produce charts with all seven lines on them, but they are quite difficult to read. For this chart, we have selected the alternative strategies in which there is the most movement as the price of licensed child care changes.

The next chart shows the simulated effect of a change in the expected after-tax earnings of the main caregiving parent on the child care and employment strategies adopted by families. Again, it focuses on four of these strategies, two associated with the use of licensed child care, along with non-employment and the combination of part-time employment with parent or relative care.

## Effect of Employment Earnings on Child Care and Employment



Again, the probability of adopting each strategy is measured vertically. Horizontally, we have the expected after-tax full-time employment earnings of the main caregiving parent, if employed. More precisely, this is the expected contribution to total household after-tax and after-benefit income that the main caregiving parent would provide if she/he were to move from non-employment to full-time employment. So, it is an estimate of the spending power that she would bring to the family by being employed.

As we can see by following the blue line, the probability of being employed full-time and using licensed care rises as the potential earnings of the main caregiving parent. That combination of employment and child care becomes more attractive (and feasible) the higher her earnings are. No surprise here, really, and another affirmation that affordability matters. Often, the choice about using licensed child care comes down to a comparison of the cost of that child care to the earnings that have to pay for it; if the cost of licensed care is too large a proportion of the potential full-time earnings of this parent, it may not make financial sense for the family. So, as the ability to pay rises, more families use licensed care.

There is little effect on the brown line. Changes in full-time employment earnings do not have much impact on the strategy that combines part-time employment and the use of licensed child care.

However, both non-employment and the combination of part-time employment and parent/relative care do respond as the expected earnings of the main caregiving parent rise. As potential earnings rise, fewer main caregiving parents are willing to stay at home and provide care. Non-employment has a percentage probability of nearly 40% when the after-tax income contribution of the main caregiving parent is small. This falls to about 20% if the potential income contribution of the main caregiving parent rises to \$40,000.

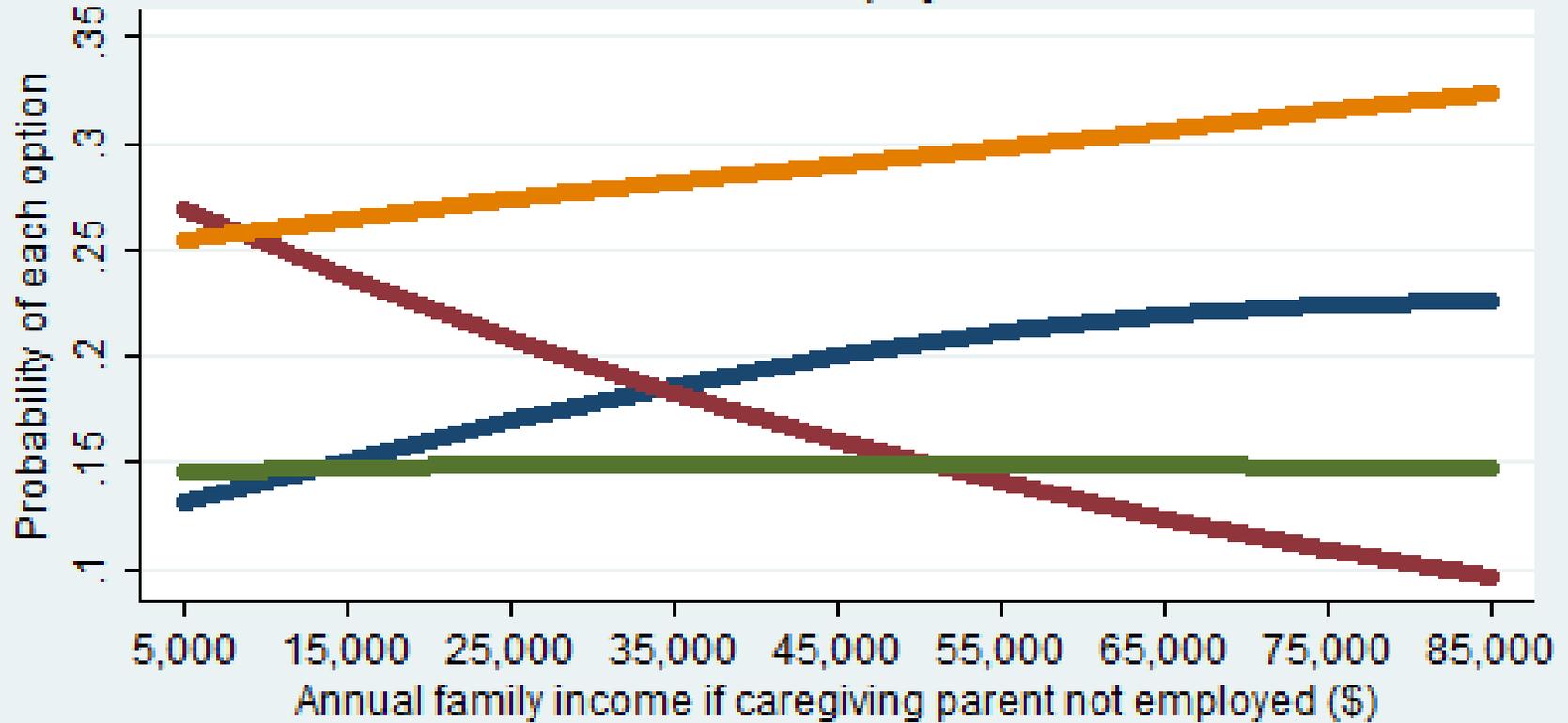
It is not only the decision to be not employed that is affected by potential earnings. The option of part-time employment combined with parent and relative care of the

children also becomes less attractive as potential earnings rise. The probability of this option falls by about half, from 20% to 10%.

Let's look in detail at one more of these charts showing simulations from our statistical estimates. After that, we will provide a few more charts with less commentary. All are designed to give you a good sense of the estimates upon which we build our City of Toronto model using a different data set and more recent data (an enhanced version of the City of Toronto portion of the National Household Survey).

The chart below shows the impact on the child care and employment strategies of families of "other income" in the family. In a two-parent family this is largely the spouse's employment income. In a one-parent family, this is largely a range of child benefits.

## Effect of Other After-Tax After-Benefit Income On Child Care and Employment Decisions



Most of the lines on this graph are the ones we have seen before, but there is one substitution. Unfortunately, we are not yet able to control the colours on these charts, so the brown line now represents a different option, but one that is very responsive to changes in other family income – the combination of full-time employment and parent and/or relative care.

The probability of each option is measured vertically. Other income in the family (after-tax and after-benefits) is measured horizontally. So, as our eye moves from left to right across this chart, we are moving to higher and higher levels of other income in the family. Our model of child care and employment decision-making suggests that the earnings of the main caregiving parent and the other income in the family are likely to have different effects on the child care and employment strategy that the family adopts. We expect the earnings of the main caregiving parent to be very intimately related to child care decisions, because there is a strong conflict between her use of time in employment and her use of time to provide child care. However, a similar dollar change in other family income will have different effects. As other income rises, it may be more possible for the main caregiving parent to decide not to be employed, if she should want this. Her income is less essential to maintaining the standard of living of the household. On the other hand, if she decides to continue employment as other family income rises, she is now more financially able to afford expensive purchased child care. We see all of these effects in the chart above.

Follow the gold line and the blue line from left to right as other family income rises in our simulation. The gold line is the non-employment strategy. This rises in probability from about 25% to over 30% as other income grows from \$5,000 to \$85,000. But, that means that most main caregiving parents stay employed at all different levels of other family income. As we can see (following the blue line), the use of licensed child care combined with full-time employment rises strongly as other family income rises – this option is more affordable. What falls (shown by the brown line) is the combination of full-time employment and parent and/or relative care.

Again, we have an intriguing story about the substitutions that take place as circumstances change. More affluent families are more likely to have a parent at home, because they can afford it. But this is not a very large effect (about 5% of families change towards this strategy as other income rises). About 10% of families move towards full-time employment and the use of licensed care as other family income rises (from about 0.125 probability [12.5%] at low incomes to about 0.225 probability [22.5%] at higher incomes). And, there is a drop in the probability of being full-time employed and using parent/relative care as other family income rises. This option is adopted by over 25% of families if other family income is very low, but only by about 10% of families at high levels of other family income.

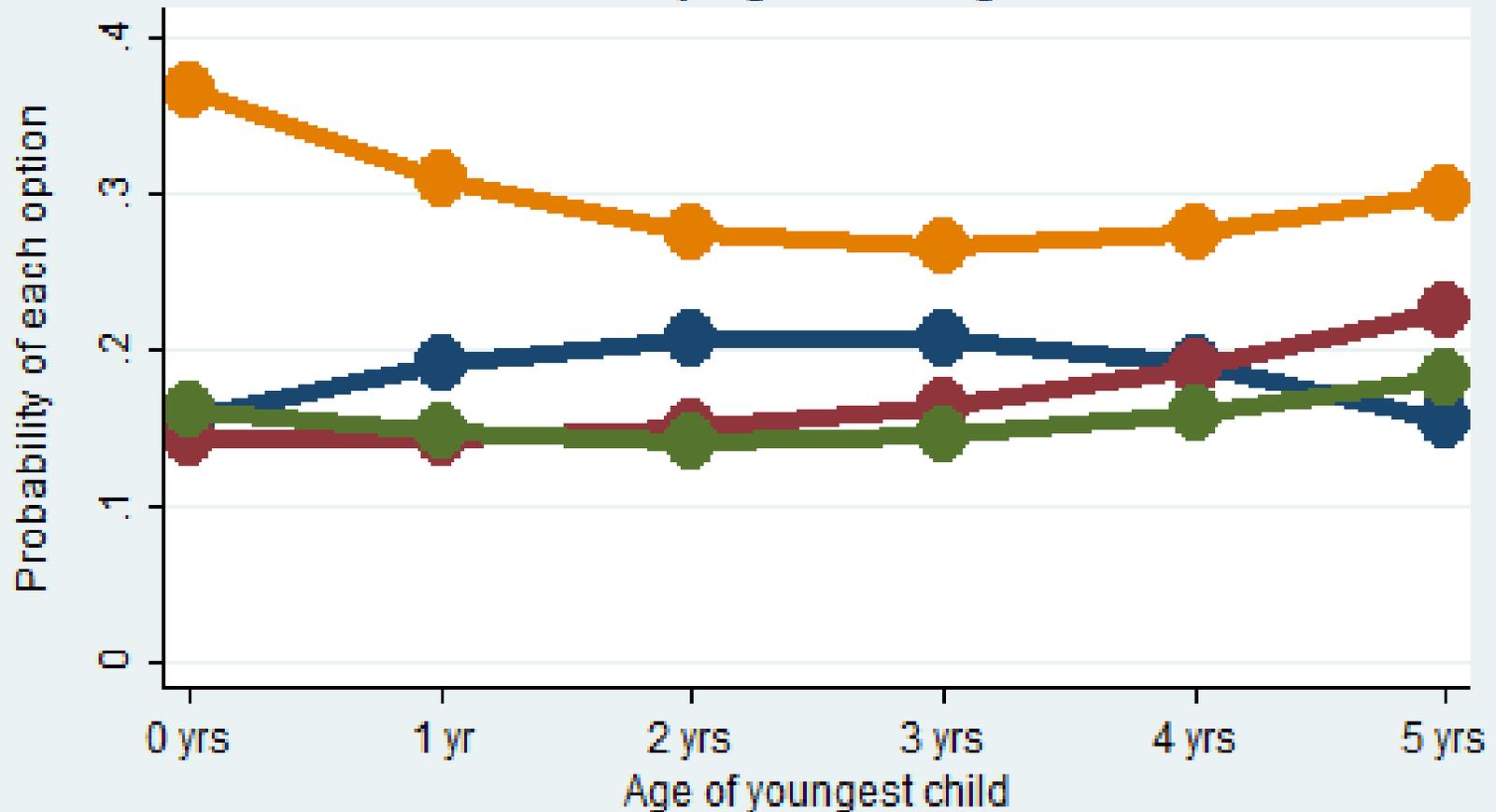
It is worth taking a minute to remind ourselves that each of these simulations shows the impact of changes in one variable **with all other variables remaining constant**. So, the charts above showed the effect of changes in licensed child care price with other factors (including incomes) held constant, the effect of earnings of the main caregiving parent with other factors held constant, and the effects of other family income with other factors held constant. This is sometimes important to remember. For instance, if fertility rates were to increase and we had an increase in the number of children in families this would have two effects at least – a change in the number of children 0-5 years of age in the family, but also an increase for families in licensed child care prices (because these are measured as aggregate prices across all children younger than compulsory school age in the family). If we wanted to simulate the effect of changes in fertility, we would have to do a simulation with both of these changes simultaneously.

There are many other possible simulations that can be done to show what the estimated impact of different variables is. Without detailed commentary, we reproduce a couple more below. The next one shows the impact of child age on the types of care and employment strategies used by families. The probability of each option is measured vertically. The age of the youngest child in the family is

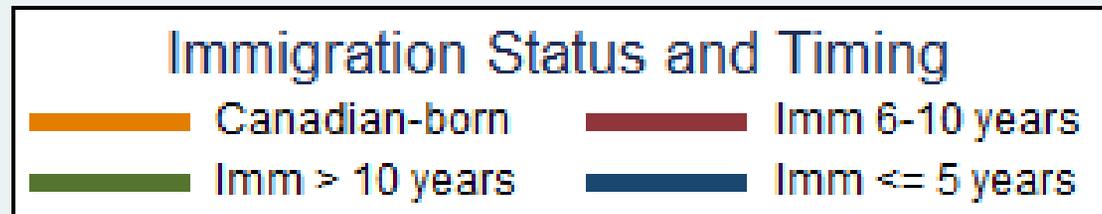
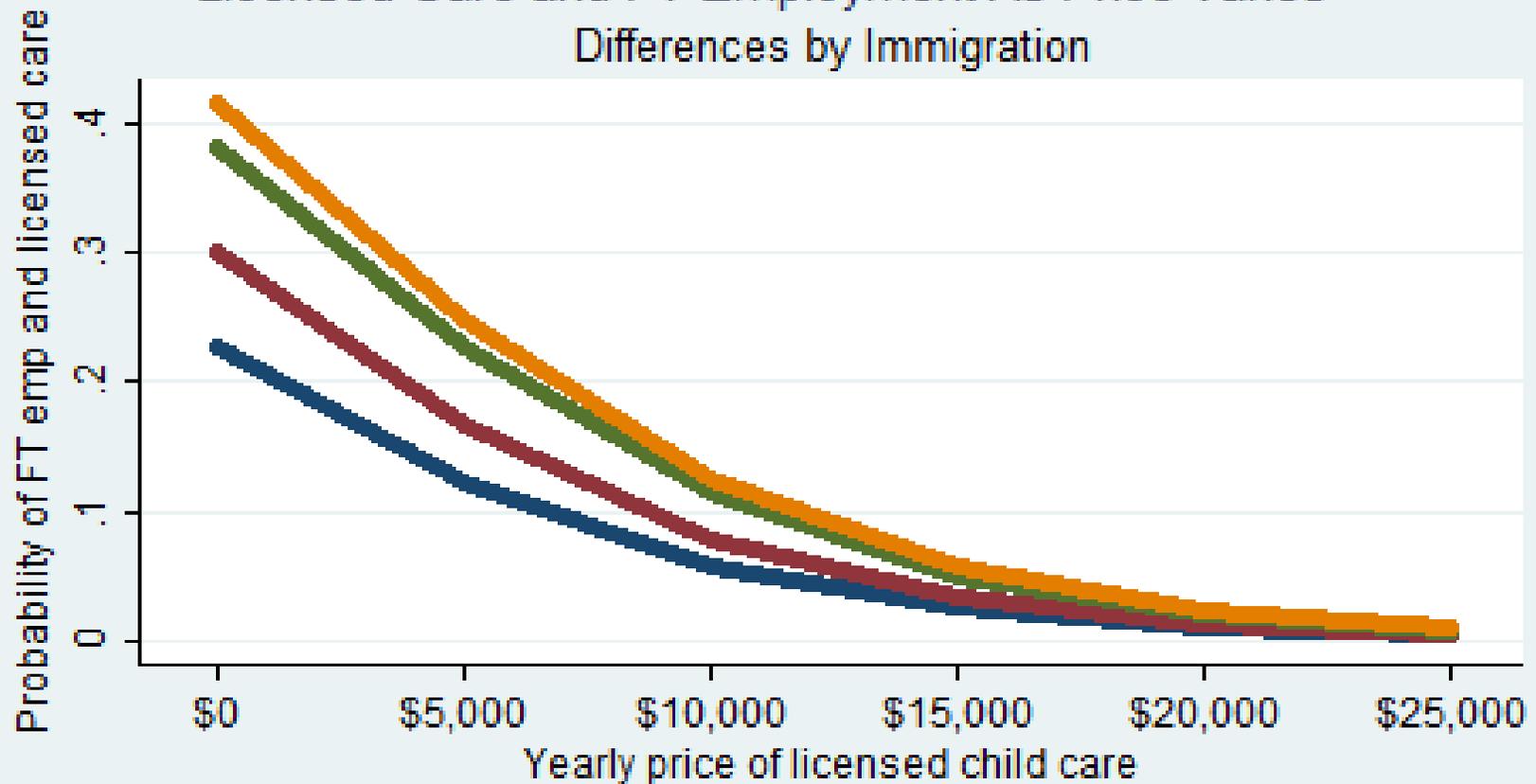
shown along the horizontal axis. Families in which the main caregiving parent is on maternity or parental leave have been excluded from our statistical estimation, so families shown with a child who is zero years of age are those not presumably eligible for such leave and benefits.

The final chart combines the immigrant status of the main caregiving parent and the price of licensed child care. The different lines do not represent different possible child care and employment strategies. Instead, this chart focuses only on the users of licensed child care who are full-time employed. The different lines look at how immigrant status affects the response of families to licensed child care prices. As you might expect, families in which the main caregiving parent is Canadian-born are more likely to use full-time employment and licensed care for their children when the price of licensed care is affordable. Families in which the main caregiving parent immigrated ten or more years ago are not much different from Canadian-born parents. But families in which the main caregiving parent is a recent immigrant are less likely to adopt this child care and employment strategy even if child care price is low. And, for all types of families, when child care prices are high, the probability of using licensed child care and being employed full-time drops very substantially as price rises.

## Use of Child Care by Age of Youngest Child



## Licensed Care and FT Employment As Price Varies Differences by Immigration



## 6. Measuring Affordability of Licensed Child Care in Toronto

Affordability of licensed child care is an odd concept. On one level, it is completely obvious what it means: the ability of families to afford to purchase licensed child care services at prevailing prices if they want it for their children. It is very widely believed that child care should be affordable – that licensed child care is beneficial for children and helps mothers to be able to work and that the unaffordability of child care is therefore a barrier to families achieving objectives that are important to them and important to society.

On the other hand, it is not obvious how best to measure this concept that we all believe is important. Most existing measures of affordability are based on “typical” families. One measure used by the OECD takes a dual-earner family in which the primary earner is assumed to earn 100% of the before-tax average wage in that country, while the second earner earns 67% of that amount. They have two children – aged 2 and 3 years – and they purchase regulated early childhood education and care services at the average price of those services in that country. Adjustments are made to income to calculate after-tax income and adjustments are made to the price of care to reflect any child care related benefits or subsidies that are available to this type of family. The ratio of the net cost of child care to the net family income for this “typical” family is said to measure the affordability of regulated child care for two-parent families in that country.

Of course, this type of measure is very approximate. It does not necessarily reflect the situation of families with different numbers and ages of children, or with incomes that are different than the average. It assumes that it is meaningful to presume a single average price of licensed child care services across the country. The affordability problem is likely to be quite different for families in different situations and different parts of the country, but this measure of affordability does not reflect this diversity.

We want a measure of affordability that reflects the diversity of situations in which families find themselves. Affordability is different for different families and we

should be able to measure that. Using a data set that is representative of families across the City of Toronto can allow us to measure differential affordability for different families.

If we are going to reflect the diversity of family situations, we need to be able to make a projection of the amount of income that each family could earn. Of course, we could use the actual incomes that families earn in whatever dataset we are using. But, that's a problem, because those incomes are often a result of the affordability barriers that exist. For instance, a mother may take only a part-time job so that she can off-shift with her husband to care for their toddler. Her earnings in the part-time job do not reflect her potential for earning income; they reflect the results of unaffordability. Comparing the price of licensed child care to her income from the part-time job does not appropriately measure what fraction of her potential income is taken up by the cost of child care.

To solve this problem, we need to be able to predict the ability of the main caregiving parent in each family to earn income if she had a full-time job. Of course, in our demand model, we have already completed this exercise. A selection-corrected regression of mother's wages on their key determinants can be used to project mothers' full-time earnings. This answers the question we need to answer for measuring affordability: how does the cost of licensed child care compare to the amounts of income that either the main caregiving parent, or the entire family, could earn to pay for it?

Details of building the affordability models is provided below:

- The Labour Force Survey 2016 is used to estimate wage equations for the main caregiving parent, based on her labour-force-related characteristics.
- We have data on 24,000 families in 140 neighbourhoods in Toronto from the National Household Survey of 2011. We have a large number of family characteristics as well as the actual earnings of parents who are not the main caregiving parent.

- Average prices across groupings of Toronto neighbourhoods provide the typical price of licensed child care for each child age group for each family.
- We also have information about the characteristics of families who receive child care subsidies in each of Toronto's neighbourhoods. This information on subsidy receipt is used to model the impact of subsidies on reducing affordability problems in Toronto.
- Data for each family on other incomes and incomes of main caregiving parents are run through the CTACS model to produce estimates of potential after-tax after-benefit income for each parent and for the family as a whole.
- This data on incomes is combined with expected parental fees charged for licensed child care for all young children in the family to calculate two indexes of child care affordability. One of these indexes calculates the ratio of net child care fees to net family income for each family in the data set. The other calculates the ratio of net child care fees to the net income contribution of the parent who is presumed to be the principal caregiver (and decision-maker about child care arrangements) when able to access child care and earn a full income.
- Affordability patterns are calculated for different groups of neighbourhoods and for families with different characteristics. We also examine the effects on affordability of possible changes in demographic or policy variables.

An affordability index for child care should measure the ability of parents to pay for licensed child care services, and that ability would typically depend on the parents' level of income. For this index, we propose that the numerator should be the cost of licensed child care borne by the family when the parents are in the labour force full time. The denominator should be the appropriate measure of income.

Our recommended affordability measures are defined in two ways for each family:

Family Income Affordability Measure (FIAM) = net child care cost / after-tax after-benefits total family income with both parents employed full-time.

Caregiving Parent's Affordability Measure (CPAM) = net child care cost / change in after-tax after-benefits family income as a result of full-time employment of the presumed principal caregiving parent (generally the mother or lone father).

The Family Income Affordability Measure takes the net child care cost as the numerator of this measure. The calculation of net child care cost begins with the cost of purchasing regulated ECEC for all the children in the family less than compulsory school age. Because families in Toronto paying for child care often qualify for the child care expense deduction (CCED), this cost is reduced by the value of that deduction, calculated using the Canadian Tax and Credit Simulator (CTaCS) model. For families who have relatively low full-time incomes, the City of Toronto provides significant geared-to-income child care subsidies. There are a limited number of such subsidized places available, and significant waiting lists for parents with young children who might otherwise qualify for subsidies. We model receipt of these subsidies using City of Toronto data to calculate the net child care cost for subsidized families.

The Family Income Affordability Measure takes the expected net income for the family if both parents are employed as the denominator of the measure. The after-tax income is calculated ignoring the effect of the Child Care Expense Deduction on net income, because this effect has already been accounted for in the net child care price. The ratio now gives us a measure of the fraction of family's disposable income that they would have to spend to purchase regulated ECEC for all their children less than compulsory school age.

The second affordability measure (the Caregiving Parent Affordability Measure or CPAM) looks at the changes in disposable income for the family when the mother or single father moves from being out of the labour force to taking a full-time job.

To compute the change in disposable income for the family, we assume that there are no child care costs and compute the taxes and benefits for all parents in two scenarios: when only the non-principal caregiving parent is in the labour force, and when all potential earners are in the labour force full time. We subtract taxes (net of benefits) from earnings for each of the adults in the family, and add the after-tax after-benefit incomes (if there are two parents) to get net family income. The difference in net family income between the two scenarios we call the “after-tax after-benefits caregiver’s income”. Because the after-tax after-benefits caregiver’s income is measured under the assumption that there are no child care costs, it gives us a measure of what is available from the caregiver’s work to pay for child care.

To get the Caregiver’s Income Affordability Measure, we now require the net cost of child care for the numerator. The net child care cost begins with the cost of purchasing regulated ECEC for all the children in the family less than compulsory school age. Because families in Toronto paying for child care often qualify for the child care expense deduction (CCED), this cost is reduced by the value of that deduction, calculated using the Canadian Tax and Credit Simulator (CTaCS) model. For single parent families who have low full-time incomes, the City of Toronto provides significant geared-to-income child care subsidies (quite aside from the CCED). There are a limited number of such subsidized places available, and significant waiting lists for parents with young children who might otherwise qualify for subsidies. We model receipt of subsidy to judge affordability.

## 7. Child Care Demand for Children 6-9 years

The Study Team has also built a software model to predict and analyze demand for schoolaged child care in the City of Toronto<sup>6</sup>.

Because of data limitations, the schoolaged model can only analyze child care demand for children 6-9 years of age, and not 6-12 years of age. The Survey of Young Canadians did not collect data about child care arrangements for children 10-12. We have built a schoolaged child care demand model in which the choice of a care arrangement is conditional upon the labour force decision of the main caregiving parent. The demand model does not also model employment decisions; in effect, we assume that employment decisions are made first and then child care decisions are made second for schoolaged children. The decisions are linked, but in a different way than for children 0-5.

For families that have a child 6-9, but also have at least one child 0-5 years of age, we use the preschool demand model to predict the employment decision (full-time, part-time, not in the labour force) of the main caregiving parent and then use that in the prediction model for schoolaged children in that family. For families that have no children 0-5, we take their actual employment status given in the National Household Survey to help predict the care arrangement decision they will make for schoolaged children. The following tables indicate the distribution of child care decisions in the base case.

The price of licensed care, family incomes and the employment status of the main caregiving parent all have important effects on the likelihood that the family will use licensed child care for its 6-9 year-old children. The demand for licensed

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<sup>6</sup> Note that we use the term “schoolaged” to refer to children 6-9 who are of compulsory school age. This term does not include kindergarten-aged children.

child care also varies according to family situation. The more children 0-9 years of age in a family, the less likely the family is to demand licensed care for its schoolaged children.

Immigrant status matters for child care demand as well. The use of licensed schoolaged care is relatively low for immigrants within the first 10 years after arrival. By the time immigrants have been in Canada for over 10 years, more use schoolaged care. Families in which the main caregiving parent is Canadian-born have a likelihood of using licensed child care that is higher yet.

Toronto's child care subsidy system has important effects on the demand for licensed schoolaged child care, as it does for younger children. Parents who would not otherwise be able to afford the use of licensed services can do so if they are able to access child care subsidies. Families earning less than \$20,000 are eligible for a full subsidy; above that income level, they may be eligible for a partial subsidy of the costs of licensed child care. The availability of subsidy acts to increase the number of lone parent families, in particular, that use schoolaged care.

## **8. Using and Updating the Demand Model and Affordability Models in the Future**

The Child Care Demand and Affordability models can be used in a number of ways. In particular, the demand models can be used to predict the total amount of children who will use licensed child care under different circumstances. The model also predicts what care arrangements other children will be using if their parents cannot afford licensed care. And, the demand model for children 0-5 years of age predicts how many main caregiving parents will be employed full-time and part-time, along with the care arrangements their children will be using.

It is possible, using the demand models (both for 0-5 and 6-9 year-old children) to look at the distribution of the benefits and burdens of care arrangements. It is possible to examine what kinds of families, from what backgrounds, circumstances and income levels, will be using licensed child care or other care arrangements. It is possible to see what types of families may be disadvantaged in their access to licensed child care given current policy and program arrangements.

On top of this, the affordability models allow us to explicitly measure the degree of affordability of licensed child care for different groups of families and to identify where affordability problems are most acute. Because affordability of licensed child care is closely related to employment and child care decisions of families, it is possible to open a window on the ways in which affordability affects the ability of the City to achieve equity and employment goals.

All of this means that the demand and affordability models can be particularly helpful when the City is developing its periodic growth plans for child care and related services. Consider, for instance, the expected growth of child population in the City of Toronto over the next period.

Right now, there are 27,487 subsidized children and the population of children in Toronto is 172,221 (0-5 years) and 107,348 (6-9 years). This data is from Stats Can projections used in the Finance Department Ontario publication. This gives a total of 279,569 children. In other words, there are currently subsidized spaces for 9.8% of children 0-9 years of age. For simplicity, call this 10% of children in the age range. That means the status quo is a situation in which there are subsidies for 10% of the child population 0-9 years. (There are currently subsidies for 11.1% of children 0-5 and 7.8% of children 6-9).

The Finance Department of Ontario projections say that there will be 177,711

children 0-4 years of age and 167,060 5-9 years of age in 2031 (15 years from now). Readjusting into our categories, this would imply 211,123 children 0-5 and 133,648 children 6-9 years of age. Therefore, the expected total in 2031 is 344,771 children 0-9 years of age. This would mean an additional 65,202 children by 2031, or an increase of 23.3% compared to 2015. To keep the same percent of subsidies (10%), the number of subsidies would have to increase to 34,477.

Hemson Consulting Ltd. (2013) has produced alternative population projections for the City of Toronto that differ in important ways. They see the population of young children in Toronto rising more quickly in the next few years and then decreasing gradually after that. They see Toronto's population of children 0-9 increasing by 24.2% by 2021. However, by 2031, the population of children 0-9 would be only 14.2% higher than today.

On the face of it, these population projections would seem to imply that licensed child care services and licensed child care subsidies would need to grow by about 23% over the next years. However, to fully know the implications of these population growth numbers for Toronto's child care system, a number of other factors need to be taken into account. First, we would need to consider whether the future population growth will be a mirror-image of the current Toronto population or not. Arguably, a larger proportion of future growth will come from new immigration, perhaps especially from certain countries. These families could have more or fewer children, on average, than the current population of Toronto families with young children. Their anticipated incomes in the future could be lower or higher. Their education levels could mirror the current group of Toronto families or not. All of this could be factored into a scenario to simulate the probable future full-fee demand for licensed child care.

On top of this, the affordability models could be used, along with the assumptions about future family demographics and incomes, to chart what is likely to happen

to the affordability of licensed child care over the next fifteen years, and the probable effects on employment.

This information could be used to determine the rate at which subsidy funding should grow in the city in order to reduce the barriers to licensed child care access for families with young children over time. It could also be used to present ideas to federal and provincial governments about the likely effects on affordability and employment of substantial new spending on licensed child care.

It is important to maintain and improve models like these demand and affordability models. The behavioural responses built into the demand models are based on data from 2010-2011. This data does not fully take into account the impacts of full-day kindergarten on child care demand. Also, because of small sample size, the data support for the schoolaged child care demand model is thinner than would be optimal. All of this implies that it is very important for the City of Toronto to pressure Statistics Canada to renew its collection of child care data and to ensure that surveys are well designed to provide information needed for models such as these. When new data, such as from the 2016 Census is available, these models should incorporate its insights.