

The Centre for Spatial Economics

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

Short-term Impact Analysis of an Expansion of Regulated Early Learning and Care in Nova Scotia

Prepared for:

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Abstract

This report provides an analysis of the short-term economic impact of an expansion of regulated early learning and care (ELC) as it is currently structured in the province of Nova Scotia. The report provides estimates of the impact on GDP, employment, government revenues and mothers' labour supply from an increase in ELC expenditure in Nova Scotia. It is found that the ELC sector provides more short-term economic stimulus than other major sectors in the Nova Scotia economy. Moreover, an expansion in the number of early childhood educators and spaces will have an additional positive effect on the economy via an increase in mothers' labour supply.

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Table of Contents

Executive Summary	3
1. Introduction.....	5
2. Literature Review of ELC Benefits.....	5
3. Economic Impact Estimates and Multipliers.....	7
4. Direct and Indirect Economic Impact for ELC in Nova Scotia.....	9
5. Induced Impact Assessment of ELC in Nova Scotia	11
6. Comparison of Combined Direct, Indirect and Induced Effects	14
7. Mothers' Labour Supply and Total Employment Effects	15
8. Impact on Government Revenue.....	17
8. Conclusion.....	19
9. References	21
10. Glossary of Terms	29



Executive Summary

A large body of research has examined early learning and care (ELC). In general the literature finds that quality ELC provides benefits to participating children, parents of participating children and society as a whole including benefits to government spending and revenues. The economic benefits of ELC can be calculated for either the long term or short term using two different approaches. The literature that focuses on the long term tends to find that the present value of benefits from quality ELC programs are much larger than the costs, particular for disadvantaged children. The literature that focuses on the short-term economic effects tends to find that the ELC sector has large GDP and employment multipliers compared with other sectors. The present study does not examine the long-term benefits and costs of an expansion of ELC sector because this analysis was beyond the parameters of the study. Instead the study focuses on the short-term economic effects caused by an increase in activity (called output in the economic literature) in Nova Scotia's regulated ELC sector as it is currently comprised.

An expansion of regulated ELC will have many short-term economic effects. To understand these effects it is helpful to decompose them into four distinct parts. First an increase in ELC spending will directly boost GDP and employment in the ELC sector. This is the direct economic effect. Second, the expansion of output in the ELC sector will increase demand for the goods and services of supplying sectors, and their suppliers, etc. This is the indirect economic effect. Third, the increase in employment and income generated by the direct and indirect channels will boost the economy as the extra income is spent. This is the induced economic effect. Fourth, the expansion in the number of early childhood educators and therefore spaces will permit more mothers to work. This is the mothers' labour supply effect. This effect will also provide significant short-term economic benefits to Nova Scotia as the additional income is spent.

The report examines each of these short-term effects and provides a comparison with other sectors so that the importance of an increase in ELC activity can be put into the proper context. In order for the analysis to be comparable to other sectors of the economy the analysis focuses on the increase in GDP that is generated from a dollar increase in output in the ELC sector, which is called the GDP multiplier. The employment multiplier is also calculated, which is presented as the number of jobs created per million dollars of the initial increase in expenditure or output. The analysis uses historic economic data and input-output model estimates from Statistics Canada as well as the personal income tax schedules for Nova Scotia. The estimates illustrate the economic impact from an expansion of the existing ELC sector. This means that the workforce composition, wages and quality of ELC services are assumed to be the same as currently exists.

The combined direct and indirect GDP impact is estimated by Statistics Canada to be \$0.95 per dollar of additional ELC sector output. This multiplier is larger than that calculated for most other major industries in Nova Scotia. This means that for every dollar increase in spending in the ELC sector the province will experience a larger short-term gain in GDP than for most other industries via the direct and indirect effects alone.

In addition, the ELC sector provides a large boost to the provincial economy via the induced effect as those who are hired in the direct and indirect rounds spend their income. The ELC sector has a large induced GDP multiplier for two reasons. First, labour costs are a very large share of total costs in the sector. Over 80 cents of every dollar spent by the sector is devoted to labour costs, which directly contribute to the increase in the induced effect. Second, the existing ELC sector has low wages. This means the induced effect is quite large per dollar increase in labour income because the marginal tax rate and the marginal propensity to save are low for these workers. The induced effect on GDP is estimated to be \$1.27 per dollar of the initial increase in output.

This study did not examine the impact on the economic multipliers caused by higher wages for early childhood educators. Other research has examined the short-term economic effect on a provincial economy from an expansion of ELC output that pays much higher wages. This analysis



found that the ELC sector still had one of the highest GDP multipliers of all the sectors in that provincial economy. This type of analysis, however, was beyond the scope of the current study.

The combined direct, indirect and induced GDP multiplier is 2.23. This is larger than the multiplier for the other major sectors of the provincial economy. The implication is that an expansion of the ELC sector will provide much more short-term stimulus to the Nova Scotia economy than a similar expansion of any other major sector via the direct, indirect and induced effects. The short-term GDP multiplier for the ELC sector is also larger than that for many government programs and larger than the short-term impact on GDP from an increase in taxes

In addition to a large GDP multiplier an expansion of the ELC sector also creates a large number of jobs. The estimated direct and indirect effects add an estimated 31.6 jobs per million dollars. This multiplier is the largest of the major sectors in Nova Scotia. Furthermore, the induce effect is very large so more jobs are added in the provincial economy. It is estimated that the induced effect creates 15.1 jobs in Nova Scotia per million dollars and the combined direct, indirect and induced employment multiplier is 46.8 jobs in Nova Scotia per million dollars of ELC spending. The combination of large GDP and employment multipliers means that a dollar invested in the ELC sector has a larger effect on the provincial economy and jobs than a dollar used to support any of the other major sectors in the province.

An expansion in the number of jobs in the ELC sector also permits more mothers to go out and find work. It is estimated that an extra 31 early childhood educators in the ELC sector would support over 193 child care spaces. Using conservative assumptions that only half of these spaces are full-time spaces, and that only 22% of the full-time spaces are used by mothers to obtain employment, this number of spaces would permit 16.9 mothers to find full-time work. And this increase in employment would also have an induced economic effect. Combining all the potential channels together means that every additional early childhood educator supports 1.17 other jobs.

The increase in personal income and overall economic activity described above will generate government revenues in the short-run. The revenue that governments collectively gain from the increase in economic activity as a result of a million dollar increase in ELC spending is estimated to be \$860.7 thousand. Notably, this increase in government revenues is in excess of the \$806.1 thousand cost of hiring 31 ELC workers.¹ Government revenues are spread between the federal, provincial and Canada Pension Plan, however. The provincial government, which is responsible for ELC, receives less tax revenue than the federal government from an increase in ELC activity. So an expansion of the ELC sector via a provincial government program does not cover the cost of the program incurred by the provincial government.

¹ This estimate includes wages, salaries and supplementary labour income. Supplementary labour income is a term used to represent non-wage labour costs to employers, such as employers payments for Employment Insurance (EI), the Canada Pension Plan (CPP) and fringe benefits.



1. Introduction

This study examines the short-term economic effects caused by an increase in activity (called output in the economic literature) in the regulated early learning and care (ELC) sector in the province of Nova Scotia. There are several distinct components of the economic impact--direct, indirect, induced and mothers' labour supply effect. First an increase in ELC spending will directly boost GDP and employment in the ELC sector. This is the direct economic effect. Second, the expansion of output in the ELC sector will increase demand for the goods and services of supplying sectors, and their suppliers, etc. This is the indirect economic effect. Third, the increase in employment and income generated by the direct and indirect channels will boost the economy as the extra income is spent. This is the induced economic effect. For most sectors, the total short-term economic impact ends at this point, but the ELC sector has an additional short-term economic effect. The provision of these services allows parents to find work and earn income. The labour supply effect, therefore, has an additional impact on the economy.

To put this analysis into context the next section of the report provides a brief review of the literature that examines the benefits of quality ELC for children, their parents and society generally. The third section examines the method used to estimate short-term effects and describes the economic impact found by other studies for ELC. In the fourth section, the direct and indirect economic impacts from Statistics Canada's input-output simulation model for Nova Scotia are described. In the fifth section the induced economic impact is examined. The sixth section illustrates the combined direct, indirect and induced GDP effects and compares it with those for other industries in Nova Scotia. The seventh section examines the labour supply effect. The eighth section looks at the impact on governments' revenues.

2. Literature Review of ELC Benefits

There is a large body of research that examines ELC and its impact on children, their parents and society as a whole including government expenditures and revenues. In the academic literature it is generally found that quality ELC programs improve disadvantaged children's cognitive abilities, future economic well-being and social outcomes². The literature also mainly agrees that quality ELC programs improve cognitive abilities and future economic well-being of more advantaged children.³ The literature is more divided on the effect of ELC programs on children's socio-emotional development. The majority of articles argue that quality ELC programs either have a positive or no effect on children's socio-emotional development while a minority of studies using non-experimental approaches⁴ argue that children's socio-emotional development is negatively affected.⁵ And some research indicates that the quality of the child-mother interaction may be

² Karoly and Bigelow (2005); Borman and Hewes (2002); Jarousse *et al.* (1992).

³ Loeb *et al.* (2007); Goodman and Sianesi (2005); Gormley and Gayer (2005); Gormley *et al.* (2005); Magnuson *et al.* (2005); Leuven *et al.* (2004); NICHD (2003b); Barnett (2001); Campbell *et al.* (2001); Peisner-Feinberg (1999); Reynolds (1999); Currie and Duncan (1995); Andersson (1992); Andersson (1989); Belsky (1984); Clarke-Stewart and Fein (1983); McKay *et al.* (1978).

⁴ Barnett (2008).

⁵ Levin and Schwartz (2007); Loeb *et al.* (2007); Baker, Gruber and Milligan (2005); Goodman and Sianesi (2005); Magnuson *et al.* (2005); NICHD (2003a); Love *et al.* (2003); Sylva (2003); Barnett (2001); Peisner-Feinberg (1999); Reynolds (1999); Barnett *et al.* (1994); Seitz *et al.* (1994); Schweinhart *et al.* (1993); Andersson (1992); Johnson and Walker (1991); Andersson (1989); Lally *et al.* (1988); Belsky (1987); Belsky (1986); Gamble and Zigler (1986); Haskins (1985); Jester and Guinagh (1983); Clarke-Stewart and Fein (1983); Belsky *et al.* (1982); Andrews *et al.* (1982); Belsky and Steinberg (1978); McKay *et al.* (1978); Weikart *et al.* (1978);



jeopardised by low-quality care and extended periods of time spent in care.⁶ In contrast, high quality care is found to provide a multitude of positive outcomes.⁷

In order to reach a conclusion on the outcomes of ELC programs given sometimes conflicting evidence, it is therefore helpful to examine the research in greater detail. Barnett (2008) indicates that meta analysis shows that the developmental and socio-emotional effects are positive. He also finds that the studies that use the more persuasive randomized experimental design found more positive effects than what the meta analysis found in general. In contrast, the negative effects that were found by studies with non-experimental design⁸ may be influenced by unobserved differences between the children and the families who do and do not use child care. Therefore, one can conclude that on balance the research suggests that ELC provide significant developmental and socio-emotional benefits to children.

Most of the literature concerning the impact on mothers of children participating in ELC tries to estimate the effect of higher child care fees on mothers' labour supply. Mothers' labour supply effect will be explored in greater depth in section seven. The impact of accessibility is discussed in some research.⁹ German researchers Kreyenfeld and Hank (1999) and Italian researchers Del Boca and Vuri (2005) argue that availability is more important than affordability in Germany and Italy respectively. Furthermore, Joshi (1990) finds that women with young children who do not use ELC experience large wage losses, and these losses persist after they return to the labour market.

Economic benefits and costs of ELC programs can be examined in the long term or short term. The literature that estimates long-term benefits and costs of ELC programs consistently shows that benefits outweigh costs.¹⁰ The magnitude of the benefits and costs as well as the benefit-cost ratio depends on the characteristics of the children. Disadvantaged children benefit the most from quality ELC. For example, for the U.S., the Chicago Child-Parent Centers Program, and the Carolina Abecedarian and High Scope/Perry Programs show costs being repaid several times over, with the calculated benefit-cost ratios for these programs ranging between 3.8:1 and 7.2:1.¹¹ Notably, these benefits include a reduction in government expenditure as well as increased revenues.

Other types of ELC programs show positive—albeit smaller—net benefits to society per dollar spent. Kilburn and Karoly (2008) cite an average of 48 pre-school programs that have a benefit/cost ratio of 2.4. Karoly and Bigelow (2005) estimate that a universal ELC program in California would yield benefits of \$2-\$4 for every \$1 invested (depending on the assumptions). Belfield (2005) estimates that every \$1 invested provides future benefits worth \$2.3 for the Louisiana ELC system. Chevalier et al. (2006) estimate that a universal program in Ireland will yield an astonishing \$4.6-\$7.1 in benefits (depending on the assumptions) for each dollar of cost.

For Canada, Cleveland and Krashinsky (1998) estimate that a universal high-quality ELC program will return more than \$2 for every dollar invested. Fairholm (2009) found that the net present value of benefits exceed costs by a factor of 2.5:1. And Fairholm and Davis (2010) found that for Ontario the introduction of the proposals recommended by Dr. Pascal (2009) would provide a benefit-cost ratio of 2.0:1 for ongoing operations. Notably, these recommendations included a increase in labour income for qualified early childhood educators from roughly \$31,800 to \$58,300 per annum.

⁶ Baker, Gruber and Milligan (2005).

⁷ Andersson (2003).

⁸ Barnett (2008).

⁹ McCain *et al.* (2007); Del Boca and Vuri (2005); Connelly and Davis (2002); Kreyenfeld and Hank (1999).

¹⁰ Fairholm and Davis (2010); Fairholm (2009); Kilburn and Karoly (2008); Temple and Reynolds (2007); Chevalier et al. (2006); Belfield (2005); Karoly and Bigelow (2005); Cleveland and Krashinsky (1998).

¹¹ Barnett (1996) and Schweinhart et al. (1993) estimate a benefit-cost ratio of 7.2:1 for the Perry Preschool Program, Masse and Barnett (2002) estimate a benefit-cost ratio of 3.8:1 for the Abecedarian Program, and Reynolds et al. (2002) estimate a benefit-cost ratio of 7.1:1 for the Chicago Child-Parent Centers Program.



3. Economic Impact Estimates and Multipliers

This report examines the short-term economic impact caused by an increase in ELC activity in Nova Scotia. The basic method to assess the economic impact relies on estimates from Statistics Canada's Input-Output (IO) model. This is a common approach to illustrate the economic impact from an increase in spending or output in a given sector.

Statistics Canada's provincial input-output (IO) simulation model can estimate the short-term economic impact from changes in output or expenditure for any industry or product (goods or services). All products and services are categorized by Statistics Canada. In the IO model the relevant service representing ELC is "Child Care, Outside the Home". In the IO model all products and services are represented as being produced by a given industry or industries. The principal industry that "produces" ELC in the North American Industry Classification System (NAICS) is "Child day-care services" (NAICS 6244). This means that an analysis of the short-term economic effects of an investment in ELC can use information for the above service and/or industry.

When there is an increase in expenditure for a particular product or service there are several economic effects to consider. There is a direct effect on the industry that originally produces the good or service. This outcome can be thought to be the *direct effect* on the economy from an increase in expenditure. The economic effects, however, do not stop there.

When an industry increases production, they must increase their use of the goods and services that are used in their production processes. All of the original industry's suppliers will increase their sales and production because of the increase in demand. This in turn results in further production increases elsewhere in the economy. This effect cascades throughout the economy as the suppliers of the original suppliers increase their production, etcetera. The full effect of all these rounds of production increases can be thought to be the *indirect effect* on the economy from the original increase in expenditure or production. Generally, the higher the import content of products and services used, the lower the multiplier because the spending "leaks" out of the economy.

The direct and indirect increases in production will lead to a rise in employment and labour income. Part of the rise in income will "leak" out via taxes and savings. If households spend some of their increase in after-tax income, there will be an increase in demand for the products they purchase, which will lead to higher production or imports. These changes will also cause further economic effects similar to the cascading effect described above. The effect on the economy from higher employment and income is called the *induced effect*.

Typically multipliers are used to illustrate the magnitude of these economic effects. There are several types of multipliers. Type I multipliers combine the direct and indirect effects. Multipliers that combined direct, indirect and induced effects are called Type II multipliers.

Multipliers are also used to measure different aspects of the impact. There are gross output, GDP and employment multipliers. The gross output or revenue multiplier for an industry is "the total value of production in all sectors of the economy that is necessary in order to satisfy a dollar's worth of final demand" for that industry's output. Technically, the multiplier is the ratio of all these inputs relative to the initial rise of output in an industry.¹²

As Cross and Ghanem (2006) indicate, industries with more linkages to other sectors will have higher gross output multipliers. This does not mean that these industries are more important to economic growth. Gross output multipliers exaggerate the importance of industries with complex contractual and production relationships and do not net out intermediate purchases, so there can be double counting when using these multipliers to show the importance of an industry for overall economic activity or growth. Therefore, using a gross output multiplier as an indication of the economic benefits of an industry can be misleading.

¹² See Cross and Ghanem (2006) for a discussion of multipliers including limitations of IO multipliers.



GDP multipliers provide a more accurate picture of the economic impact from an increase in spending or production on overall economic growth. The results for these multipliers can be dramatically different than for gross output multipliers. The values for GDP multipliers are considerably smaller than revenue multipliers, because they net out intermediate inputs and capture production done in the firm. For example, manufacturing has one of the highest revenue multipliers (reflecting how it has outsourced production to other industries), but its multiplier for creating GDP in Canada ranks last among the major industry groups.¹³ The most relevant multipliers for the current study are the GDP and employment multipliers.

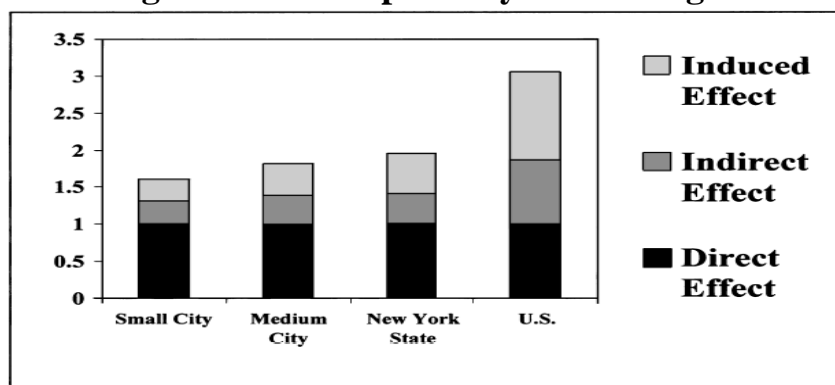
GDP multipliers can measure the increase in the economy caused by a dollar increase in output or expenditure for a specific industry, good/service, project or program. For example, a multiplier of two means that two dollars of GDP are generated per dollar of program costs. GDP multipliers for the ELC sector are generally estimated to be larger than those for other key sectors, many government programs and larger than the short-term impact from increased taxes. The short-term tax multiplier is less than one because some of the money from a tax cut, for example, is saved.

An employment multiplier shows the number of jobs created per million dollars of the initial expenditure. For example, a multiplier of 20 means 20 jobs were created per million dollars of program costs. As shown by Fairholm (2009), the employment multiplier for the ELC sector is one of the largest of all sectors in the Canadian economy.

There are a number of studies that examine the short-term economic effect of investing in ELC. GDP multipliers for the ELC sector range from slightly over 1½ dollars to several dollars (see Table 3.1). Generally GDP multipliers for smaller regions are lower than multipliers for larger regions because of higher import “leakages” (purchases made outside the local region) (see Figure 3.1).

Reference	Location	Multiplier
Bartik (2006a)	US	2.78 (state), 3.79 (national)
Pratt and Kay (2006)	New York State	1.78 (Type II)
Warner <i>et al.</i> (2003)	Tompkins County, NY	1.60 (Type II)
Warner <i>et al.</i> (2004)	New York City, NY	1.91
Warner and Liu (2004)	US	1.91 (Type II)
Prentice (2008)	Local Area in Manitoba	1.58 (Type II)
Fairholm (2009)	Canada	2.34 (Type II)
Fairholm (2010)	Ontario	2.27 (Type II)

Figure 3.1: Multipliers by Size of Region



Source: Warner *et al.*, (2003)

¹³ Cross and Ghanem (2006).



4. Direct and Indirect Economic Impact for ELC in Nova Scotia

A custom simulation was conducted using Statistics Canada's provincial IO simulation model. Since the industry "Child day-care services" (NAICS 6244) was not represented at the worksheet level, the simulation was done by increasing expenditure by million dollars for "Child care, outside the home".¹⁴ Summary information from the custom simulation is provided in Table 4.1. This custom simulation is helpful because it can be compared with the impacts on the economy from increasing output in other industries.

Statistics Canada's most recent provincial IO model reflects the structure of the Nova Scotia economy in 2006. Since the economy is constantly evolving, the IO model results were adjusted to be more representative of the effects that could be expected today. This was done by altering the direct employment effect to reflect the average weekly earnings of \$422.97 for the "Child Day-Care Services" (NAICS 6244) for 2009 from the Survey of Employment, Payrolls and Hours (SEPH). The weekly earnings, including overtime, were annualized to reflect 52 weeks a year, which means an annual wage of \$22,020.

Wages do not represent all labour income, since there is also other income, such as supplementary labour income (SLI). The IO simulation shows SLI being 18.1% of wages. Accordingly, wages were scaled up 18.1% to \$26,006 to reflect total labour income per worker. The total number of direct jobs created, were then calculated by dividing the total change in direct labour income from the IO simulation by the average labour income per worker. This means that the direct employment effect is 31.00 (\$806,035/\$26,006) jobs per million dollars. The indirect employment effect was calculated in a similar manner. First, the average weekly wage from the SEPH for the industrial aggregate for 2009 was annualized and then scaling up by 18.1% to get average labour costs of \$44,858 per worker. The estimated indirect increase in total labour income was divided by the average cost per worker to obtain 0.64 (\$28,533/\$44,858) jobs per million dollars.

Table 4.1: ELC Outside the Home - Ratios and Multipliers

GDP	
Direct GDP	0.905
Total GDP multiplier	0.952
Ratio of total-to-direct GDP	1.052
Labour income	
Direct labour income	0.806
Total labour income multiplier	0.835
Ratio of total-to-direct labour income	1.035
Employment	
Direct Employment multiplier (per million dollars)	31.00
Total Employment multiplier (per million dollars)	31.64
Ratio of total-to-direct employment	1.020
Gross output (thousands \$)	
Gross output multiplier	1.082
Ratio of total-to-direct gross output	1.082
Source: Statistics Canada Custom Simulation & calculations by author.	

¹⁴ Statistics Canada's "Survey of Household Spending" collects data on expenditures for child care inside and outside the home. Annual spending on "day care centres" and "other child care outside the home" are explicitly requested. These expenditures exclude children's camps, such as summer camps and day camps.



The above GDP multiplier results from the input-output simulation for the ELC sector are compared with GDP multipliers for the major industry groups for Nova Scotia for 2006 in Table 4.2. Statistics Canada's estimates show that the total direct and indirect impact on Nova Scotia's GDP is \$0.95 per dollar increase in ELC spending, which is the highest of all the major industries. This means that a dollar invested in the ELC sector has a larger direct and indirect impact on the economy than a dollar used to support any of these other major sectors. For example, a dollar invested in ELC will boost Nova Scotia's GDP via the direct and indirect effects by 6% more than the next closest major sector—finance (0.952/0.898). The difference in the impact on provincial GDP is even larger compared with other sectors, such as construction and manufacturing. The impact of the ELC sector on Nova Scotia's GDP is 67% larger than that provided by the construction sector and 112% larger than the boost via the manufacturing sector.

Not only is the GDP multiplier for the ELC sector the largest of all major industry sectors, but the total employment multiplier from Table 4.1 compared with employment multipliers for other major industries illustrates that per dollar, the ELC sector creates more jobs than any of these industries (see Table 4.2). The employment multiplier for the ELC sector is an estimated 31.6 jobs within Nova Scotia per million dollars compared to 29.0 jobs in Nova Scotia for the next closest industry, education, which is a difference of 9% (31.6/29.0). Notably, the gap is much larger compared with many other industries. For example, construction creates 9.9 jobs per million dollars and manufacturing creates 7.7 jobs per million dollars. This means that provincial job creation is respectively 220% and 330% higher in the ELC sector than for these other sectors.

Not all of the jobs that are created are full-time jobs. Using Statistics Canada's estimates, it can be calculated that 25.5 full-time equivalent (FTE) jobs are created per million dollars of expenditure via the direct (24.5 FTE) and indirect (1.0 FTE) effects. This compares with 23.7 FTE jobs created in education, a 23.1 FTE jobs in other services and 9.7 FTE jobs in construction.

Table 4.2: Combined Direct and Indirect Industry Multipliers		
	GDP (per \$)	Employment (per million dollars)
Child care outside the home	0.952	31.6
Finance, insurance & real estate	0.898	4.2
Mining, Oil & Gas Extraction	0.880	2.4
Education	0.865	28.7
Admin, & Support, Waste Management, etc.	0.848	19.8
Health & Social Assistance	0.833	17.2
Other Services	0.833	29.0
Non-Profit Institutions	0.830	25.0
Retail Trade	0.829	23.2
Wholesale Trade	0.782	11.9
Government Sector	0.768	12.2
Prof., Sci. & Tech Serv	0.751	16.7
Arts, Ent. and Rec.	0.738	26.6
Info. & Cultural	0.736	7.0
Forestry & Logging	0.688	11.7
Accom. & Food Serv.	0.673	24.0
Fishing, Hunting & Trapping	0.662	10.0
Transport. & Warehousing	0.654	12.5
Utilities	0.643	2.9
Agriculture	0.637	15.5
Construction	0.571	9.9
Support for Agri. & forestry	0.552	9.8
Manufacturing	0.449	7.3

Source: Statistics Canada Input-Output multipliers, custom simulation and calculations by author.



5. Induced Impact Assessment of ELC in Nova Scotia

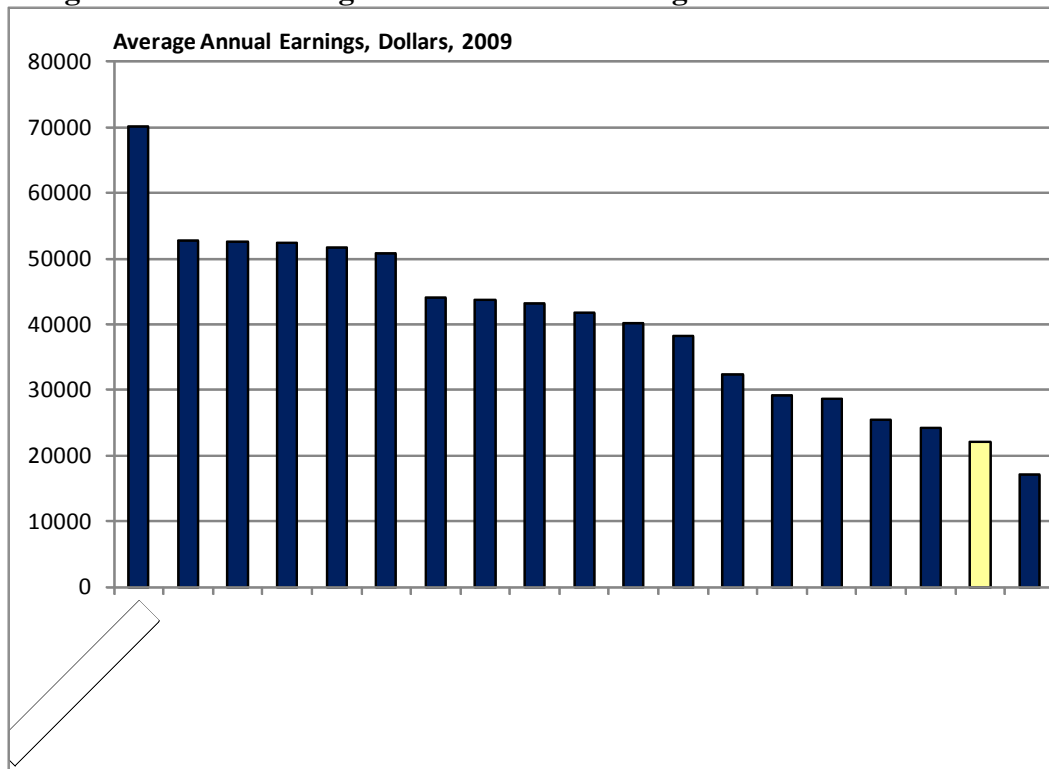
The above discussion focused on the direct and indirect economic impacts (Type I multiplier) from an increase in expenditures for the ELC sector compared with various other sectors. These effects, however, are only part of the total economic impact of changes in expenditures or output. As expressed above there is also the induced effect caused by changes in income. While Statistics Canada provides estimates of direct and indirect economic effects from changes in outputs or expenditures, it does not provide estimates of the induced effect for provincial economies.

The induced effect is more complicated to estimate than the direct and indirect effects because it varies depending on labour's share of costs and who receives the extra income. Clearly, if more of the costs of a sector are labour costs the induced effect will be larger. The ELC sector has one of the highest labour shares of total costs of all the sectors. This will directly increase the induced effect of the ELC sector compared to other sectors. The induced effect for the existing ELC sector will also be increased because of the financial profile of the workers due to their low wages.

Generally speaking, lower income households spend more out of an extra dollar of income than high income households.¹⁵ If more of the increase in income is injected back into the economy via spending, the additional round of production will be larger, which affects the size of the induced multiplier. The induced multiplier will be higher when lower income workers are hired or their pay increased compared with high income workers.

One way to gauge the relative induced multipliers from changes in employment and wages is to compare the average incomes of workers. Figure 5.1 shows the annualized average weekly earnings for 2009 from the Survey of Employment Payrolls and Hours (SEPH) for industries in Nova Scotia. With the exception of the accommodation and food service industry, the ELC sector workers receive the lowest wages. And the ELC sector has lower wages than the other major sectors that

Figure 5.1: Lower Wage Industries Provide Higher Short-Term Stimulus



¹⁵ Dynan et al. (2004) show that the marginal propensity to consume is higher for low income households.



have a high type I multiplier. Given the inverse relationship between wages and the marginal propensity to consume, one can conclude that stimulus to the ELC sector would provide more induced stimulus to the economy per dollar of employment income than all but the accommodation and food service industry and that the ELC sector would have a higher induced multiplier than the other industries that have a high type I multiplier.

Dynan et al. (2004) found for the U.S. that the marginal propensity to save (MPS) was less than three cents per dollar for low-income households and 43 cents per dollar for high-income households. A basic multiplier that does not include taxes, is $\alpha=1/(1-\text{marginal propensity to consume})$ or $\alpha=1/\text{marginal propensity to save}$. The difference between a simple multiplier using a marginal propensity to save of three cents versus 43 cents per dollar is 33.3 for low-income households compared with 2.3 for high-income households. Since there are other leakages besides savings, such as imports and taxes, the actual induced multiplier will be less.

Tax leakages rise with income in Nova Scotia because of the progressive personal income tax system.¹⁶ Using tax rates for 2009, a dollar increase in gross wage income at an annual salary of \$22,020 (the annualized weekly earnings of the NAICS 6244 “Child day-care services” industry) would boost personal income taxes payable by 23.8 cents.¹⁷ For workers who earn an income equal to the average industrial wage of \$37,983 the tax bite was 28.8 cents on an extra dollar in 2009.

In addition, a portion of each dollar of earned income will be siphoned into government coffers via payroll taxes for employment insurance (EI) and the Canada Pension Plan (CPP). Notably, these payroll taxes are regressive insofar as they have pensionable and insurable maximums above which additional amounts are not collected. For 2009, the marginal tax rates for EI and CPP were 1.73% and 4.95% and became zero at the maximum earnings of \$42,300 and \$46,300 respectively.

As well, a portion of each dollar spent will go towards sales taxes. In Nova Scotia the Harmonized Sales Tax (HST) was 13% in 2009, with the federal and provincial governments receiving 5% and 8% respectively. The HST is not applied to all consumer items, so the effective rate for an extra dollar of spending is less than these rates. Lower income households have a lower effective indirect tax rate on spending than high income households because they spend relatively more money on shelter and food, which have a lower incidence of indirect taxation. Using the information from the Canadian household spending survey for the lowest quintile shows an average incidence of 8.3% versus 10.9% for the highest quintile and 9.4% for a mid-level earner. These estimates were used to represent the differences in spending and tax leakages for the different income groups.

There are also import leakages that reduce the size of the multiplier. From 2006 to 2008 imports into Nova Scotia represented 53-54% of final domestic demand and averaged 53.6%. This rate of import penetration, however, overstates the actual import leakage from extra personal income and spending for two reasons. First, the provincial accounts treat all imports as final demand, which overstates the incidence of imports in final domestic demand. This because a large share of the goods imported into the economy are intermediate goods. As discussed by Cross and Ghanem (2003), many imports are used in the production of provincial exports. To more accurately illustrate the increase in imports because of a rise in domestic demand, these exports should be removed. This is

¹⁶ **Federal Tax Rates for 2009:** 15% on the first \$40,726 of taxable income, + 22% on the next \$40,726 of taxable income (taxable income between \$40,726 and \$81,452), + 26% on the next \$44,812 of taxable income (taxable income between \$81,452 and \$126,264), + 29% of taxable income over \$126,264. At \$32,506 to \$40,126 of net income single individuals would also experience a 5% clawback of the GST tax credit.

Nova Scotia Tax Rates for 2009: 8.79% on the first \$29,590 of taxable income, + 14.95% on the next \$29,590 (taxable income between \$29,590 and \$59,180) + 16.67% on the next \$33,820 (taxable income between \$59,180 and \$93,000) + 17.5% on the amount over \$93,000. Surtax of 10% for tax owing >\$10,000.

¹⁷ Taxable income is less than employment income because of the basic personal exemption of \$10,320 and the employment deduction of \$1,044 for 2009.



done in the current exercise by using the estimate from Cross and Ghanem that 26% of the value of exports are imported products. Once these imports are removed, the share of imports to final domestic demand is 43.9%.

Second, consumer spending has a lower incidence of imports than the economy as a whole because services are a large portion of consumer spending. And services have a lower share of imports per dollar spent than goods. For example, rent is the largest consumer category, worth over \$3.3 billion in 2006, none of which is imported. In order to take this phenomenon into account, the consumer spending illustrated in the Input-Output tables at the “S” level were compared with the import share of available products (domestic output plus imports) on a commodity by commodity basis. Once the import share is applied to each consumption item and these are totalled, the import share of total consumer spending is estimated to be 38.7%.

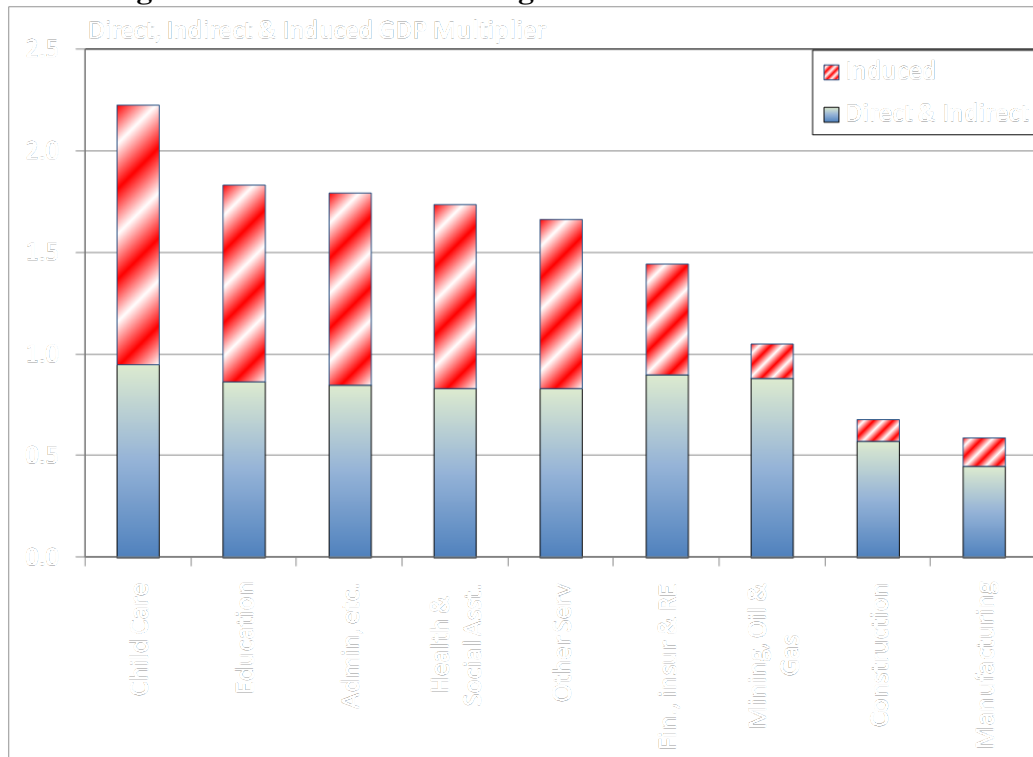
In order to determine the induced effect caused by an increase in employment income by ELC workers detailed calculations are made using the above leakage estimates in order to calculate the full multiplier effect. For these calculations, many rounds of spending and production are calculated that are analogous to the direct and indirect effects discussed above. The first round effect represents the direct increase in consumer spending and domestic production that occur following an increase in employment income after taking into account the tax, savings and import leakages. In these first round calculations, it is assumed that ELC workers earn \$22,020 per annum. At this income level, the 2009 personal tax rates for EI and CPP of 1.73% and 4.95% and the personal income tax rates of 15% for the federal government and 8.79% for Nova Scotia are used. It is also assumed that the marginal propensity to consume (MPC) is 97 cents on the dollar, the effective sales tax rate is 8.3 cents per dollar of consumer spending and imports represent 38.7% of each extra dollar of consumer spending. Notably, the use of 38.7% for the import leakage likely overstates the leakage because lower income households tend to spend more of their money on locally produced consumer items like rent, and less on imported luxury goods. This means the multiplier estimate for the ELC sector is likely conservative.

In subsequent consumption and production rounds, it is assumed that the economic effects are spread throughout the economy. These rounds use assumptions representing an average worker with earned income of \$37,983, a MPC of 84.2 cents per dollar, GST tax credit clawback of 5%, an EI rate of 1.73%, a CPP rate of 4.95%, a federal personal income tax rate of rate of 15%, a provincial personal income tax rate of 8.79%, an import leakage of 43.9% per extra dollar of final domestic demand and an effective sales tax rate of 9.2%. Calculations for subsequent consumption and production rounds continue until the difference between rounds is less than 0.01%.

Using the above assumptions, the induced multiplier for an increase in “Child day-care services” employment and wages would be 1.53 per dollar increase in employment income. This compares with a multiplier of 1.23 for the top tax bracket and a multiplier of 1.42 for average earners. Since, the induce effect only operates on labour income, the GDP multiplier is less than the above estimates. For the ELC sector, labour income represents 80.6% of direct costs, so the impact of the induced effect on GDP is 1.23 (0.806×1.53). In addition, the rise in labour income via the indirect effect adds an additional 0.04 ($1.42 \times 28,537 / 1,000,000$) for a total induced GDP multiplier of 1.27.

The number of jobs created by the induced effect is estimated by scaling up the labour income effects from the direct and indirect rounds by using the multipliers estimated above for the low-wage and average-wage groups respectively. Further, it was assumed that 53.3% of increase in GDP was comprised of wages, salaries and supplementary labour income (WSSL), which represents the average share in Nova Scotia from 2006-2008. To estimate the number of jobs that this increase in WSSL represents, the estimate was divided by the average wage per job of \$37,983 plus the average SLI rate of 18.1% or \$44,858. These calculations produce an estimate that 15.1 jobs are created in Nova Scotia as a result of the induced effects.



Figure 6.1: ELC Provides Largest Short-Term GDP Stimulus

6. Comparison of Combined Direct, Indirect and Induced Effects

To calculate the total potential impact on GDP from an increase in expenditure in the ELC sector, the various effects must be combined. As is discussed in Section 4, the direct and indirect effect per million dollars of increased expenditure in ELC causes GDP to increase by \$952 thousand. The induced effect provides an additional increase in GDP of \$1,274 thousand. This means the combined direct, indirect and induced GDP multiplier is 2.23. To put this result into context, the GDP multiplier for the ELC sector is compared with the GDP multipliers for other sectors that have high type I multipliers in Nova Scotia, plus construction and manufacturing.

In order to quantify what the total direct, indirect and induced effects would be for other industries in Nova Scotia, an additional set of calculations were performed to estimate the induced effect. For each industry, the labour income effects were calculated from Statistics Canada IO multiplier estimates for the direct and indirect effects. Since there are different leakage rates at different levels of income, the wage levels for each industry from the SEPH for 2009 were used to determine the MPS and tax leakages. For each industry, the personal income tax leakage was estimated based on an extra dollar of income at the average wage for that industry and the resulting increase in personal income tax.¹⁸ The average import leakage was used to estimate these multipliers. Since lower-income workers consume proportionately fewer imported goods per dollar spent than high-income workers, this assumption has the effect of understating the calculated multiplier for low-wage industries like ELC and overstating the calculated multiplier for high-wage industries. This means the multiplier estimates are more conservative for low-wage compared to high wage industries.

Figure 6.1 shows that the total GDP multiplier for the ELC sector is much higher than for the other major sectors listed. The reason for the high multiplier is two-fold. First, labour costs are a very

¹⁸ This assumption means there is an increase in average hours worked as opposed to an increase in the number of people employed. A rise in the number of people employed would have a lower average tax leakage per dollar increase in output and a higher multiplier, particularly if some of the jobs are part time.



large share of total costs in the sector so for every dollar increase in output, labour costs rise by over 80 cents. Second, the existing ELC sector has low wages. This means the induced effect is quite large per dollar increase in wages because the marginal tax rate and the marginal propensity to save are low. The implication of this analysis is that an expansion of ELC output provides considerable short-term stimulus to the economy that exceeds that for other major sectors of the economy.¹⁹

Table 7.1: Effects of ELC on Mothers' Labour Supply

Reference	Country	Population Examined (Age of Youngest Child)	Impact of 1% Increase in Child Care Fees	
			Labour Force Participation	Average Hours Worked
Anderson & Levine (1999)	U.S.	Married women Single women	-0.92 to 0.00 -0.50 to 0.00	
Blau & Hagy (1998)	U.S.	Married & single mothers (<7)		-0.20
Blau & Robins (1988)	U.S.	Married women (<14)	-0.38	
Connelly (1992)	U.S.	Married women (<13)	-0.20	
Ribar (1992)	U.S.	Married women (<15)		-0.74 to -0.64
Ribar (1995)	U.S.	Married women (<15)		-0.024 to -0.088
Powell (1997)	Canada	Married women (<6)	-0.38	-0.32
Powell (2002)	Canada	Married women (<7)	-0.16	
Michalopoulos & Robins (2000)	Canada & U.S.	Married mothers (<5)	-0.156	
Michalopoulos & Robins (2002)	Canada & U.S.	Single parents (<5)	-0.26	
Kornstad & Thoresen (2002)	Norway	Married women (1-2)	-0.12	-0.14
Choné <i>et al.</i> (2003)	France	Married women (<3) Married women (<7)	-0.01 -0.01	-0.02 -0.01
Oishi (2002)	Japan	Married women (<7)	-0.60	
Wrohlich (2004)	Germany	Married women (<6)	-0.03 (east) -0.07 (west)	-0.04 (east) -0.09 (west)
Averett <i>et al.</i> (1997)	U.S.	Married women (<6)		-0.78
Graafland (2000)	Netherlands	Married women	-0.15	

Sources: Doiron and Kalb (2005); Kalb (2007).

7. Mothers' Labour Supply and Total Employment Effects

A number of researchers have examined the impact of the price and availability of ELC on mothers' supply of labour. This literature agrees that a higher fee for child care lowers a mother's tendency to use child care and supply labour. The estimated response of mothers' labour supply to a 1% increase in program fees ranges widely, from 0.0% to -0.92% (see Table 7.1). This means that a 1% increase in fees could decrease the mother's labour supply by as much as 0.92%. Labour supply is comprised of two components: participation rates and average hours worked. Generally it is found that average hours worked responds more than participation rates to changes in child care fees.

¹⁹ Higher ELC wages would impact the multipliers. Clearly, the job multiplier would be lower. The induced effect would be also lower because the MPS and tax rate are higher at higher income levels. There could also be an impact on parents depending on how higher wages are funded. If wages are funded by a fee increase there would be a reduction in the demand for child care services and therefore on mothers' labour supply.



There is a tendency for labour supply responses to be larger in non-European countries (Canada, the U.S. and Japan) than in European countries, particularly in some continental European countries. This may be due to the availability of ELC. For example, German researchers Kreyenfeld and Hank (1999) and Italian researchers Del Boca and Vuri (2005) argue that availability is more important than affordability in Germany and Italy.²⁰ Canada is not immune from this dynamic. The OECD (2004), for example, indicates that Canada is affected by a lack of availability of child care spaces.

To estimate the impact of increased availability of child care spaces on mothers' labour supply, a number of assumptions are needed. The calculations are made consistent with the effects described in the fourth section, by using the estimated direct employment effect. This means there are 31 jobs or 24.5 FTE per million dollars invested in ELC. It is assumed that these jobs are for early childhood educators (ECEs). One ECE provides services to several children. The number of children per staff and group size are regulated by the provincial government. See Table 7.2 for the staff:child ratios for child care centres in the province by age of the children. It is assumed that these ratios remain in force. Also it is assumed that the increase in staff is proportionate to the number of child care spaces and the staff:child ratios for these age groups. This means the distribution of child care spaces by age remains the same and that the implied aggregate child:staff ratio remains at 7.9 children per ECE.

Using the age distribution of child care spaces and Nova Scotia's child/staff ratios, one can calculate that an extra 24.5 FTE ECEs would support over 193 child care spaces (see Table 7.2). Of these spaces, 139 are full-time spaces for children 0-5 years, 39.5 are part-time spaces for children 3 to 5 years, and 14.8 are part-time spaces for children 6-12 years. If half of the children put into full-time spaces are in full-time care, then there would be 69.5 children aged 0-5 in full-time care. For older children, the time they spend in elementary school must be taken into account. If half of the children aged 6-12 in part-time child care are in school and child care full time (school plus child care hours), then there would be 7.4 children in full-time care. It is assumed that none of the children 0-5 who are in part-time child care are in school and child care full-time.

It is assumed that for every extra child in full-time care 0.22 mothers work full-time—a number extrapolated from Cleveland and Krashinsky's (1998) analysis. The result of these calculations is that there would be 16.9 mothers who would work full-time $((139+14.8)*0.5*0.22)$ per million dollars invested in child care.

The implication of this analysis is that an increase in expenditure in the ELC sector would increase the number of ECEs working, which would boost the number of child care spaces available. The

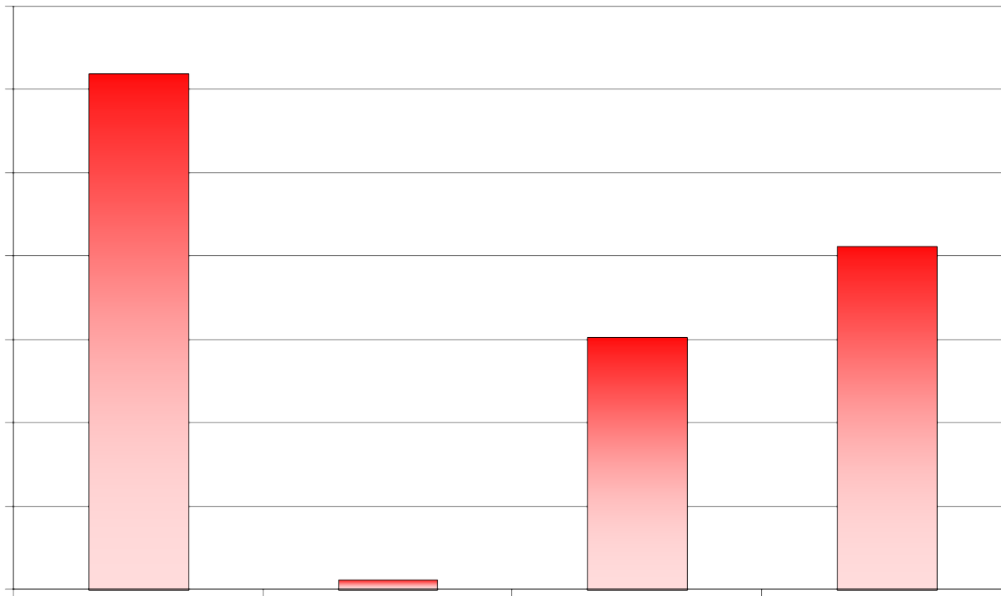
Table 7.2 Mothers' Labour Supply Effects					
Age of Children	Staff:Child Ratio	Child Care Spaces	Increase In Staff	New Spaces	ΔMothers' Full-time Work
0-17 mths	1:4	501	2.0	8.2	0.9
18-35 mths	1:6	2675	7.3	43.7	4.8
36-60 mths	1:8	5323	10.9	87.1	9.6
36-60 mths (part day)	1:12	2414	3.3	39.5	0.0
6-12 yrs	1:15	907	1.0	14.8	1.6
Total	1:7.9	11820	24.5	193.3	16.9
Sources: Childcare Resource and Research Unit (2009)—Staff:Child Ratios and Child Care Spaces, Calculations by author—Increase in Staff, New Spaces and Change in Mothers' Full-time Work					

²⁰ The lower labour supply response in European countries could be related to other labour market factors.



more child care spaces available, the more mothers would be able to go out and work, which would have a significant impact on the total number of jobs and therefore economic activity that would be supported by the initial increase in spending in the ELC sector. This means that 31 jobs in the ELC sector are supporting 36.4 other jobs or that each ECE supports 1.17 other jobs (see Figure 7.1).

Figure 7.1: ELC Supports a Large Number of Jobs



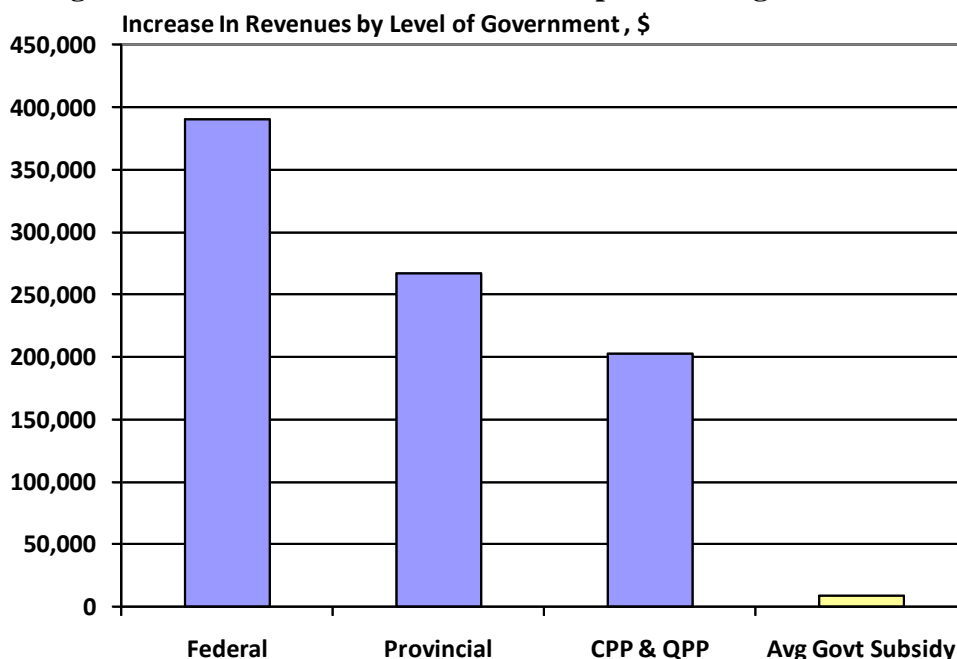
8. Impact on Government Revenue

The increase in personal income, consumption and overall economic activity described above will generate government revenues. By assuming that all ELC workers earn the average wage of \$22,020 for 2009, the 2009 tax schedules for Nova Scotia can be used to estimate federal and provincial personal income taxes for each worker. Furthermore, the EI and CPP payroll tax rates are known, so these revenues can also be estimated per employee. These per employee estimates were then scaled up to represent 31 additional ELC workers.

Similarly, the average industrial wage for 2009 of \$37,983 was used to represent other jobs created via the indirect and induced effects. The estimated increase in direct tax revenues per job was scaled up to reflect the increase in jobs from these rounds. For mothers' full-time work, the average full-time, full-year wage for females from the 2006 census was used and adjusted to reflect the increase in female wages from the census reference year to 2009. This estimate of \$36,861 was used with the tax schedules to determine the direct tax revenue per employee and then multiplied by the estimated number of women who would work full-time.

In addition to the increase in direct taxes, there will also be an increase in indirect taxes mostly because of the sales tax revenues generated by increased consumer spending. To estimate indirect tax revenues the various links in the multiplier chain were decomposed so that the sales tax leakages based on the MPC and the estimated effective sales tax rates for people with different levels of income as discussed above were calculated. Since it was assumed that only the jobs created by the direct effect would have a low-level wage (and therefore a higher MPC and lower effective sales tax rate), only the initial round of the multiplier chain used the low wage assumptions. All other rounds assumed that workers had an average wage, an average MPC and an average effective sales tax rate. The local government effects were very small in the direct and indirect impact estimates and were therefore not included in the following discussion.



Figure 8.1: All Levels of Government Experience Higher Revenues

Once the above calculations are done, it can be shown that both the federal and provincial governments benefit from the increase in economic activity (Figure 8.1). The federal government gains the largest increase in revenues (including EI), followed by the provincial government and the CPP. Since the input-output simulation estimates do not break out all indirect taxes between levels of government for both shocks, it was assumed that the federal/provincial split of indirect tax revenues followed the same split as the effective Federal/Provincial portions of the HST rate.

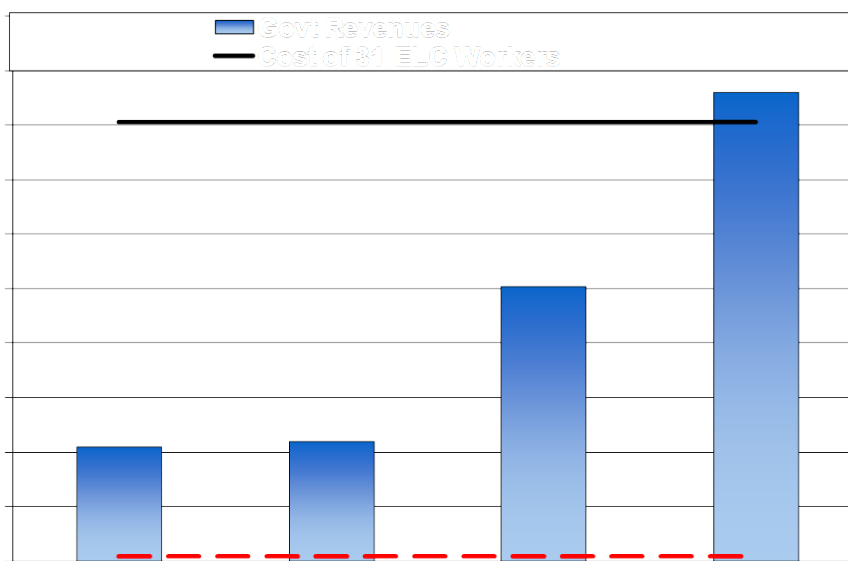
Notably, the cost of hiring 31 ELC workers—total wages, salaries and supplementary labour income—is slightly less than the revenues that governments collectively gain from the increase in economic activity caused by the direct, indirect, induced effects, and from more mothers participating in the labour market (Figure 8.2). It should also be noted that the increase in governments' revenue is more than the increase in the average subsidy as identified by the input-output simulation. But the total gain in government revenues is less than the original one million dollar increase in expenditures for child care. And since some of the additional revenues that governments' receive accrue to the CPP the difference between the increase in spending and general tax revenue is even greater.

Also, it is useful to note that the provincial government is responsible for ELC, and this level of government gains less revenue than the total cost of more ELC workers. It is also important to keep in mind that these wage costs do not include other costs of an expansion of the ELC sector, such as building costs or training costs. Furthermore, the input-output simulation model and multiplier estimates assume that all employees can be obtained for the average wage in the sector, and that there are no capacity constraints that would boost wages, inflation and cause other crowding out. These assumptions may be appropriate during a period of economic slack, but costs could escalate during a period of workforce shortages.²¹

²¹ The impact of the expansion of ELC services depends on if there is pent-up demand for ELC services, and if mothers can find a job. During periods of economic slack when the multiplier effect is at its maximum it is possible that not all of the parents who are assumed to find work as a result of the increased availability of ELC will find employment. Notably, the assumption of 0.22 mothers finding a job per new full-time child care space implies that the job finding rate is at least 22% and as much as 29.5% if the same percentage of mothers look for work as their participation rate of 74.6% in the 2006 census. Given that using Shimer's



Figure 8.2: Total Additional Government Revenues Exceed Wage Costs



9. Conclusion

Increased investment in regulated early learning and care (ELC) in the province of Nova Scotia will provide many short-term economic benefits. The economic benefits to Nova Scotia can be decomposed into several channels including the direct, indirect and induced effects. For most of these channels, the ELC sector provides more benefits than other major sectors.

Statistics Canada estimates that the combined direct and indirect GDP multiplier is 0.95 per dollar of spending on ELC. And one million dollars of investment in the sector will add 31.6 jobs via the direct and indirect channels. Both of these multipliers are larger than those for other major industries in Nova Scotia.

The ELC sector also provides a large boost to the economy via the induced effect as those who are hired spend their income. It is found that per dollar increase in ELC spending the induced effect provides an additional boost to GDP of \$1.27 and 15.1 jobs are created in Nova Scotia per million dollars. The ELC sector has the largest induced GDP multiplier effect of all the major sectors.

Combining the direct, indirect and induced multipliers shows that one dollar of investment in ELC increases GDP by \$2.23 and the combined employment multiplier is 46.8 jobs in Nova Scotia per million dollars of ELC spending. These gains are larger for ELC related spending than for other major sectors of the Nova Scotia economy. The combination of large GDP and employment multipliers means that a dollar invested in the ELC sector has a larger effect on the economy and jobs than a dollar used to support any of the other of the major sectors in the province, many government programs and larger than the short-term impact from increased taxes.

An expansion in the number of jobs in the ELC sector also permits more mothers to go out and find work. It is estimated that an extra 31 early childhood educators in the ELC sector would support over 193 child care spaces and permit an additional 16.9 mothers to find full-time work. And this

(2005) approach the overall job finding rate might fall to around 40% during a recession, the assumption that 22 mothers out of one hundred find work seems reasonable if not conservative.



increase in employment would also have an induced economic effect. Combining all the potential channels together means that one early childhood educator supports 1.17 other jobs.

The increase in personal income and overall economic activity will generate government revenues. It is estimated that governments collectively gain \$860.7 thousand from a one million increase in spending in the ELC sector. Notably, this increase in government revenues is in excess of the \$806.1 thousand cost of hiring 31 extra ELC workers. But government revenues are spread between the federal, provincial and Canada pension plan, so no one level of government receives sufficient revenue to fund the increase in wage costs let alone the one million dollar rise in ELC spending. And the provincial government, which is responsible for ELC, receives less tax revenue than the federal government from an increase in ELC spending.



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11. Glossary of Terms

Assumptions - Judgements concerning unknown factors and the future which are made in analyzing alternative courses of action. Assumptions are made to support and reasonably limit the scope of the analysis.

Direct Effects - Typically measured in dollars of output or number of employees stimulated by the initial demand for a sector's services.

Economy - The realised system of human activities related to the production, distribution, exchange, and consumption of goods and services of a country or other area.

Estimation - A method of quantifying costs or benefits, in which each organisation involved in system development, operation, and use estimates, averages, and projects its costs. Sometimes referred to as the bottom-up method.

GDP – Gross Domestic Product.

Indirect Effects - Counts the multiple rounds of inter-industry purchases spurred by child care industry spending. Child care businesses purchase food and supplies from other industries, in turn stimulating output in those industries.

Induced Effects - Captures the impact of household spending. Employees spend their wages in the larger economy and these expenditures generate demand in other industry sectors (housing, groceries, etc.).

Investment - An expenditure of funds to acquire a new capability or capacity.

Participation Rate - Refers to the percentage of working-age individuals (the 16-65s) who are either working or consider themselves to be available for paid work

Simulation - A method of quantifying costs or benefits in which the process is analyzed and simulated to obtain costs.

Supplementary Labour Income - A term used to represent non-wage labour costs to employers, such as employers payments for Employment Insurance, the Canada Pension Plan and fringe benefits

Type I multiplier - Includes the direct effects of the child care sector and the indirect effects of inter-industry purchases.

Type II multiplier - Includes direct effects of the child care sector, indirect effects of inter-industry purchases, and induced effects generated by household and worker expenditures.

