The Centre for Spatial Economics

Assessing past, present and future economic and demographic change in Canada

Early Learning and Care Impact Analysis

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Abstract

About this Report

This report examines the benefits and costs of the early learning and care system proposed by the Pascal report on early learning and care for Ontario. The short and long-term economic benefits are calculated for the Ontario economy from the operation of the proposed early learning and care system. It is found that the early learning and care system boosts the economy by $2.0 per dollar of expenditure in the short run. In the long run, the benefit to cost ratio is estimated to be 2.4 to one.

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Executive Summary

The implementation of the proposed early learning and care system outlined in Pascal (2009) will create substantial short, medium and long-term benefits for Ontario. This report examines the economic implications of the proposed changes as of the first year of full operation in 2012-13 using conservative assumptions.

Pascal proposes to increase expenditures by up to $990 million in order to introduce an Early Learning Program (ELP) for children aged 4-5 years so that they can have full day learning provided by school boards at no additional cost to parents. Extended day/year learning and care programs for children in kindergarten, primary grades and children 9-12 will be provided where numbers warrant on a fee per child basis. The report also proposes a significant re-engineering of current services for children 0-3 in order to develop Child and Family Centres (CFC) to provide integrated services for these children and their parents. It is envisioned that this will be accomplished by reallocating $1 billion of current funding. Capital costs worth $1.7 billion over 25 years will be needed to build new classrooms and to renovate existing classrooms. Funding for these initiatives will be accomplished by using $1 billion of new funding, and re-organizing $1 billion of current spending.

These proposals will boost the amount of spending in the economy by 2012-13 via several channels. First, as expressed by Pascal, the introduction of the ELP for children 4-5 will result in new expenditures of up to $990 million. Moreover, the introduction of all day learning for children 4-5 will likely boost the utilization rate for this group, which we estimate will lead to an additional 12,800 children receiving JK/SK education. Second, Pascal foresees that the re-organization of Early Learning and Care (ELC) will lead to lower fees for extended day/year programming for children 4-8. Since Canadian parents are very price sensitive this will cause a significant increase in utilization rates for these programs. We estimate that lower fees will encourage an additional 126,300 children aged 4-8 to use extended day/year programs. This will cause total parental expenditures to rise by an estimated $480 million. Third, although the reorganization of CFC will not have a significant net effect on the economy in the short-term because total spending stays the same, there is the prospect of rising utilization over time. Fourth, Capital costs over 25 years are expected to be $1.7 billion, but the cash costs are estimated to be $570 million on average over the first three years to ensure that there are sufficient classrooms for the programs to commence. In total, the injection of money into the economy from the proposed changes is $2,040 million by 2012-13. This spending will cause a large increase in GDP.

For the proposed system, it is estimated that one dollar of spending for ongoing operations increases s GDP in Ontario by $1.53 [illegible] over 25 y

Long-term benefits from the implementation of the proposed ELC system can be divided into benefits to children and parents/mothers. The primary quantifiable benefit to children is higher future income due to lower high-school dropout rates and consequently higher post-secondary attendance rates. The primary quantifiable benefits to parents/mothers are increases in present earnings due to higher labour force participation rates and increases in future earnings due to more work experience and higher post-secondary completion rates. Qualitative benefits include improved psychological outcomes from higher quality care. It is

Introduction

This report analyzes the short- and long-term economic implications of the implementation and operation of the early learning and care system (ELC) as outlined in Pascal (2009) for Ontario and the city of Toronto. The focus of the report is on the ELC system when first fully implemented by 2012-13.

To understand the economic implications of the Pascal report it is helpful to understand several factors including: the proposed changes to early learning and care services, the number of children who likely will be affected by these changes, the short and long-term economic effects that flow from these changes.

To simulate the short-term impact of the Pascal report on the economies of Ontario and Toronto, the direct and indirect economic impacts resulting from a change in money injected into the Ontario economy is estimated using Statistics Canada's input-output model simulations for Ontario. These results were distributed to sub-provincial areas based on the number of affected children. The induced economic impact was also estimated to ensure that the full short-term effects are included. The approach to determine the induced effect used the C_4SE Ontario regional model. The Ontario regional model has the Greater Toronto Area (GTA), but not specifically the city of Toronto. The induced effect was distributed between the city of Toronto and the GTA outside of Toronto based on the number of children affected.

The long-term benefit/cost analysis rests on the approach taken by Fairholm (2009a) and uses various data for Ontario, the GTA, the Toronto Census Metropolitan Area (CMA) and the city of Toronto. The basic approach is to calculate the net present value of all benefits to children, parents and the economy, as well as the net present value of costs to society over the next 80 years.

The analysis is divided into four main sections. The first section supplies a brief synopsis of the proposed changes to the ELC system in Ontario and some broad discussion of the implications. The second section identifies the number of children in Ontario and Toronto who will potentially be affected by changes to the early learning system. The third section outlines the short-term economic impacts of the proposed early learning and care system, and the fourth section outlines the long-term economic impacts of the proposed early learning and care system. A detail discussion of the methodology used can be found in the appendices.

Pascal Report Synopsis

The Pascal report recommends several changes to the early learning and care services in Ontario. Some changes will affect children in all age groups, while other changes will affect specific demographic groups. The proposals will clearly involve children in four distinct cohorts: 0-3, 4-5, 6-8 and 9-12 years. Other proposals have the potential to affect children with special needs. The proposals will influence the number of children using ELC services, potentially the quality of ELC, as well as the developmental and educational outcomes for children. To understand the potential effects it is helpful to summarize the changes that are proposed and the broad implications of these proposals and the assumptions used in the analysis before examining the impacts in detail.

Pascal proposes a common programming framework for all of Ontario's early childhood settings based on Early Learning for Every Child Today (ELECT). The continuum of development and guidelines of practice in ELECT will provide a common approach, tools and guidance for working with children zero to eight years, including in Child and Family Centres (CFC), the Early Learning Program (ELP) and the primary grades.

Pascal also states that Ontario needs a consistent approach to screening all children as early in life as possible. He proposes using the Nipissing District Developmental Screens (NDDS) throughout the province. The NDDS offers 13 screens that assess children's development at intervals between 1 month of age and 6 years. The NDDS is also included in the enhanced 18-month well-baby visit

now in development in Ontario. Pascal envisions the visit as being a prime occasion to connect parents with CFC and other community services. He also proposes that a further developmental check should be carried out at registration for the Early Learning Program. Therefore Pascal proposes assessments of children shortly after birth, 18 months and registration for the full-day ELP. Assessments have the potential of identifying children with special needs.

Pascal also thinks these assessments will provide parents with information about their child and complement the detailed portfolios of each child's progress in early years programming. This information could help to engage more parents in their children's education. In particular, Pascal notes the importance of parental involvement in their children's education and partnerships between educators and parents. He proposes informal outreach for some parents, and a process through flexible program models that support two-way partnerships. Pascal notes that achievement gaps can be reduced by regular participation in quality programming that helps make parents aware of how their children learn and gives them ideas and resources to support their children's development. If these gaps are eliminated there could be a very large impact on the long-term effects.

For children 0-3, the report notes that the current arrangement is spread among multiple providers and under a variety of auspices. Pascal recommends that programs be integrated into Best Start CFC under a single municipal system manager in each area. The centres would provide a variety of services including flexible, part-time and full-day/full-year early learning/care options for children up to 4 years of age. The preferred location of these centres would be in schools. Non-school locations would be partnered with a school or family of schools. The operation of CFC could be provided by local or regional governments, school boards, postsecondary institutions, or non-profit agencies. Non-profit and commercial providers could continue to operate licensed child care in accordance with current program standards. All service expansion would take place through CFC and school boards. Fees would continue to be charged for some aspects of ELC.

For children aged 4-5, there would be a shift from the provision of half-day kindergarten to a system that provides a full-day, school-year ELP, operated by school boards. The full-day implementation would start in 2010-11 and take three years to be implemented, so that the plan would be fully implemented by the 2012-13 school year. There would be no parent fees, so these services would be financed via general provincial tax revenue. Parents would have the option of extended programming before and after the school day and year, not as an add-on, but as part of the ELP provided by school boards. Parent would pay fees for extended day/year programming.

The Pascal report also proposed that extended programming would also be available for primary school children. For children 6-8, there would be extended programming provided by school boards before and after the traditional school day, and da8(rined b)sw[(dTl diiA.001tram be na.306 0 TD.7these) Tcgra7(y, 7.7

Economic Implications of Measures in Pascal Report

This section discusses the implications of the changes proposed by the Pascal report. Global implications are discussed first and then those for specific cohorts are discussed next. Where possible the analysis will identify if the proposals affect the short-term versus long-term analysis.

The short-term analysis focuses on the change in expenditures to operate the new system. If governments spend more on direct expenditures, such as salaries and infrastructure, then near-term economic activity receives a boost. An increase in government transfer payments does not directly boost economic activity. It is only when the money is spent by the recipient, such as households, school boards or municipal governments that economic activity is increased. This distinction is important because spending in different sectors affect the economy differently. Moreover, since the re-organization of ELC is expected to lower fees, ELC utilization will rise. If total spending on ELC increases there can be an additional leveraged economic effect.

For the long-term analysis, it is important to determine not only the magnitude of the impact on societal costs and benefits but also the timing of these impacts so that the net present value of the long-term benefits and costs and the benefit/cost ratio can be calculated.

Some of the proposed changes are straightforward to quantify, while others are more difficult. To help in the calculation of the economic effects, it is useful to differentiate between the impact on an average or representative child and the total number of children who will be affected. The effects per child or child hour are obtained from the literature that examines the impact of different types of early learning programs on children's developmental and/or educational outcomes.[1] The number of children affected are calculated by using an average of parental fee sensitivity that was found by Powell (2002) and the situation in the U.K. (see Appendix A) The implications of the proposed changes are more difficult to quantify when dealing with changes that affect the quality of ELC services or the behaviour of parents. In some cases there is insufficient information to quantity the effect on the average child or the number of children affected using reasonable assumptions. In these cases the effect is noted, but the impact is not included in the quantitative analysis.

General Implications

It is important to note that Pascal is proposing a number of complementary changes to the early childhood learning and care system. These ECERS changes could influence the quality of ELC, early identification of special needs children and provide a system that successfully increases the involvement of parents in their children's education. If successful, the proposals could dramatically improve the developmental and educational outcomes for children of all ages and therefore would boost the long-term economic benefits flowing from Pascal's proposals. Many of the proposals could also boost demand for ELC services in the short, medium and long-run. The combination of increased benefits per child with greater demand (more children using the ELC services) means that the total effect could be larger than the sum of the partial effects discussed below.

Pascal proposes a common programming framework for all of Ontario's early childhood settings based on Early Learning for Every Child Today and use of NDDS throughout the province. In Pascal's view these assessments will provide parents with good information about their child and complement the detailed portfolios of each child's progress in early years programming. This approach appears to be part of a process by which to engage parents in their children's education. The involvement of parents in their child's learning can pay large dividends.

Jeynes (2005) states that meta-analysis show that parental involvement is associated with higher student achievement outcomes. These findings emerged consistently whether the outcome measures were grades, standardized test scores, or a variety of other measures, including teacher ratings. For the overall population of students, on average, the achievement scores of children with highly

[1] see Fairholm (2009a) for a review of the literature.

involved parents was higher than children with less involved parents. This academic advantage for those parents who were highly involved in their edu

new system is in full operation. Since operating costs remain the same, there will not be a significant short-term economic impact from the operation CFC in the new system.[5]

The Pascal report did indicate that there may be a need for transitional funding, but the magnitude was not identified and would presumably not continue during the normal operation of the new system, which is the focus of this examination. The report also suggests that once services are organized to reflect what families want and need, they will have a better idea about the levels of new investment required for expansion. So there may be more money later for this aspect of the proposals, but the magnitude of this expansion was not specified in the original proposals and therefore was not included in the current analysis of the short-term effects. Furthermore, if fees for ELC services for children 0-3 remain the same there would not be any change in utilization rates, which would keep total parental fees at the same level. So the net short-term impact would be zero.

Long-term benefits depend on the effects per child from the operation of the new system and from changes in the utilization rate. For children 0-3, there may be long-term benefits because the new system will be delivered by ECE trained providers and special needs resource teachers. More highly trained staff tends to improve the quality of ELC services and therefore the long-term benefits for participating children. Also more highly trained staff could help to identify special needs children earlier, which would provide additional long-term benefits. The Pascal report also suggests that the staff-child ratios and age groups should be reviewed, which could result in a change in the staff-child ratio.[6] A higher staff-child ratio likely would improve the quality of the ELC services provided to children and would boost long-term benefits. Higher staff-child ratios would also boost costs and these expenditures would have an immediate short-term impact. Any change in the staff-child ratios, however, is likely to occur beyond 2012-13, which is the focus of the current study.

It is not clear what additional long-term benefits may accrue to children 0-3 years from the introduction of the new system since these benefits depend in part on the early identification and intervention for special needs children, and from increased parental involvement. Any additional impact on the long-term benefits and costs would therefore depend on whether the utilization rate increases in the new system. Since costs of the system remain the same it is unlikely there would be an increase in the utilization rate.

Children 4-5 School Day Program

The proposal to replace the half-day kindergarten program with a full-day ELP for 4-5 year olds would cause an increase in the utilization of school provided ELC during the normal school day and a decrease outside the school system. Parents would favour the all day ELP over non-school services for two reasons. First, the direct cost to parents of using these services would fall to zero since the system would be funded by general tax revenues. Second, the actual and perceived quality of ELC provided by the school system would likely be higher than what generally is provided outside the school system in part because the new system uses teachers and ECE trained staff. ad008corviceem

If parents perceive that the quality of ELC provided by the school system is higher than what 16.1g9ohew availableme,g

Children 4-12 Extended Programs

Extended day/year care can be beneficial to children, particularly disadvantaged children. Durlak and Weissberg (2007) state that one meta-analysis of 35 studies found that the test scores of low-income, at-risk youth improved significantly in both reading and mathematics after they participated in after-school programs (Lauer et al., 2006). They report, however, that academic outcomes for other youth have been inconsistent (Kane, 2003; Scott-Little, Hamann and Jurs, 2002; Vandell et al., 2004). Durlak and Weissberg's find that youth who participate in after-school programs that use evidence based skill training approaches improve significantly in three major areas: feelings and attitudes, indicators of behavioral adjustment, and school performance. They also reduced problem behaviours (e.g., aggression, noncompliance and conduct problems) and drug use. They find that effective after-school programs improve academic achievement measures by 0.31 SD and is similar in magnitude to successful primary prevention programs

Similarly the research that examines extended year programs tend to find positive results. In a meta-analysis of summer school results for elementary and middle school children Cooper et al. (2000) reported that children benefited by 0.14 to 0.25 standard deviations on academic achievement measures from summer school programs. And Kim (2006) found that those studies employing the most rigorous (random assignment) evaluation designs showed even larger effects. Winship et al. conclude that these meta-analyses imply that summer academic programs typically increase students' test scores by one-fifth of a standard deviation, which is equivalent to moving a student from the 50th percentile of the distribution to the 58th percentile.

For 4-8 year olds we have assumed that the utilization rate for extended day/year programming rises based on the drop in fees and the higher utilization rate for wrap around care found in the UK. Using an average of these estimates, means that the utilization rates for 4-5 will rise from 34% to 52%. For 6-8 year olds, it is assumed that the utilization rate rises from 7% to 24%.[7] Since there is no drop in fees for children 9-12, the utilization rate for this age cohort is assumed to remain the same after the change in after school programs. (see Appendix A for a discussion)

Costs/Funding

The Pascal report recommends the following new spending:

- $990-million for staffing, occupancy and operating of full school day/year preschool program for 4-5 year olds and occupancy costs, administration, supervision, program and professional development for an extended day/year program for 4-12 year olds
- $1.7-billion in capital for school expansion
- Reallocate child services spending of up to $1 billion, and re-engineering of services provided by CFC. To be managed by municipalities
- Transitional funding for municipalities –not specified

Pascal suggests the following funding sources:

- $500 million of committed funding. The Ontario government's funding commitment is for $200 million in 2010 and $300 million in 2011.
- Reallocate up to $1-billion of children's service spending (Ministry of Children and Youth Services (MCYS) and municipal) to municipalities
- Re-engineering of services provided by CFC.
- $1-billion of new funding out of general revenues.

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teachers' salaries will be determined by collective agreements. In 2005, the census indicates that kindergarten and elementary teachers earned $59,273 on average for full-time, full-year employment. If teachers also receive benefits worth 24% of wages, their average labour income would be $73,499. As discussed in the previous section, Pascal estimates that the total increase in staffing costs of the ELP to be $430 million.

The new system envisioned by Pascal will feature educators with age-specific qualifications, which may require upgrading of skills for these workers. Some certified primary school teachers may have acquired specific early childhood knowledge and skills through prior postsecondary education, in-service professional development, or early learning additional qualification courses. Others may have acquired the equivalent knowledge and skills through experience and learning opportunities. Pascal suggests that a rigorous process for prior learning assessment and recognition (PLAR)

0-3	710	450	260
4-5	580	240	340
6-8	150	40	110
9-12	60	60	0
Total	1,570	780	710

Staff cost estimated by multiplying labour income per worker by the number of staff required based on staff-child ratios and the estimated number of children expected to be enrolled.
Totals may not add up due to rounding.

Table 5: Change in Net Income For CFC and Extended Day/Year Programs Utilization Rates for Children 4-8 Rise to 50%
($ Millions)

Age of Children	Change in Fee Revenues	Change in Staff Costs	Change in Net Income
0-3	0	260	-260
4-5	150	340	-180
6-8	330	110	220
9-12	0	0	0
Total	480	710	-220

Staff cost estimated by multiplying labour income per worker by the number of staff required based on staff-child ratios and the estimated number of children expected to be enrolled.
Totals may not add up due to rounding.

The increase in revenues for the extended day/year programming for 4-12 year olds more than offset the increase in salary expenses under the assumptions used above (see Table 5). The estimates, however, show that the increase in labour income will increase costs for municipalities operating the CFC. There would be other cost savings to offset this increase in staff costs, however.

Re-Allocation and Re-Engineering

Municipal authorities will be responsible for the creation and management of CFCs. These new centres will be developed and expanded by consolidating and re-engineering the resources, governance and mandates of existing child care, family resource and early intervention services. These include regulated group and home child care,

($ Millions)

Table 11: Child Care Fees		
	Current Fee	New System Fee
Infant	52.37	---
Toddler	43.67	---
2 1/2 – 5	35.14	---
3 8 m - 4	34.42	27
4 8m - 5	34.42	27
6 – 8	26.24	20
9-12	26.24	---
Source: Pascal (2009)		

Given the current distribution of family incomes and subsidies there would be no shortage of families available to utilize these subsidies (see Table 13). The total number of families earning less than $20,000 with children less than six years of age was around 50 thousand in 2005. The number of subsidized spaces for children less than six was 55 thousand, which exceeds the number of families earning less $20,000, although it should be noted that these data do not indicate the total number of children less than six in these families. The total number of subsidized spaces is 62% of the number of the families in the two lowest income groups combined. Once all eligible income groups are combined–up to $70,000— subsidized spaces represent only 19% of the number of eligible families. Since there are families with higher income than $20,000 who receive subsidized spaces, as witnessed by the $40.1 million in subsidy co-payments in Table 6, there would be a large number of children in the lowest family income cohorts who do not currently receive subsidies.

Table 12: Extra System Funding Available for Fee Subsidies ($ Millions)	
Extra Funding Available 0-3*	170
Extra Funding Available 4-12	150
Total Extra Funding Available 0-12	320
Subsidy Costs for Children 4-12	260
Net Systemic Funding Surplus	60
Totals may not add up due to rounding. * Includes fee subsidies for children 0-3	

Pascal the introduction of the Early Learning Program for children 4-5 will result in new expenditures of $990 million. The reorganization of CFC lead by municipalities will not have a significant net effect in the short-term on the economy because total spending stays the same, although there would be a small net impact as a result of the re-organization because different sectors have different short-term multipliers and higher paid employees spend less of every extra dollar. As expressed by Pascal the re-organization of ELC will lead to lower fees and higher utilization rates that will cause total parental expenditure to rise by an estimated $480 million. Capital costs over 25 years are expected to be $1.7 billion, but with an estimated annual cash costs $570 million on average over the first three years to ensure that there are sufficient classrooms for the programs to commence. The analysis uses these estimates to calculate the short-term impacts.

Benefits and Costs of Early Learning and Care

The net benefits of an ELC program to an economy can be illustrated in two different ways. A multiplier can be estimated, which shows the rise in overall economic activity in the short run per dollar increase in expenditure for that particular program. Alternatively, the present value of the benefits and costs can be estimated, the dollar amount of the net benefits of the program can be calculated and the benefit/cost ratio can be determined.

The literature on the short-run effects of spending on ELC programs typically find that they are among the largest of all sectors. Fairholm (2009a) examines direct and indirect GDP multipliers in different sectors of the Canadian economy. He finds that the ELC sector provides one of the largest direct and indirect GDP multipliers of all the major sectors—tied for fifth largest—using estimates from Statistics Canada's Input-Output model. Furthermore, the ELC sector has one of the highest induced multipliers. When the direct, indirect, and induced effects are combined, ELC boosts the economy by 2.3 dollars per dollar of spending, which is one of the largest short-term multipliers of all the major sectors. Prentice (2008) finds that the local area multiplier for a sub-provincial area is quite high, with a

multiplier of 1.58 for a local area of Manitoba. Similarly, US research also shows that ELC program multipliers are higher than multipliers for other key sectors of the economy.[10]

The literature that estimates long-term costs and benefits of child care programs consistently shows that the benefits exceed costs. The extensive Chicago child-parent centres program and two randomised studies: the High Scope/Perry and Carolina Abecedarian programs in the US show costs being repaid several times over for disadvantaged children. Other child care programs, both targeted and universal, show positive albeit smaller net benefits to society per dollar spent. For Canada, Fairholm (2009a) found that the net present value of benefits to be 2.54 per dollar invested and Cleveland and Krashinsky (1998) estimated high quality child care in Canada would return over $2 for every dollar invested. For the US, Karoly and Bigelow (2005) estimated that a universal child care program in California would yield benefits of $2-$4 for every dollar invested, and Belfield (2005) estimated that every dollar invested provides future benefits worth $2.25 for the Louisiana child care system.

Short-term analysis

In order to estimate the short-term economic benefits as accurately as possible several sets of impact estimates were taken from Statistics Canada's detailed Ontario input-output model. This permits the analysis to reflect the economic impact from the removal of different components of existing ELC services and the implementation of the proposed ELC services.

The removal of the current ELC system for 0-8 year olds used the "child care, outside the home" GDP and employment multipliers.[11] The implementation of the full-day Early Learning Program for 4-5 year olds uses the education category. The implementation of new extended day/year ELC for 4-5 and 6-8 year-olds and the CFC system for 0-3 year olds used adjusted GDP and employment multipliers. The ELC multipliers were adjusted to reflect the higher wages and benefits in the new system and to reflect the changed share of non-labour cost spending by child care centres. For children 9-12, fees and the number of children using after school care remains the same and there is no known change in costs, so the net impact is zero and are not included below.

Short-term economic impacts were calculated for direct and indirect multipliers obtained from Statistics Canada and from induced multipliers calculated by the authors (see Appendix B for the detailed methodology). The induced economic effect occurs because of the increased spending by households that happens because of the direct and indirect change in employment and labour income. The magnitude of the induced effect will vary by sector based on the share of labour costs in total costs for that sector, and based on the wages of the workers employed. In general, lower wage workers have a lower marginal tax rate, and a tendency to save less (spend more) from an extra dollar of income than higher wage earners. More income for lower wage workers therefore cause a larger induced effect per dollar than for higher wage workers.

To estimate the short-term economic impact for a particular infusion or withdrawal of spending caused by the transformation of ELC into the new system, the spending estimates were multiplied by the related multiplier. All of these short-term economic impacts were transformed into hourly estimates for Ontario, the GTA and Toronto using data for hours and costs of hourly child care (see Appendix C for calculations of hours and costs). This allowed the estimation of costs and the resulting impact on gross domestic product (GDP) and employment for these jurisdictions.

[10] Warner and Liu (2004) find that child care has a direct and indirect (type I) multiplier of 1.49 and a direct, indirect and induced (type II) multiplier of 1.91 for the US economy.

[11] A special simulation of Statistics Canada input-output model was undertaken to estimate the impact of changes in child care services. In the IO model, this was done by increasing output for the commodity, "Child care, outside the home", since the North American Industry Classification System (NAICS) Industry 6244—"Child day-care services"—was not represented in the worksheet level model. This custom simulation is helpful because it illustrates the impacts on the overall Ontario economy from changing ELC output and by design can be compared with the impacts on the economy from increasing output in other industries.

For construction spending, the direct and indirect construction industry multipliers from Statistics Canada along with induced effects calculated by the authors are used to estimate the impact on the Ontario economy. The capital costs are not decomposed by type of construction or by geographic location, however. In order to estimate the sub-provincial effects, it is assumed that the capital costs are distributed based on the number of children hours in different geographic locations.

The GDP multiplier reflects the increase in value added (or GDP) in Ontario from a change in industry output or spending. These multipliers exclude leakages such as imports and avoid double counting of intermediate inputs. For the proposed system, one dollar of spending increases GDP by $2.02 for ongoing operations and by $1.90 for the GTA and Toronto. For capital spending, one dollar of spending adds $1.47 to GDP for Ontario and $1.36 for the GTA and Toronto.

The employment multiplier measures the number of jobs created per million dollars spent. Using the wages and benefits provided by the Pascal report, it can be estimated that one million dollars spent on early learning in Ontario directly creates 13.6 jobs in the ELC sector. As suppliers increase output as a result of the rise in the ELC sector's activity they will also hire an

5	137,140	7.3%
Total 6-8	432,715	23.1%
6	142,665	7.6%
7	142,930	7.6%
8	147,120	7.8%
Total 9-12	635,940	33.9%
9	151,735	8.1%
10	158,680	8.5%
11	163,145	8.7%
12	162,380	8.7%

Source: 2006 Census

there will be a larger relative increase in the need for ECE trained workers in the city of Toronto than in the rest of the province because younger children required more trained staff than older children. Over time, the pace of population growth for children in Toronto is expected to lag behind that for the Province, with a gain of roughly 21.5% from 2006 to 2036.

Table 20 - Children by Age in City of Toronto (2006)

Age	Number of Children	%
Children 0-12	353,820	100.0%
Total 0-3	108,945	30.8%
Under 1 year	28,275	8.0%
1	27,410	7.7%
2	26,915	7.6%
3	26,345	7.4%
Total 4-5	52,145	14.7%
4	26,035	7.4%
5	26,110	7.4%
Total 6-8	79,935	22.6%
6	26,780	7.6%
7	26,010	7.4%
8	27,145	7.7%
Total 9-12	112,795	31.9%
9	27,550	7.8%
10	28,415	8.0%
11	28,870	8.2%
12	27,960	7.9%

Source: 2006 Census, Census Division

As illustrated in Table 21, there were 886,330 children aged 0-12 in the Greater Toronto Area (GTA) in 2006 according to the census. There were relatively more children 0-3 and 4-5 years of age than in Ontario as a whole, with 29.2% and 14.7% respectively. The implication of this observation is that the GTA will require relatively more ECEs than the rest of Ontario because these age groups have higher staff-child ratios. And the number of children 0-12 is expanding quickly in the GTA, with this group expected to grow by 51.3% from 2006 to 2036. Most of this population growth will occur in the GTA outside of Toronto. The children's population of the GTA outside Toronto is expected to grow by 71% from 2006 to 2036.

Table 21 - Children by Age in GTA (2006)

Age	Number of Children	%
Children 0-12	886,330	100.0%
Total 0-3	259,170	29.2%
Under 1 year	64,680	7.3%
1	64,630	7.3%

2	65,410	7.4%
3	64,450	7.3%
Total 4-5	129,965	14.7%
4	64,730	7.3%
5	65,235	7.4%
Total 6-8	203,750	23.0%
6	67,780	7.6%
7	66,635	7.5%
8	69,335	7.8%
Total 9-12	293,425	33.1%
9	70,705	8.0%
10	73,795	8.3%
11	74,865	8.4%
12	74,060	8.4%

Source: 2006 Census, Durham, York, Peel, Halton and Toronto Census Divisions

As of 2006, there were 990,230 children aged 0-12 in the province of Ontario outside the GTA (see Table 22). Proportionately fewer children outside the GTA are in the 0-3 and 4-5 cohorts than in the

Pascal's proposals would also increase the number of children receiving early learning by an estimated 139,200. The more children receiving quality education the greater the long-term benefits are to society. The long-term benefits to the economy are estimated to exceed costs by a factor of around 2.4 for every dollar invested. These short and long-term benefits clearly indicate that the implementation of the Pascal recommendations will benefit the Ontario economy.

The short-term multipliers and the long-term benefit/cost estimates were calculated using conservative assumptions regarding the impact of the implementation of the new system. Consequently, there is the likelihood that the benefits to the economy will exceed estimates provided in this report. Even with conservative assumptions there are considerable benefits to the economy from implementing these proposals.

The demographic projections illustrate that the number of children 0-12 in Ontario will be expanding over the next twenty years, with a gain of over 31% from 2006 to 2036. The area outside Toronto in the GTA will see the largest increase at around 71%. These estimates illustrate that the number of children needing ELC will continue to expand for the foreseeable

References

Barnett, W. S., and L. N. Masse (2007). "Comparative benefit–cost analysis of the Abecedarian program and its policy implications."

Fairholm, R. (2009b). "Literature Review of ECEC Labour Market – Understanding and Addressing Workforce Shortages in Early Childhood Education and Care (ECEC) Project", Child Care Human Resource Sector Council.

Galinsky, E. (2006). "The economic benefits of high-quality early childhood programs: What makes the difference?" prepared for The Committee for Economic Development with funding from the A.L. Mailman Family Foundation. Available at: http://www.ecs.org/html/Document.asp?chouseid=6755. Accessed 16/11/2009.

Guralnick, M. (1991). "The Next Decade of Research on the Effectiveness of Early Intervention", *Exceptional Children*, 58,pp. 174-183.

Guralnick, M. (1997). *The effectiveness of early intervention*.

Guralnick, M. (2004) "Effectiveness of Early Intervention for Vulnerable Children: A Developmental Perspective" *Early Intervention: The Essential Readings*, edited by Feldman, M. Blackwell Publishing Ltd. Malden MA. pp 9-50.

Helburn, S.W. (Ed.) (1995). *Child care, cost, and quality in child care centers – Technical report*, University of Colorado at Denver, Department of Economics, Center for Research in Economics and Social Policy.

Jenkins, J. R. and R. E. O'Connor (2002). "Chapter II: Early identification and intervention for young children with reading/learning disabilities", Identification of learning disabilities: Research to practice, pp. 99–149.

Jeynes, W.H. (2005) "Parental Involvement and Student Achievement: A Meta-Analysis", Family Involvement Research Digests, Harvard Family Research Project: Harvard Graduate School of Education, from http://www.hfrp.org/publications-resources/browse-our-publications/parental-involvement-and-student-achievement-a-meta-analysis

Ministry of Children and Youth Services (2009). "Results-Based Plan Briefing Book 2009-10". Available at: http:/www.children.gov.on.ca/htdocs/English/about/Results_2009-2010.aspx

Nagy, P., B. Ryan and R. Robinsen (2002). Nipissing Instrument Validation Report, In Evaluation of the Healthy Babies, Healthy Children Program, Unpublished Report of the Early Years and Healthy Child Development Branch, Ontario Ministry of Community, Family and Children's Services.

OECD (2006). "Starting Strong II: Early Childhood Education and Care".

Pascal, C. (2009). "With Our Best Future in Mind – Implementing Early Learning in Ontario", Report to the Premier by the Special Advisor on Early Learning. Available at: http://www.ontario.ca/ontprodconsume/groups/content/@gopsp/@initiative/documents/document/ont06_018899.pdf. accessed 8/7/2009.

Powell, L. M. (2002). "Joint Labor Supply and Childcare Choice Decisions of Married Mothers." *The Journal of Human Resources*, 37(1), pp. 106-128

Prentice, S. (2008). "Rural Childcare in Manitoba: New Economic Evidence", Municipal Leader, pp. 27-29.

Scott-Little, C., M. Hamann, S. Jurs. (2002). "Evaluations of after-school programs: A meta-evaluationa Ĥ ◗ ㄱ otiẘ ᖳ ¿ ʲ fl ㄱ ₴ ㄴ ى i ę aons of -

Appendix A: Assumptions for Utilization Rates

An idea of how the new system will affect ELC utilization rates can be derived from economics and other research. Basic consumer theory states that demand for a service depends on income, the price of the service and consumer preferences. Household income is unlikely to change significantly as a result of the introduction of the new system because the dollar magnitude of proposed changes was estimated by Pascal at less than $1 billion. This dir

Another factor that could influence utilization is a lack of accessibility. If the existing system is suffering from a lack of available spaces, so that parents cannot access quality child care, the level of utilization would be below what parents want. Therefore, if there is an expansion in the number of spaces available there would also be an expansion in utilization. It appears, however, that the Pascal report is suggesting reorganizing existing child care spaces, and keeping existing providers, before determining additional need and expanding the system in the future. So there does not appear to be a change in the number of spaces or types of organizations providing these services in the near term. If the same organizations are providing these services there is the likelihood that parents will not perceive any change in the quality of services offered. If the perceived quality of ELC services remains the same, [14] then the initial impact on utilization would be minimal since it is unlikely that preferences would change otherwise.

If accessibility is better where shortages currently exist or the perceived quality of these services is better there would be an increase in the utilization rate. At this point it is not clear if any of these factors will occur and boost demand by 2012-13, although many of these factors will likely occur later. Therefore, it cannot be assumed that there will be a change in the utilization of the system for 0-3 year olds at the point the full-day 4-5 year ELP is first implemented by 2012-13, which is the focus of the present analysis. But it can be assumed that the money freed-up from the re-allocation of funding and responsibilities could lead to an increase in the number of subsidized spaces and therefore demand by around 6,420 spaces. This amounts to roughly an increase of 8.6%, although it should be noted that the rise in enrolment would also increase staff and other operating costs. Since the distribution of these funds is unknown and to be conservative, it is assumed that there is no change in the enrolment for children 0-3 by 2012-13.

Over time, the utilization rate likely will change because of the structure of the new system. The new system will employ ECEs, whereas the existing system employs people with and without ECE education. A higher portion of providers with ECE education will directly increase structural quality and is found to be positively related to process quality. If parents perceive that there has been an improvement in the quality of services provided, then there will be an increase in demand. The streamlining of the system to a one stop shop could reduce non-financial costs of using the services provided by CFC. Moreover, the inclusion of the 18-month well-baby visit as an entry point into the new system could increase participation. And any additional funding to expand the system by lowering fees or improving accessibility to quality services would obviously impact the utilization rate. The exact degree of change in participation is unknown, however, until the fee, accessibility and quality are determined.

Currently, the rate of participation of children 0-3 in child care centres is around 10% based on the available data for regulated child care spaces by different age groups and the detailed population by age data from the census. In OECD countries there are a range of ELC utilization rates for children three and younger –8.6% in Germany, 18.7% in Italy, and 35% in Finland—for systems that charge fees and generally higher utilization rates in countries that charge no fees.[15] Therefore, there is scope for an increase in the utilization rate over the longer term.

Children 4-5

The current rate of kindergarten enrolment is roughly 83% for junior kindergarten and 88% for kindergarten. In the new system there would likely be an increase in these enrolment rates. We have assumed a 4.5% increase for each group and that an average of 90% of eligible children will take part in the ELP provided by the new system, which means an additional 12,800 children. This

[14] Certified teachers working with 4 – 5 year old children will have an opportunity to upgrade their ECE skills to achieve the appropriate level of education within five years. The focus of the current analysis is the operation of the system after three years. At that point in time, those currently without ECE training will still have two more years to obtain this qualification, so some of these benefits will occur later.
[15] OECD (2006)

assumption is less than the rate found in some countries with systems similar to that proposed by Pascal. For example, 95-99% of the 3-6 year age cohort is enrolled in the universal (voluntary and free) preschool programs in Belgium, France, and Italy.[16] Given that Canadian parents are generally found to be very price sensitive, there is the distinct possibility that the increase in ELC utilization will rise above 90%.[17] This means the long-term benefits of this study are conservative.

The proposed new early learning and care system for 4-5 year olds will also provide extended hours during the school year, and 50 weeks each year. These ELC services will be associated with the school system and delivered by ECE trained staff. Parents will pay for extended day/year programming in the new system. Parents now pay for extended day/year ELC. If the cost to parents remains the same, then there would be no change in demand based on fees alone.

Since the new system is designed to be provide improvements in a number of important areas there is the likelihood that over time demand will increase significantly for three basic reasons. First, the new system will be provided by the school system using ECE trained personnel. ECE training tends to improve the quality of ELC. Therefore, there is the likelihood that parents will perceive that the new system is better than traditional child care in terms of quality and there will be an additional increase in demand for these services. Second, since children are already in school for the whole school day compared to the current part-day or every-other-day there would be an extra incentive to place children in the extended day/year programs that are located at the school, since there would not be the logistical problem of transporting the children to another location. This would reduce the effective cost for parents. Third, there would be an incentive to parents to extend the time their children are in ELC to include extended day programming for economic reasons, such as work and education. The addition of extended day ELC would mean that parents could be employed during the standard work day. In the UK, for example, around one in two children aged 5-7 are in wraparound care.[18]

Pascal states that the cost of providing extended day/year programming will fall and that these cost savings will be passed onto parents. The current average fee for child care is estimated to be $34.42 per day for children aged 4-5 years although rates vary widely throughout Ontario, with fees higher in the large urban areas and lower in smaller urban and rural communities.[19] Pascal estimates that the new extended day/year ELC fee will be $27 per day for these children. This means there will be a fee reduction of 21.6%. For Canada Powell (2002) found that for married mothers a 1% drop in fees results in a rise in the probability of using centre-based care of between 1.4% and 2.0% using a

Children 6-8

For children 6-8 years old, the Pascal report proposes extended day/school care that will be provided by the school boards and employ people with ECE training. As described above the research suggests that after-school and summer programs can have significant effects on the academic outcomes of children, particularly disadvantaged children. Both after-school and summer programs are found to improve academic outcomes by around 0.2-0.3 SD for disadvantaged children. Thesee

Appendix B: Short-term effects methodology

The methodology used to estimate the short-term stimulus effects of the new ELC system is discussed below. To calculate the economic impact of the implementation of the new ELC system, several economic effects are first calculated, including: provision of existing ELC services, operating the new ELC system, and the impact of capital expenditures. The final estimates are shown on a net basis by subtracting the gross stimulus for current ELC services from the stimulus derived from implementing the proposed early learning system.

In general, the economic impact estimates for current ELC services and new ELC system use multipliers from Statistics Canada's child care, outside the home commodity, although the multipliers for the new system had to be modified to reflect different wages and benefits than current ELC services. Since some of the services are to be delivered by the education system, a set of education sector multipliers also were used. And construction industry multipliers were used to estimate the short-term effects from capital expenditures on the economy (See Table B1).

Table B1: Statistics Canada Multipliers Used For Analysis (Multiplier per $ Output)

	Child Care Outside the Home	Education	Non-Residential Building Construction
Direct labour income	0.90	0.79	0.41
Indirect labour Income	0.02	0.06	0.16
Direct GDP	0.96	0.85	0.52
Indirect GDP	0.04	0.09	0.24
Direct employment*	25.63	13.50	7.86
Indirect employment*	0.42	1.39	3.09

*employment per $million of output
Source: Statistics Canada Ontario IO model simulations

Methodology for stimulus provided by current ELC

The methodology for estimating the economic impact from removing current ELC services involves the calculation of several factors discussed below. The results are reported in Table B2.

For the stimulus from current ELC; direct labour income, indirect labour income, direct GDP effect, indirect GDP effect, induced GDP effect, direct employment effect, indirect employment effect and induced employment effect were calculated as follows.

- Direct labour income was the labour cost of current ELC.
- Indirect labour income was found by multiplying the non-labour costs of current ELC by the wage share of non-labour cost (from the child care outside of home commodity input-output simulation).
- Direct GDP effects were found by multiplying total costs of current ELC by the direct GDP multiplier (from the child care outside of home commodity input-output simulation).
- Indirect GDP effects were found by multiplying non-labour costs of current ELC by the GDP impact per dollar non-labour cost (from the child care outside of home commodity input-output simulation).
- Induced GDP effects were found by multiplying labour costs of current ELC by the induced GDP to wage multiplier for an income group similar to that of workers in ELC (see Fairholm (2009a) for more details). The induced GDP effect of the indirect labour income is also included.

- Direct employment effects were calculated by dividing labour costs of current ELC by the yearly wage of a worker in ELC.
- Indirect employment effects were found by multiplying non-wage costs by the employment impact of an extra dollar spent on non-wage cost (from the child care

Table B3: Proposed expanded kindergarten (per $million of expenditures)			
	Ontario	GTA	Toronto
Direct labour income	674,020	674,020	674,020
Indirect labour income	89,620	79,772	79,772
Direct GDP	848,225	848,225	848,225
Indirect GDP	138,746	123,500	123,500
Induced GDP	944,452	840,671	840,671
Direct employment	11.42	11.42	11.42
Indirect employment	2.13	1.89	1.89
Induced employment	14.49	12.89	12.89

Methodology for stimulus provided by school-delivered extended hour/full year program

The methodology for estimating the operating of the proposed school-delivered extended hour/full year program involves calculation of several factors discussed below. The results are reported in Table B4.

For the stimulus from the proposed school-delivered extended hour/full year program; direct labour income, indirect labour income, direct GDP effect, indirect GDP effect, induced GDP effect, direct employment effect, indirect employment effect and induced employment effect were calculated as follows.

- Direct labour income was the labour cost of the proposed school-delivered extended hour/full year program; direct.
- Indirect labour income was found by multiplying the non-labour costs of the proposed school-delivered extended hour/full year program by the wage share of non-labour cost (from the child care outside of home commodity input-output simulation).
- Direct GDP effects were found by multiplying total costs of the proposed school-delivered extended hour/full year program by the direct GDP multiplier (from the child care outside of home commodity input-output simulation).
- Indirect GDP effects were found by multiplying non-labour costs of the proposed school-delivered extended hour/full year program by the GDP impact per dollar non-labour cost (from the child care outside of home commodity input-output simulation).
- Induced GDP effects were found by multiplying labour costs of the proposed school-delivered extended hour/full year program by the induced GDP to wage multiplier from an income group similar to that of workers in new system ELC (see Fairholm (2009) for more details). The induced GDP effect of the indirect labour income is also included.
- Direct employment effects were calculated by dividing labour costs of the proposed school-delivered extended hour/full year program by the yearly wage of a worker in ELC.
- Indirect employment effects were found by multiplying non-wage costs by the employment impact of an extra dollar spent on non-wage cost (from the child care outside of home commodity input-output simulation).
- Induced employment effects were estimated by multiplying the induced GDP effects by the ratio of indirect employment effects to indirect GDP effects. This give a reasonable estimate of the employment effect from extra higher wages of ELC workers being spent.

Table B4: Proposed new non-kindergarten system (per $million of expenditures)			
	Ontario	GTA	Toronto
Direct labour income	848,339	852,425	853,969
Indirect labour income	35,070	30,376	30,058
Direct GDP	900,775	905,113	906,753
Indirect GDP	55,291	47,890	47,389
Induced GDP	1,092,329	975,753	977,058
Direct employment	14.38	14.45	14.47
Indirect employment	0.74	0.64	0.63
Induced employment	14.60	13.04	13.06

Methodology for stimulus from capital investment

The methodology for estimating the impact of new capital investment involves calculation several factors discussed below. The results of the calculations are reported in Table B5.

For the stimulus from capital investment; direct labour income, indirect labour income, direct GDP effect, indirect GDP effect, induced GDP effect, direct employment effect, indirect employment effect and induced employment effect were calculated as follows.

- Direct labour income is calculated from multiplying capital investment expenditures by the labour income share from the non-residential building construction industry input-output simulation.
- Indirect labour income is calculated from multiplying capital investment expenditures by the indirect labour income share from the non-residential building construction industry input-output simulation.
- Direct GDP effects are calculated from multiplying capital investment expenditures by the direct GDP multiplier from the non-residential building construction industry input-output simulation.
- Indirect GDP effects are calculated from multiplying capital investment expenditures by the indirect GDP multiplier from the non-residential building construction industry input-output simulation.
- Induced GDP effects are found from multiplying direct labour income by the induced GDP to wage multiplier from an income group similar to that of workers in the non-residential building construction industry. The induced GDP effect of the indirect labour income is also included.
- Direct employment effects are calculated from multiplying capital investment expenditures by the direct employment multiplier from the non-residential building construction industry input-output simulation.
- Indirect employment effects are calculated from multiplying capital investment expenditures by the indirect employment multiplier from the non-residential building construction industry input-output simulation.
- Induced employment effects were by multiplying induced GDP effects by the ratio of indirect employment effects to indirect GDP effects. This give a reasonable estimate of the employment effect from extra wages of non-residential building construction workers being spent.

Table B5: Proposed Capital Expenditures (per $million of expenditures)			
	Ontario	GTA	Toronto
Direct labour income	412,059	412,059	412,059
Indirect labour income	161,968	144,170	144,170
Direct GDP	519,633	519,633	519,633
Indirect GDP	239,112	212,837	212,837
Induced GDP	710,288	632,239	632,239
Direct employment	7.86	7.86	7.86
Indirect employment	3.09	2.75	2.75
Induced employment	9.18	8.17	8.17

Methodology for aggregating the first two components

The stimulus effects of implementing the new early learning system are found by adding the kindergarten and non-kindergarten components of the new system. This is done for the following

The hours were calculated as follows:

The hours spent by current 0-5 children in child care were estimated by multiplying the percentage of the age cohort in child care by the number of children in that cohort by the number of hours an average child spent in child care. The data on percentage of children in child care by age and number of hours spent in child care by children by age were obtained from the National Longitudinal Survey of Children and Youth (NLSCY). Unfortunately data were only available for Ontario and the Toronto CMA which meant that calculations for the GTA and city of Toronto used the same data. Data for the number of children by age and jurisdiction were obtained from the Ontario Ministry of Finance population projection.

The hours spent by current 6-8 year old children in after-school care were assumed to be two hours per day during the school year and 9 hours per day during the summer vacation period for an average of 3.75 hours in care. The percentage of these children in child care for Ontario was estimated through data collected on the number of children 6-12 in care, and distributing based on population. It is assumed that the utilization rate for this age cohort for 2008 is evident in 2012. The percentage of these children in child care for the GTA and Toronto were estimated from data collected from the city of Toronto. In the new system, the hours each child spends in child care is assumed to be the same as the hours spent in child care in the current system. The percentage of these children in child care for the GTA and Toronto was estimated from data collected from the city of Toronto.

The number of hours spent by participants in the re-engineered 0-3 year old program is assumed to be the same as the current system.

The number of extra hours that will be spent in the Early Learning Program by 4-5 year olds was calculated by multiplying the assumed extra hours per child by the 90% of children aged 4-5 who are assumed to benefit from the full-day ELP. The extra hours in the Early Learning Program per child in the new system was assumed to three hours per day, five days per week, and 40 weeks per year. Data for the number of children by age and jurisdiction were obtained from the Ontario Ministry of Finance population projection.

Notably, the above estimate of the NPV from long-term economic growth is likely an underestimate. This is because the calculation is only for the children who directly participate in the programs. There is evidence, however, that subsequent generations will also benefit from the enhanced income that ELC participants earn. Barnett and Masse (2007) provide estimates of the generational income elasticity, which together with the mean age of fathers and mothers at childbirth can be used to estimate ELC benefits from higher earnings among future offspring of ELC participants. For the Ontario situation, these calculations would result in a NPV around 10% higher per five-year-old child in 2005. These higher earnings of future generations, however, will not be considered in the analysis that follows in order to focus solely on the children who participate in the program and their mothers. From Table C.6A, one can see that the future earnings of participants account for most of total benefits. Table C.7A lists the NPV of benefits by age of child. The four and five year cohorts account for most of the children in ELC. Benefits to older age cohorts were calculated by discounting future benefits by fewer years.

Table C.7a - 2005 Child Benefits by Birth Cohort Ontario

Cohort	Age of Child	NPV Child Benefits
2000	5	$19,785
2001	4	$19,495
2002	3	$19,211

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6m - <1 yr	3	3.3	3.3
1 year	3	4.0	4.5
2 years	3	6.1	6.1
3 years	6	8.0	8.0
4 years	6	8.8	10.0
5 years	6	9.3	12.0

Table C.9a - ELC Worker Education Ontario – 2005

	% of workforce
Caregiver ECE educated	46.4
Caregiver not ECE educated	53.6

Table C.9b - ELC Worker Education Toronto - GTA - 2005

	% of workforce

time the mother is out of the labour force makes no difference to hourly maternal benefits (earnings in Table C.11a for a full year leave are twice those in Table C.12a for a half year leave).

The immediate gain in wages for 2005 was derived using earnings data from the 2006 census. The wage gain was based on the median annual female wages for full-time work by age for 2005. Wage gains in the following years (2006-2080) are then estimated by assuming that the future wage of the mother at home corresponds to the wage of the mother at work at a one-year younger age or a one-year older age, whichever is lowest. In choosing this method, it is assumed that yearly earnings to mothers spending a year less in the workforce are always lower than earnings of mothers not taking a year off (this assumption is congruent with Joshi's [1990] analysis). It is assumed that real wages increase by 1% each year on average over the working lives of women. Immediate and future wage gains to mothers are then corrected for labour force participation and are proportioned out by birth rate frequency by mother's age. Table C.13a shows the NPVs of benefits to mothers.

Notably, these estimates are conservative since they do not take into account the pension benefits that would accrue over the working lives of women, similar to Joshi's assumptions. And the estimates do not include the possibility that women will use the availability of ELC to upgrade their training and therefore have a higher future income path. This latter issue is dealt with in the following section.

Table C.11a - Earnings to Mother of a Five-Year-Old Child from Working an Extra Year Ontario - 2005

Age of Mother	2005	2006-2080 NPV

Table C.13C - 2005 Maternal Benefits by Birth Cohort Toronto City - 2005		
Cohort	Child Age	NPV Benefits
2000	5	$72,926
2001	4	$72,627
2002	3	$72,320
2003	2	$71,951
2004	1	$71,527
2005	0	$71,071

Hourly earnings are calculated by dividing immediate and future wage gains by Carolina Abecedarian program yearly hours (2500). These hourly earnings are then multiplied by the number of full-time workers that result from an additional formal ELC space to find mothers' hourly benefits from ELC. The NPV of mothers' hourly benefits (for those in the workforce[4 143.88(num)7. EitLC ysis mmediate wage

Benefits to mothers in education

Next step is to investigate the percent of participants who had children at age 18-20 and at age 24-

Appendix D: Growth Model

The growth model used to calculate the economic benefits of higher educational attainment for ELC participants is the standard Solow model with human capital. The model can be written:

$$(1)\ Y_t = A_t K_t^{\alpha} (H_t L_t)^{1-\alpha} H_t^{\gamma}$$

Where,

Y_t is GDP

A_t is productivity

K_t is (physical) capital

H_t is human capital

L_t is raw labour

α and γ are constants

This model is from Dickens et al. (2006), who outline three versions of the standard Solow model with human capital ($\gamma = -0.25$, $\gamma = 0$, $\gamma = 0.05$). For simplifying purposes, this analysis will focus solely on the middle version, which means the above model can be written:

$$(2)\ Y_t = A_t K_t^{\alpha} (H_t L_t)^{1-\alpha}$$

The model runs from 2006-2080. Data for Y_t and K_t can be found in the Centre for Spatial Economics provincial model for the period 2006-2036 for Ontario and the GTA (city of Toronto uses a proportion of GTA GDP and capital). The constant α is set equal to the Dickens et al. value of 0.347.

Inserting equation 2 into equation 4 and rewriting gives:

$$(6)\ K_t = \left(\frac{s}{g} A_t\right)^{1/1-\alpha} (H_t L_t)$$

Combining equation 4, 5 and 6 gives:

$$(7)\ K_t = \left(\frac{A_t}{A_{t-1}}\right)^{1/1-\alpha} \left(\frac{H_t L_t}{H_{t-1} L_{t-1}}\right) K_{t-1}$$

Equation 7 is used to extrapolate K_t for the period 2036-2080. Equation 2 is then used to extrapolate Y_t for the period 2036-2080. This is the base model (BM).

The alternative model for participants in early learning (AMP) is estimated on the basis of one extra child attending ELC. A_t is the same as before. L_t