Literature Review of Socioeconomic Effects and Net Benefits

Understanding and Addressing Workforce Shortages in Early Childhood Education and Care (ECEC) Project

Child Care
Human Resources
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INTRODUCTION

About the Project

Recruitment and retention are long-standing and well-documented challenges facing the early childhood education and care (ECEC) sector. An accurate understanding of workforce shortages—the number of ECEC workers needed across Canada—and the implications of these shortages is critical in order to address these challenge. To achieve this, the Child Care Human Resources Sector Council (CCHRSC) developed the *Understanding and Addressing Workforce Shortages in ECEC Project.* Funded by Human Resources and Skills Development Canada, the project focused on:

- Defining current workforce shortages by exploring the factors that influence supply and demand of ECEC workers;
- Reporting on available data and data deficiencies;
- Documenting the impact of current shortages on the sector, labour market engagement, and on the economy;
- Identifying current strategies and other options for addressing ECEC worker shortages; and
- Exploring the feasibility of developing a forecasting model to predict future shortages.

The CCHRSC engaged the Centre for Spatial Economics (C_4SE), a consulting organization created to improve the quality of spatial economic and demographic research in Canada, to conduct the project research and create reports designed to meet the project objectives.

Research Approach

Between 2008 and 2009, the C_4SE worked to define current shortages of ECEC workers, assess their impact, and explore the feasibility of predicting future shortages. Most specifically, C_4SE:

- Conducted 18 key informant interviews with provincial/territorial/municipal government officials in the ministries responsible for child care or their representatives, along with other key stakeholders and analysts of the ECEC sector;
- Conducted a review of literature of factors that influence the demand for and supply of the early childhood education and care workforce; and
- Analyzed a variety of data provided by municipal, provincial, and territorial governments in addition to publicly available data from Statistics Canada, on topics including: employment, labour force, unemployment rate, wages, and education.

By considering factors such as the available workforce, creation of new child care spaces, projected birth rates, and parental employment patterns, this project will determine the current shortages facing the sector.

Project Reports

The information gathered for the *Addressing Workforce Shortages in ECEC Project* has been used to create a variety of reports that help define key findings. The **Literature Review of Socioeconomic Effects and Net Benefits** examines the literature on ECEC and its' impact on children, their parents and society in order to determine the socioeconomic implications of workforce shortages in ECEC. The implications of workforce shortages are inferred from the available literature, as the academic literature available does not directly address this issue. The report is the first in a series of reports produced, including:

- **Literature Review of the ECEC Labour Market:** This report summarizes available evidence regarding the factors that influence the demand and supply for ECEC workers and examines some conundrums in the ECEC labour market;

- **Estimates of Workforce Shortages:** This report examines the literature on ECEC workforce shortages, describes the technique that is used to estimate workforce shortages in the ECEC sector and estimates the economic costs of current workforce shortages;
- **Recruitment and Retention Challenges and Strategies:** This report examines recruitment and retention challenges in the ECEC sector from an economic and human resource management perspective. Research into these challenges is examined and ways to reduce the recruitment and retention problem are proposed;
- **Data and Model Feasibility:** This report examines existing data sources and provides an assessment of the data gaps and limitations of available data. The feasibility of developing occupational demand and supply models for the provinces and territories is also explored; and
- **Executive Summary : Understanding and Addressing Workforce Shortages Project:** This report contains background information on the *Addressing Workforce Shortages in ECEC Project* and a brief, plain language executive summary of each of the reports produced.

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Document Overview

The available academic literature does not directly examine the socioeconomic implications of workforce shortages in the early childhood education and care (ECEC) sector. Instead, the socioeconomic effects of workforce shortages can be imputed by examining the lost benefits and costs to society from having fewer high-quality child care spaces.[1] There is a large body of research that examines the impact of ECEC of varying degrees of quality on children, their parents and society.

This literature can be roughly divided into four sections:

1. The socioeconomic effects of ECEC on participating children,
2. The socioeconomic effects on mothers of participating children,
3. The economic benefits and costs of selected programs, and
4. The economic benefits and costs of ECEC to an economy (be it local or national).

Each of these areas of international research will be reviewed in turn. It is useful to compare the experiences of various countries, but this examination does raise the issue of comparability.

[1] For a recent review of the research on early childhood education and care see Barnett (2008).

Sometimes there are large contextual differences between countries. For example, the ECEC programs in Sweden and Canada are quite different and are as dissimilar as the Canadian and U.S. health care systems. And the U.S. child care system is quite different from Canada's in several respects, such as training levels of staff and program entry ages of children. These differences are worth keeping in mind when reading this review.

Within Canada, Québec has developed a distinctly different system that provides reduced-contribution ECEC to a large number of children. The Québec system has garnered special academic interest in understanding the ramifications of adopting such a system. The academic research on this system will be highlighted in a separate chapter.

SECTION 1 : SOCIOECONOMIC EFFECTS

1A. SOCIOECONOMIC EFFECTS OF ECEC PROGRAMS ON CHILDREN

Since there are similarities and differences between the ECEC programs and policies in different countries, it is important to keep the institutional context in mind when examining the research below. As indicated by Kamerman (2006) ECEC policies and programs in Europe and the Anglo-American countries evolved out of remarkably similar historical streams: child protection, early childhood education, services for children with special needs, and services to facilitate mothers' labour force participation. In all the countries, one overarching theme is the movement from private charity to public responsibility, although the extent of public responsibility varies across countries. However, Kamerman indicates that the most distinguishing variation among countries appears to be the relative emphasis given in public policy to custodial care of poor and disadvantaged children of working mothers versus the education and socialization of all children.

ECEC programs may be publicly funded and delivered (the predominant pattern in the Nordic countries, for example); publicly funded and privately delivered (as in the Netherlands and Germany, for example); or include a combination of publicly funded and delivered, publicly funded and privately delivered, and privately funded and delivered programs as is the case in many of the less developed countries such as Brazil as well as most of Africa. Programs may be free, particularly those delivered under education auspices, or may charge income-related fees, although in almost all of Europe they are heavily subsidized by government. Over time there has been a move toward a greater emphasis on education in some European countries, with the responsibility for ECEC being shifted toward the education ministry. [2]

In contrast, Kamerman (2006) states that in several of the Anglo-American countries, the two parallel streams of ECEC and education have continued, in part because of the absence of national policy supporting early childhood education and perhaps because of the continued ambivalence about where primary responsibility for child-rearing and socialization should lie. In Canada and some other Anglo-American countries, the responsibility for education is assigned to the provincial or state level of government, which makes the development of a national system more of a challenge than other countries that have a national education ministry. Child care and education have only begun to be integrated in these countries and the two—and sometimes three—streams (compensatory education, care, and education/socialization) have remained separate. Notably, Canada's system is different from the U.S. system, with generally higher training standards and longer maternity leave, which means that the children entering care programs tend to be older than in the U.S.

There is widespread agreement in the academic literature that ECEC programs tend to significantly improve cognitive abilities, future economic well-being and social outcomes for disadvantaged children. The literature also mainly agrees that ECEC improves cognitive abilities and the future economic well-being of more advantaged children. The literature is more divided on the effect of ECEC on the socio-emotional development of children. The majority of articles argue that ECEC either has a positive or no effect on children's socio-emotional development and a minority of articles argue that children's socio-emotional development is negatively affected. High quality ECEC is found to have a variety of positive outcomes.[3]

Table 1 shows socio-educational outcomes for disadvantaged children participating in three well-studied U.S. programs: the Chicago child-parent centre program, and the High/Scope Perry and Carolina Abecedarian programs (the latter two used randomized experimental design). Children who participated in these programs (P) were less likely than the control group (C) to receive special education, to repeat a grade and to be arrested by age 21(with one exception), and more

[2] Kamerman (2006).

[3] In the literature "quality" ECEC generally reflects those factors that influence child developmental outcomes. This is discussed in more detail below. Parents' misjudgement of quality is one reason why there could be "market failure" and sub-optimal utilization of child care and socioeconomic outcomes (Cleveland and Krashinsky, 1998, [Canada]).

likely to finish high school. In addition, participants in the High/Scope Perry pre-school program were healthier and better off economically than their peers (see Table 2). Randomized studies such as the High/Scope Perry and Carolina Abecedarian programs are rare in the literature, and this is unfortunate since these studies tend to give unbiased results. Of the two, the Carolina Abecedarian program is more recent and involves full-time full-day ECEC. This program will therefore be used to benchmark the model we have designed to evaluate the socioeconomic effects on children from workforce shortages in the Canadian ECEC sector.

Many studies have shown improved social and economic outcomes for disadvantaged children participating in child care, for example, in the U.S., Karoly and Bigelow (2005, [California]), and Borman and Hewes (2002); and in other countries such as France, Jarousse et al. (1992). The U.S. researcher Barnett (1998) reviews 38 studies and finds that of the 37 studies reporting educational outcomes, all show lower grade retention and special education rates for ECEC program children. The U.S. articles by Gormley et al. (2005) and Barnett et al. (2005) extend the analysis to include more advantaged children, and find that participating children from both low- and high-income families receive roughly comparable educational gains in high-quality pre-school programs.

Table 1: Social Outcomes of Disadvantaged Children

	High/Scope Perry Pre-school (%)	Carolina Abecedarian	Chicago Child-Parent Centres (%)
Special education	37 (P) vs. 50 (C)	25 (P) vs. 48 (C)	14 (P) vs. 25 (C)
Retained in grade	35 (P) vs. 40 (C)	31 (P) vs. 55 (C)	23 (P) vs. 38 (C)
High school graduation	65 (P) vs. 45 (C)	67 (P) vs. 51 (C)	50 (P) vs. 39 (C)
Arrested by 21	15 (P) vs. 25 (C)	45 (P) vs. 41 (C)	17 (P) vs. 25 (C)

Source: Barnett (2004a).

Table 2: Health and Economic Outcomes - High/Scope Perry Pre-School Program

	Participants (%)	Control Group (%)
Smoked	41.5	50.7
Used hard drugs	22.2	29.3
Used soft drugs	45.3	54.4
Treated for drug/drinking problems	22.2	33.9
Owned a home	36.7	26.6
Owned a car	73.8	60.9
Had life insurance	66.5	53.8

Source: Nores et al. (2005).

The literature also mostly agrees that early childhood education improves cognitive outcomes of participating children.

Beneficial cognitive effects from early childhood education were found in 17 studies.[4] Of the 17, one mentions beneficial cognitive effects in the short run but not in the long run (Magnuson et al., 2005); one indicates positive cognitive effects for disadvantaged children but not for more advantaged children (Leuven et al., 2004); two show higher positive cognitive outcomes for children entering programs before age one (Andersson, 1992; Andersson, 1989); and two identify positive cognitive improvements for all races (Gormley and Gayer, 2005; Gormley et al., 2005). Currie and Duncan (1995) find positive cognitive effects from the U.S. Head Start program. However, Belsky et al. (2007) argue that more time spent by children in care gives higher long-term negative effects on their vocabulary test scores.

According to Barnett (2008), multiple meta-analyses conducted over the past 25 years have found pre-school education to produce an average immediate effect of about half (0.50) a standard deviation on cognitive development, which is the equivalent of seven or eight points on an IQ test, or a move from the 30th to the 50th percentile for achievement test scores. Barnett emphasizes that on many measures, a half a standard deviation is enough to reduce by half the school readiness gap between children in poverty and the national average.

Positive linkages between ECEC quality and a variety of positive outcomes in the first two years are among the most pervasive findings in developmental science. Higher-quality ECEC (in the form of responsive and stimulating care) is associated with better cognitive and language development, positive peer relations, compliance with adults, fewer behaviour problems, and better mother–child relations.[5] This view is supported by Barnett (2008), who states that research finds that the programs with the largest and longest lasting effects are the most educationally intensive and expensive. Other things being equal, programs that begin earlier appear to have greater long-term effects. Only programs that begin at age one or earlier have had persistent effects on IQ, but this does not necessarily translate into greater long-term benefits across the board.

There is more disagreement in the literature about the socio-emotional impacts of ECEC. Positive socio-emotional impacts from child care were shown in 14 studies.[6] Of these, two mention that children entering ECEC in their first year received more positive ratings from their teachers in terms of social-personal attributes (Andersson, 1992; Andersson, 1989); and one article indicates that more hours of care lead to fewer behavioural problems (Love et al., 2003). Other research, however, indicates that extended periods of time in care can have negative effects. In summarizing the literature reported separately by Belsky, Howes and Tresch Owen for the *Child Care Encyclopedia*, Andersson (2003) indicates that research shows that the quality of mother-child interaction may be jeopardized by low-quality care and extended periods of time spent in care.

Four studies show no positive or negative socio-emotional impacts from ECEC.[7] Thirteen studies mention some negative socio-emotional impacts,[8] including two that mention short-term negative, but long-term positive, socio-emotional impacts (Lally et al., 1988; Seitz et al., 1994). Goodman and Sianesi (2005) mention short-term negative, but no long-term, socio-emotional impacts. Magnuson et al. (2005) find negative socio-emotional effects in some child care arrangements but not in others. Six studies, five of them authored by Belsky, identify undesirable impacts of maternal

[4] U.S. studies: Belsky (1984); Clarke-Stewart and Fein (1983); NICHD (2003b); Barnett (2001); Peisner-Feinberg (1999); Reynolds (1999 [Illinois]); Campbell et al. (2001 [Carolina]); Loeb et al. (2007); Magnuson et al. (2005); Gormley and Gayer (2005); Gormley et al. (2005 [Oklahoma]); http://espn.go.com/video/clip?id=4280843&categoryid=2378529. Studies from other countries: Leuven et al. (2004 [Netherlands]); Andersson (1992 [Sweden]); Andersson (1989 [Sweden]); McKay et al. (1978 [Colombia]); Goodman and Sianesi (2005 [U.K.]).

[5] Owen (2004 [U.S.]).

[6] U.S. studies: Clarke-Stewart and Fein (1983); NICHD (2003a); Barnett (2001); McKay et al. (1978); Peisner-Feinberg (1999); Reynolds (1999, [Illinois]); Andrews et al. (1982); Johnson and Walker (1991, [Texas]); Reedy (unpublished); Levin and Schwartz (2007, [Georgia]); Love et al. (2003) Studies from other countries: Andersson (1992, [Sweden]); Andersson (1989, [Sweden]); Sylva (2003, [Europe]).

[7] U.S. studies: Jester and Guinagh (1983); Weikart et al. (1978, [Michigan]); Schweinhart et al. (1993, [Michigan]); Barnett et al. (1994).

[8] Canadian studies: Baker, Gruber and Milligan (2005, [Québec]). U.S. studies: U.S. Haskins (1985); Lally et al. (1988); Seitz et al. (1994); Loeb et al. (2007); Magnuson et al. (2005); Belsky (1986); Belsky (1987); Belsky and Steinberg (1978); Belsky et al. (1982); Gamble and Zigler (1986). Studies from other countries: Goodman and Sianesi (2005, [U.K.]).

employment during the infant's first year on subsequent social and emotional development[9], and two studies mention short-term negative socio-emotional impacts, which may dissipate in the long term (Loeb et al., 2007; Baker, Gruber and Milligan, 2005). However, the methodology used by some of the authors has been questioned. Belsky's findings are rebutted by U.S. researchers Phillips et al. (1987), and Cleveland (2007) rebuts Baker, Gruber and Milligan, stating that their study "does not compare children who have participated in reduced-fee childcare to children who did not. Instead, it compares child outcomes for all Québec children in the age range to all the rest of Canadian children in that same age range." Therefore Baker et al. do not have an appropriate control group with which to make a valid comparison. Clearly, this is an area of considerable debate in the literature, which depends in part on the investigation techniques and the statistical persuasiveness of each method.[10]

Barnett (2008) states that meta-analysis shows that for the social and emotional domains, the estimated positive effects have been somewhat smaller than for cogitative development, but are still meaningful, averaging about 0.33 standard deviations. Barnett also states that several studies in the United States and Canada have found centre-based ECEC to produce small negative effects on social-emotional development and behaviour—in particular, increased aggression. There is some evidence that the negative effects increase with the number of years in care, but lessen when children attend higher quality programs. Barnett indicates that the studies that found negative effects were non-experimental in design, so the effects may be influenced by unobserved differences between the children and the families who do not use ECEC. In contrast, according to Barnett, the randomized experimental studies find even more positive outcomes for the social-emotional and child development outcomes than the meta-analysis suggests.[11]

Swedish researcher Andersson (2003) states that one problem with many of the studies in the literature is that the follow-up period is too short. Even if some of the children showed some behaviour or disciplinary problems after spending time in ECEC, we know nothing about how long-lasting these effects may be. Some effects may manifest themselves years later. These "sleeper effects" may be positive or negative. Andersson found that positive effects on social development did not show up until the early teenage period, when they were very substantive. Andersson (2003) also indicates that "Higher-quality child care (in the form of responsive and stimulating care) is associated with better cognitive and language development, positive peer relations, compliance with adults, fewer behaviour problems, and better mother–child relations." Two U.S. studies mention negative socio-emotional impacts due to poor quality (Helburn, 1995; Galinsky et al., 1994). Quality is consistently found to be an important aspect of ECEC.

Barnett (2008) indicates that the research literature establishes that programs with well-educated, adequately paid teachers, small classes (no more than 20 children), and reasonable staff-child ratios (less than 1:10) have repeatedly produced strong short- and long-term educational gains. Programs putting fewer resources into the classroom often have failed to achieve similar results.

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[9] U.S. studies: Belsky (1986), (1987); Belsky and Steinberg (1978); Belsky et al. (1982); Gamble and Zigler (1986).

[10] An external reviewer indicates that it is important to note that all analytical approaches can have problems. For example, randomized experimental studies have weaknesses (selection behaviour and intention to treat, non-compliance, alternative treatments accessible to experimental controls, etc.) The Difference-in-difference (DID) estimators used in "natural" experiments have also their problems (selection on idiosyncratic temporary shocks –"Ashenfelter's dip"; differential macro trends, compositional changes with repeated cross-sections, number of control groups). But all methods in the palette of empirical approaches/methods for socio-economic evaluation (social experiment, natural experiment, discontinuity design, matching, instrumental variables, control function methods) have pros and cons compare to the 'theory' free method of clinical trial (see Blundell and Costa Dias, 2008).

[11] Differences in study design provide different degrees of confidence in the results. As indicated by Shadish et al. (2002), the most persuasive studies are randomized experimental studies that randomly assign people with the same attributes to two groups: experimental and control groups. Quasi-experimental studies match the two groups and typically use pre-tests and post-tests to determine the impact of the experiment. Non-experimental studies do not assign different groups, but use statistical techniques, such as correlation analysis, to ascertain the impact. To make matters more confusing, different authors use the same terminology to refer to different study designs. See the glossary presented at the end of this report for the definition of "experiment", "randomized experiment", "quasi-experiment" and "natural experiment" suggested by Shadish et al. (2001).

Canadian researcher Doherty (1996) outlines four elements essential to high quality ECEC:

1) The day-to-day relationship between adult and child
2) Caregiver knowledge of child development
3) The number of children the adult is responsible for at any one time
4) The size of the group

U.S. researchers Blau (2000) and Helburn (1995), show that these elements exert a significant positive impact on quality. However, in North America many of these elements are not adequately satisfied. *The Cost, Quality and Child Outcomes Study Team* (Helburn, 1995) conducted a major study of child care centres in the U.S. and found that most provided inadequate care.

In Canada, a survey of 1,000 licensed centres found one-sixth of them to be of poor or very poor quality and in violation of then-current provincial regulatory standards (Cleveland and Krashinsky, 1998). In contrast, high quality programs in Sweden consistently show better socio-emotional outcomes for participating children than their peers (Lamb, 1998).

Doherty (1996) cites five studies comparing children in high-quality and low-quality programs, which mention significant positive impacts on children's cognitive skills and socio-emotional well-being from high-quality ECEC. Doherty concludes that in order to maximize positive effects and minimize negative effects of programs, it is important to ensure that they are of high quality.

Blau (2001) provides an overview of the child care market in the U.S. with a large concentration on the issue of quality.[12] Blau (1998, 2000 and 2001) finds that the easily observed structural quality inputs, such as the group size, child-staff ratio and teacher qualifications, are correlated with process quality, but after taking this relationship into account there remains a lot of unmeasured centre-specific differences in the quality of formal child care nonetheless.[13]

Evaluating quality, however, can be notoriously difficult, especially for untrained observers. Helburn (1995) found that 90% of parents rated their child's classroom as being of very high quality, while trained observers rated most of these classrooms poor to mediocre. Mocan (2001) compared consumer evaluations of quality to actual quality and found that parents did not utilize all the available information in forming their assessment. And Mocan (2002) indicates that the evidence suggests that parents value quality, but have difficulty assessing the quality of the service they are purchasing. The parents of young children may suffer from information asymmetry.[14] This can occur because parents interpret the signals of quality incorrectly, for example, equating clean reception areas with a high quality program. Furthermore Mocan (2001) finds some evidence of moral hazard where the centres with clean reception areas tend to produce a lower level of quality for unobservable items. These results provide a partial explanation as to why the private market for child

[25] There are two distinct concepts of quality in the literature:

- The first type is variously referred to as "process" quality, "global" quality, and "dynamic features of care" and characterizes the interactions between children and their caregivers, their environment, and other children. The term *process quality* will be used in this report.
- The second type is called "structural" quality or "static features of care" and refers to characteristics of the environment such as the child-staff ratio, group size, teacher education and training, safety, staff turnover, and program administration. The term *structural quality* will be used in this report.

Blau (2001) among others argue that *process quality* is more closely related to child development than *structural quality.* Despite the widespread agreement on the importance of process quality, there is a lack of data available on process measures. Researchers tend to rely on structural measures under the assumption that the two types of quality are related. Blau directly tried to examine the link between the two concepts.

[13] Chevalier et al. (2006).

[14] Asymmetric information that alters the level of child care utilization is an example of a market failure. Market failures will be examined in the report that discusses the factors that affect the demand for child care.

care might result in low average quality.[15] Furthermore, it is widely reported that cognitive dissonance occurs because parents have few affordable options and have to convince themselves that the quality is acceptable.[16]

[15] Chevalier et al. (2006).

[16] Emlen (1999).

1B. SOCIOECONOMIC EFFECTS OF ECEC ON PARENTS

Most of the literature concerning the impact on mothers of children participating in ECEC programs tries to estimate the effect of higher program fees on mothers' labour supply. The literature agrees that higher fees for programs will decrease a mother's propensity to supply labour, or at the very least not increase it. Labour supply effects are divided into two sub-components: participation rates and average hours worked. These estimates are influenced by the mother's marital status and the age of the youngest child, among other factors. The literature also discusses other issues such as the effect of ECEC on male labour supply and the socio-emotional well-being of mothers, and the influence of market failures on mothers' labour supply.

The estimated response of mothers' labour supply to a 1% increase in program fees ranges widely, from 0.0% to -0.92% (see Table 3). This means that a 1% increase in fees could decrease the mother's labour supply by as much as 0.92%. It is ambiguous whether labour supply for married or single mothers is more responsive to price increases (see Table 3).

Generally, however, the absolute response in average hours is larger than the response in labour force participation. Also, there is a tendency for labour supply responses to be larger (absolutely) 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 limited availability of ECEC in some of these countries. 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.[17] British researcher Joshi (1990) finds large present and future wage losses for women with young children not using ECEC.

Availability also affects Canada. Due to lower population densities, access to child care centre programs is much more limited in rural areas than in urban areas. McCain et al. (2007) argue that Canadian services in rural and isolated communities are almost non-existent. According to Norris et al. (1999), Canadian families living in rural areas may not have the same access to child care centres as families living in urban areas. Bushnik (2006), using National Longitudinal Survey of Children and Youth (NLSCY) data shows that while about equal numbers of urban and rural Canadian children are placed in non-parental care, only 22.4% of rural compared to 30.1% of urban non-parental child care children are enrolled in child care centres (Table 4).[18] Lower accessibility of child care centres could be significant because the sociology and psychology literature points to the advantage of pres-schoolers attending centre-based ECEC over alternative arrangements (Berk, 1985; Howes, 1983; Ruopp et al., 1979).[19]

[17] The more modest labour supply reaction in European countries could also be related to other labour market factors that tend to diminish the responsiveness of European labour markets in general.

[18] The NLSCY does not directly indicate accessibility and availability of child care.

[19] Chiswick and DebBurman (2004).

Table 3: Effects of ECEC on Mothers' Labour Supply

Reference	Country	Population Examined (Age of Youngest Child)	Impact of 1% Increase in Child Care	
			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 and 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 et al. (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 et al. (1997)	U.S.	Married women (<6)		-0.78
Graafland (2000)	Netherlands	Married women	-0.15	

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

Table 4: Composition of Non-Parental Care: Canada 2002-03

Type of Child Care	Urban (%)	Rural (%)
Child care centre	30.1	22.4
Outside home: with non-relative **with relative**	31.1 16.8	38.9 22.1
Inside home: with non-relative **with relative**	8.3 14.7	6.1 12.5

Source: Bushnik (2006).

In Canada, recruitment problems of staff with early childhood education (ECE) credentials and higher costs are often cited as explanatory reasons for reduced access to ECEC (Report of the Expert Panel on Quality and Human Resources, 2007; Gallant et al., 2007; Beach and Flanagan, 2007). U.K. researchers Rolfe et al. (2007) note that recruitment issues include poor public transportation and high levels of crime in some areas.

Several empirical studies suggest that there is a positive but weak impact of ECEC on fertility in most countries. German researcher Schrage (2007) argues that better or more available ECEC tends to increase fertility, but that ECEC can also decrease fertility if the program is not properly structured. Furthermore, in countries where two-income households dominate, the impact on fertility is greater if the supply of subsidized ECEC is combined with parental leave that is flexible and generous, especially for parents of young children.[20] Datta Gupta, Smith and Verner (2000) reinforce this observation by finding that women's employment rates and fertility are positively related in a number of countries that have family-friendly policies.

The effects of ECEC on mothers' socio-emotional well-being have received much less attention in the literature than the effects on children's socio-emotional development. Some authors, including the controversial Baker et al. (2005), argue that ECEC leads to more hostile, less consistent parenting. However, this is contracted by the U.S. NICHD (1997) investigation of the impact of ECEC on the mother-child attachment. Associations between security and five child care parameters were examined, namely age of entry into a program, continuity of care, type of care, quality, and amount of care. None of these associations were found to be significant.

In contrast to the impact on mothers' labour supply, young children (and thereby ECEC) seem to have little or no effect on male labour supply. Australian researcher Kalb (2002) found no significant effects and references. Seven other studies found either much lower effects of children on male (as compared to female) labour supply or no effect. More specifically, Kalb (2002) found that males with children aged 0-2 and 5-9 years increased their labour supply by 0.0001% and 0.0004% respectively, and males with children aged 3-4 years decreased their labour supply by 0.0025%. None of these estimates were significant.

[20] Canada - Roy and Bernier (2006) (Québec).

1C. SOCIOECONOMIC EFFECTS OF THE QUÉBEC ECEC EXPERIENCE

Over the years there has been a significant amount of research that specifically examines the impact of ECEC on Québec's children and parents. A review of this research permits a focus on Québec's experience before and during the period during which the ECEC sector experienced a significant increase. According to the Québec Council of Family and Children (2008), the empirical studies that analyze the effects to Québec's increased support for child care are only just beginning because the establishment of the child care program is fairly recent. The council expects the results to be similar to those found internationally.

In 1997, the Québec government began to commit significant resources to the consolidation and development of its ECEC system as part of a comprehensive policy change that included kindergarten for five-year-olds being extended to full days. The government implemented its ECEC system in stages over several years. The goal was to reach 200,000 child care spaces by encouraging the provision of reduced-contribution spaces so that parents paid only five dollars per day (now seven dollars per day). These spaces were funded by the provincial government. The main focus of the new policy was on the centres de la petite enfance (CPEs), which were created from non-profit child care programs and child care agencies that had, until then, been responsible for home-based services. CPEs are non-profit organizations with parents representing a majority of the members on the boards of directors. The network of CPEs grew rapidly between 1997 and 2003.

The program was introduced gradually, with four year olds in existing regulated and eligible child care spaces able to receive reduced contribution child care starting in September 1997, and three year olds being eligible in September 1998. The major expansion in spaces started in 1999. The number of regulated child care spaces rose from 78,864 in September 1997 to 163,434 by July 2003, an increase of almost 85,000 spaces. At the end of March 2008, there were 201,166 subsidized spaces and 4,751 non-subsidized spaces for children aged 0-4 years.[21] In the 2008 Budget, the Québec government announced its intention to raise the number of public child care spaces to 220,000 by 2012.

Table 5: Child Care Spaces for 0-4-Year-Olds

Fiscal Year Ending	Reduced Contribution Spaces				Non-Reduced Contribution Child Care Centre Spaces	Total Spaces
	CPE	Family Child Care	Child Care Centres	Total		
2003	63,339	75,355	24,740	163,434	1,620	165,054
2004	68,274	82,044	27,530	177,848	1,907	179,755
2005	72,057	87,192	30,131	189,380	2,457	191,837
2006	74,573	89,011	33,034	196,618	3,487	200,105
2007	75,934	88,645	34,027	198,606	4,538	203,144
2008	77,165	88,771	35,230	201,166	4,751	205,917

Source: Family Services Agency.

Expenditures by the Department of Family and Seniors (Ministère de la famille et des ainés, MFA) for the 2007-2008 fiscal year amounted to $1,723 million. Of this amount, $1,663 million was allocated to ECEC, or 96.5% of the total expenditures. The 2008 budget provides subsidy estimates per space for 2007-2008: reduced contribution spaces in centres, $34.87; family child care, $20; and CPE, $42.27. At seven dollars a day for services, the cost of the system that is covered by fees charged to parents is 18.5% on average. The subsidy represents 81.5% of the average cost.

In 2005, the Organization for Economic Co-operation and Development (OECD) assessed public expenditures devoted to families in each of its member countries. According to this study, in 2001 public expenditures for families approached

[21] http://www.mfa.gouv.qc.ca/services-de-garde/portrait-des-services-de-garde/places-en-services-de-garde

or exceeded 3% of gross domestic product (GDP) in nearly a dozen countries including the Scandinavian countries and France. Using the same methods of calculation, public spending for families in Québec accounted for 2.8% of GDP during 2005, which places Québec far ahead of Canada as a whole (0.9%) in devoting resources for families.[22]

Several researchers have examined the socioeconomic implications of ECEC in Québec, which permits an understanding of the socioeconomic implications of ECEC in a Canadian context. When examining the results for the Québec experience it should be noted that:

- By far the largest growth in child care spaces was in family child care compared to centre-based spaces for 0-4 year olds.
- Child care quality in Québec was lower than in many other provinces before the expansion (Goelman, Doherty et al., 1998).
- Grandir en Qualité (the government's survey on the quality of ECEC) has shown a marked improvement in the quality in centre-based programs (CPEs).
- Furthermore, the rapid expansion of spaces led to workforce shortages of qualified staff.

All of the above factors need to be kept in mind since the program resulted in significant changes in: the number of spaces; composition of types of ECEC; composition of the qualifications of staff; short-term workforce shortages; and, ultimately, changes in the quality of ECEC provided.

Many of the empirical studies that specifically include results for Québec were based on the longitudinal study of the development of children in Québec (l'Étude longitudinale du développement des enfants du Québec 1998-2002 [ÉLDEQ]). The first phase of ÉLDEQ focused on a cohort of 2,010 infants who were monitored on a yearly basis starting at the age of five months for approximately four years. The second phase (2003-2010) focuses on 1,500 children, mainly from kindergarten up to the second year of primary school.

The investigation by Drouin et al. (2004) included all child care education and the measure of quality was adapted to Québec ECEC. In very general terms, the survey results for overall quality show that the services offered to children have "fair" educational quality on average, with the exception of CPEs, which have "good" educational quality on average. Japel et al. (2005) noticed that the CPEs generally offered better quality services than other types of settings. Thus, 35% of centre-based CPEs versus only 14% of for-profit child care and 10% of unregulated home-based child care were rated as good quality. The study was conducted by the GRIP (a University of Montreal research group).

The survey on the needs and preferences of families in child care, ISQ (2006), provides a portrait of families with children under five years of age and their use of ECEC services, and gauges the interest of families to use $7-a-day ECEC. The report found that there was a statistical difference in the utilization of ECEC by broad family income groups, with higher income groups generally having a higher utilization rate. ISQ (2007) found that children living in a family where the parents are less educated or have lower incomes (less socioeconomic advantaged) are less likely to attend a program on a continuous basis between 17 months and 6 years than the most socio-economically privileged children: 3% versus 27%.

The quality of child care education is generally higher for children from more privileged backgrounds. A survey conducted in Québec in 2003, showed that high activity rates (low unemployment) in a sector goes hand-in-hand with higher quality pre-school facilities, child care for children of pre-school age and for infants. The services for infants in child care are evaluated more positively when the proportion of the population in employment among residents of the area is equal to or greater than 55%.[23] The fact that higher income individuals utilized the program more will obviously affect any results for the overall effect of ECEC. Comparisons of children in ECEC with those not in ECEC could be

[22] Ministère de la Famille et des Aînés (2007). Ministry of Family, Seniors and the Status of Women (2007).

[23] ISQ (2004).

[24] ISQ & MSSS (2007).

biased upwards since more advantaged children tend to have better socioeconomic outcomes, while longitudinal studies could be biased downward since some of the above research indicates that the disadvantaged children benefit more than advantaged children from a child care program.

The likelihood of having low language skills is about 55% higher among children living in a family of low socioeconomic status, even after taking into account a number of other factors. But this gap diminishes greatly among children who attended child care at a young age. Indeed, among children who went to nursery school at the age of 18 or 29 months, the socioeconomic position of the family is no longer a factor in influencing the children's language skills.[24]

The results of a study on the psychological maladjustment in children at the University of Montreal (GRIP), published in the *Archives of General Psychiatry (2007)*, showed that young children from disadvantaged backgrounds have fewer problems of physical aggression if they attend ECEC. These results, however, may be skewed by a lack of a proper control group.[25]

A study by Lefebvre and Merrigan (2008) explored the labour supply effects on mothers from the introduction of the Québec policy. Their econometric results support the hypothesis that the Québec policy, together with the transformation of public kindergarten from a part-time to a full-time program, had a large and statistically significant impact on the labour supply of mothers with pre-school children. They estimated that the policy effectively increased labour force participation rates by 6.5% for more educated mothers and 7.3% for less educated mothers. Total annual hours worked rose by 133 for less educated mothers and 114 for more educated mothers.

Lefebvre, Merrigan, and Verstraete (2009) used annual data drawn from Statistics Canada's Survey of Labour and Income Dynamics and a difference-in-differences methodology, which is a non-experimental design, to estimate the dynamic labour supply effects of the Québec policy. The results demonstrated that the policy had long-term labour supply effects on mothers who benefited from the program when their child was less than six years of age. The researchers warn that the effects of the policy cannot be strictly interpreted as the effects of a price change since several features characterize the policy: the price change, the financial help to fund new ECEC settings, and increased wages for program staff. A striking feature of the results is that they were driven by changes in the labour supply of less educated mothers who have lower labour market attachment. The result for university-educated mothers was not statistically significant.

Baker, Gruber and Milligan (2005) - using a non-experimental design - found that Québec's new program led to more hostile, less consistent parenting, worse parental health, and a lower-quality parental relationship. They also uncovered striking evidence that children are worse off in a variety of behavioural and health dimensions, ranging from aggression to motor-social skills to illness. Nevertheless, the authors have some caveats: it is not clear whether the negative child outcomes are short-run transitions or long-run effects; they have no results for single parent families, a group that can benefit from high quality ECEC; they hint that other unmeasured benefits may offset these costs. Cleveland (2007) has challenged the findings, saying that since there is no control group the results could be biased and may not accurately illustrate the effects of the program.

The results of the study by Lefebvre, Merrigan and Verstraete (2008) showed that the subsidized ECEC policy of Québec produced negative outcomes on the Peabody Picture Vocabulary Test (PPVT) scores for children aged 5 and possibly negative for children aged 4, in particular with less educated mothers. They compared the outcomes of test scores in Québec with the rest of Canada (or Ontario) based on multiple pre- and post- treatment periods using the NLSCY data from cycle 1, covering 1994-1995, through cycle 6, covering 2004-2005. Their intuition is that children—especially those younger than age 3—spend too much time in child care centres for the policy to have a positive effect. The structure of the program creates strong incentives for families to use long hours of ECEC for children at a very young age and for other ages. This is especially true for time spent in settings found to be of medium or low quality on average.

[25] Criticism of the report's methodology was provided by an external reviewer.

As discussed above, the forcefulness of these studies is muted by their non-experimental design. Other studies with quasi-experimental or randomized experimental design have found that there are positive effects of quality ECEC on children, particularly disadvantaged children. As pointed out by Barnett, the findings in studies with non-experimental design may be influenced by unobserved differences between children and families who do and do not use ECEC.

Furthermore, during the period that Lefebvre et al. (2008) examined, child care spaces increased by 155% from 1996-1997 to 2004-2005. Given the speed and magnitude of the introduction of Québec's reduced-contribution ECEC system, and the larger-than-expected increase in demand, their findings might reflect the negative socioeconomic implications of shortages of qualified staff following the introduction of the program.

1D. CONCLUSION OF SOCIOECONOMIC EFFECTS

The literature that examines the impact of ECEC on children finds that quality programs improve children's cognitive abilities, future economic well-being and social outcomes, particularly for disadvantaged groups. There is less agreement on the impact of ECEC programs on children's socio-emotional development. Most research finds positive outcomes, while some studies suggest that long hours in care of medium to poor quality can result in negative socio-emotional outcomes. Studies find that quality ECEC improves children's developmental and socio-emotional outcomes. Parents, however, have difficulty identifying quality ECEC.

The literature that examines the impact on mothers of children participating in ECEC tends to find that higher fees will decrease mothers' labour force participation and hours worked. These effects differ depending on the mother's marital status and the age of the youngest child, among other factors. Accessibility to ECEC is discussed in a small number of articles that find that lack of access can have a larger impact on mothers' labour supply than the price of ECEC in some instances.

For Canada, most of the research is similar to that found elsewhere in the world regarding the socioeconomic implications of ECEC. Within Canada, developments in Québec are particularly noteworthy given the speed and magnitude of the change in the provision of ECEC after the Québec government's introduction of five-dollar-per-day ECEC services, along with other family policies. Research on the Québec program has found that the impact on mothers' labour supply is similar to the international results that show lower fees boost mothers' labour force participation rates and hours of work. Research lands on both sides of the debate about the impact of ECEC on children's cognitive and socio-emotional development. Most studies have found similar children's developmental outcomes as those observed elsewhere in the world. One study showed a reduction in aggression, and another found worsening parent-child interactions. One Québec study found that the subsidized policy of Québec produced negative outcomes on the Peabody Picture Vocabulary Test (PPVT) scores for children aged five years. One possible reason for this outcome is that children spent too much time in settings found to be of medium or low quality on average. Other researchers, however, have criticized these studies because they lack an appropriate control or matched group, which makes the results less powerful than randomized experimental studies that have found positive effects. There is also the possibility that the above findings reflect the potential negative socioeconomic implications of the shortages of qualified staff in the Québec system that occurred after the rapid increase in demand following the program's introduction.

To reach a conclusion on the socioeconomic outcomes, given the sometimes conflicting evidence, it is helpful to examine the research in total as well as the design of the studies that show positive versus negative outcomes. Barnett (2008) indicates that meta-analysis shows that the developmental and socio-emotional effects are positive. And the studies that use the more persuasive randomized experimental design have found more positive effects than those found by the meta-analysis in general.

In contrast, the negative effects were found by studies with non-experimental design[26], and these effects may be influenced by unobserved differences between the children and the families who do and do not use ECEC. Therefore, one can conclude that on balance the research suggests that ECEC provides developmental and socio-emotional benefits.

[26] Barnett (2008).

SECTION 2 : ECONOMIC BENEFITS AND COSTS

2A. LONG-TERM ECONOMIC BENEFITS AND COSTS OF SELECTED ECEC PROGRAMS

Benefits and costs of ECEC to an economy can be illustrated either through dollar amounts and benefit/cost ratios or through a multiplier. Benefit/cost ratios are typically used to compare long-term benefits versus long-term costs. Multipliers measure the impact of a program on overall economic activity. Multipliers typically are used to illustrate shorter term economic impacts. This section will discuss the existing literature that examines long-term economic benefits and costs and the next section will focus on short-term economic multipliers.

The literature that estimates costs and benefits of ECEC consistently shows that the long-term benefits outweigh the costs. The magnitude of the costs and benefits, however, depends on the characteristics of the children being provided ECEC. More disadvantaged children benefit the most from quality ECEC. For example, for the U.S., the Chicago child-parent centres program, and the Carolina Abecedarian and U.S. High/Scope Perry programs show costs being repaid several times over. Other ECEC programs, both targeted and universal, show positive—albeit smaller—net benefits to society per dollar spent than these three programs.

The two best studies (because of their experimental design)—the Carolina Abecedarian and High/Scope Perry programs—show very high returns on investment in ECEC (see Table 6). The High/Scope Perry pre-school program benefits are mainly caused by participant earnings and crime savings, which account for about 90% of total net benefits. The Abecedarian program differs because it offers full-day rather than part-day ECEC and takes place in a rural rather than urban setting. Crime rates for the control group were already low, and consequently crime savings for the Abecedarian program were found to be insignificant. However, unlike the other programs, the Abecedarian program includes detailed estimates for health savings and maternal earnings and these estimates as well as participant earnings were the main benefits from the program, accounting for 99% of total net benefits. The Chicago child-parent program yields very substantial benefits as well. Benefits and costs were discounted using a 3% real discount rate. This means, for example, that $100 of real 2002-dollar (or inflation adjusted 2002 dollar) benefits in 2003 is worth $97 in 2002. Similarly, Kilburn and Karoly (2008) cited an average of 48 pre-school programs that have a benefit/cost ratio of 2.36.

Various researchers have tried to estimate gains from expanding upon existing ECEC or creating universal ECEC. Belfield (2005) estimates that every extra dollar invested in ECEC in the state of Louisiana will create $2.25 in future savings. Karoly and Bigelow (2005) estimate that a universal ECEC program in California will yield benefits of $2 to $4 (depending on the assumptions) for every dollar invested. 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.

In Canada, Cleveland and Krashinsky (1998) estimate that a universal high-quality ECEC program will return more than $2 for every dollar invested. Cleveland and Krashinsky estimate how many children and mothers will benefit and the size of the benefits to individual children and mothers from the program based on their previous child care arrangement. They estimate that the benefits to children moving to the program from informal child care are higher than benefits to children moving from mother-only care. In turn, benefits to both of these groups of children (those in informal care and mother-only care) are higher than benefits to children moving from regulated ECEC as it currently exists to the new universal ECEC program. Mothers benefit from the universal ECEC program through increased labour force participation and reduced expenditures on informal care. Using reasonable assumptions as to the intensity of mothers' labour force participation, it is estimated that each additional child care space created under the universal ECEC program will result in an extra 0.2 full-time workers and will eliminate 0.6 informal child care spaces. The cost of the universal high-quality ECEC program is estimated to be $8,500 per child in 1998. In comparison, Anderson and Rosen (2008) calculate that the average public investment required per year-round, full-time space for 3-5-year-olds in Victoria, B.C. is $8,960.

Belfield (2005) calculates fiscal costs and benefits from universal ECEC in Massachusetts, Wisconsin and Ohio using a best estimate (B) and a conservative estimate (C) (see Table 7). Most benefits arise from school and criminal justice cost savings and increased tax revenues. These benefit-cost ratios are larger than one but smaller than those in Table 6, suggesting that ECEC benefits disadvantaged children more than other children. However, it should be noted that the estimates in Table 7 include only fiscal gains and use a 5% real discount rate. The estimates in Table 6 use a 3% real discount rate—the standard in the literature—and include total gains to society. This means, for example, that after-tax gains from higher wages to participants are not included in the estimates in Table 7. Using a 5% rather than 3% real discount rate lowers the per-dollar investment benefits by around $0.5, creating a significant downward bias on program benefits.

Table 6: Detailed Cost and Benefits of Three Programs (2002 Constant Dollars, 3% Real Discount Rate)

Costs and Benefits	High/Scope Perry Pre-school	Chicago Child-Parent Centres	Carolina Abecedarian
Program costs	15,844	7,384	35,864
Program benefits	138,486	74,981	135,546
Child care	946	1,829	-
K-12 education savings	8,812	5,377	8,836
Child welfare settings	-	850	-
Adult education settings	363	-	-
College	-1,113	-615	-8,128
Participant earnings	38,892	30,638	43,253
Smoking health	-	-	17,781
Crime savings	90,246	36,902	-
Welfare savings	340	-	196
Maternal earnings, 26-60	-	-	73,608
Benefits/costs	8.74	10.15	3.78

Source: Temple and Reynolds (2007).

Table 7: Costs and Benefits of Universal ECEC in Three U.S. States (2004 $Million, 5% Real Discount Rate)

Costs and Benefits	Massachusetts		Wisconsin		Ohio	
	B	C	B	C	B	C
Investment cost	577.94	433.90	206.90	143.43	482.40	410.04
School system cost-savings	205.10	123.55	140.96	78.86	241.89	146.86
Tax revenue gains: family	16.65	9.25	6.76	3.76	19.21	9.29
Tax revenue gains: participant	98.40	50.13	41.68	28.25	120.32	15.19
Criminal justice system savings	288.47	201.01	142.18	91.25	375.41	209.35
Health expenditure savings	48.27	33.72	7.00	3.34	1.18	0.59
Welfare expenditure savings	26.33	19.74	-	-	23.58	11.79
Total benefits	683.22	437.40	338.58	205.46	781.59	393.07
Benefits/costs	1.18	1.01	1.64	1.43	1.62	0.96

Source: Belfield (2005).

Bartik (2006a) estimates that introducing universal pre-school in the U.S. will cost $25-35 billion (2004 constant dollars) and boost national employment and GDP by 1.9% by 2080. Dickens et al. (2006) estimate that growth in human capital from universal ECEC in the U.S. will add an extra 3.5% or $2 trillion (2005 constant dollars) to GDP by 2080 and will cost $59 billion. Even the most conservative estimates show the costs are paid back twice over. Müller and Bauer (2001) estimate that Zürich's current ECEC expenditures of 18 million Swiss Francs (CHF) are offset by at least CHF 29 million of additional tax revenues and reduced public spending.

Lynch (2004) investigates an ECEC program targeting the poorest 20% of U.S. children and finds that initial costs of $19 billion will be repaid back twice over in 30 years. Belfield and Neveu (2006) use a general equilibrium model to estimate the impact of ECEC on the 20% most disadvantaged U.S. children. Their preliminary results are that the program will improve economic growth, but not by as much as other studies have shown. U.S. researcher Barnett (2004a) compares a hypothetical universal pre-school program with a hypothetical pre-school program targeting disadvantaged children. Universal pre-school is favoured (see Table 8) by Barnett because it yields higher overall net benefits even though it is costlier and has a lower benefit/cost ratio.

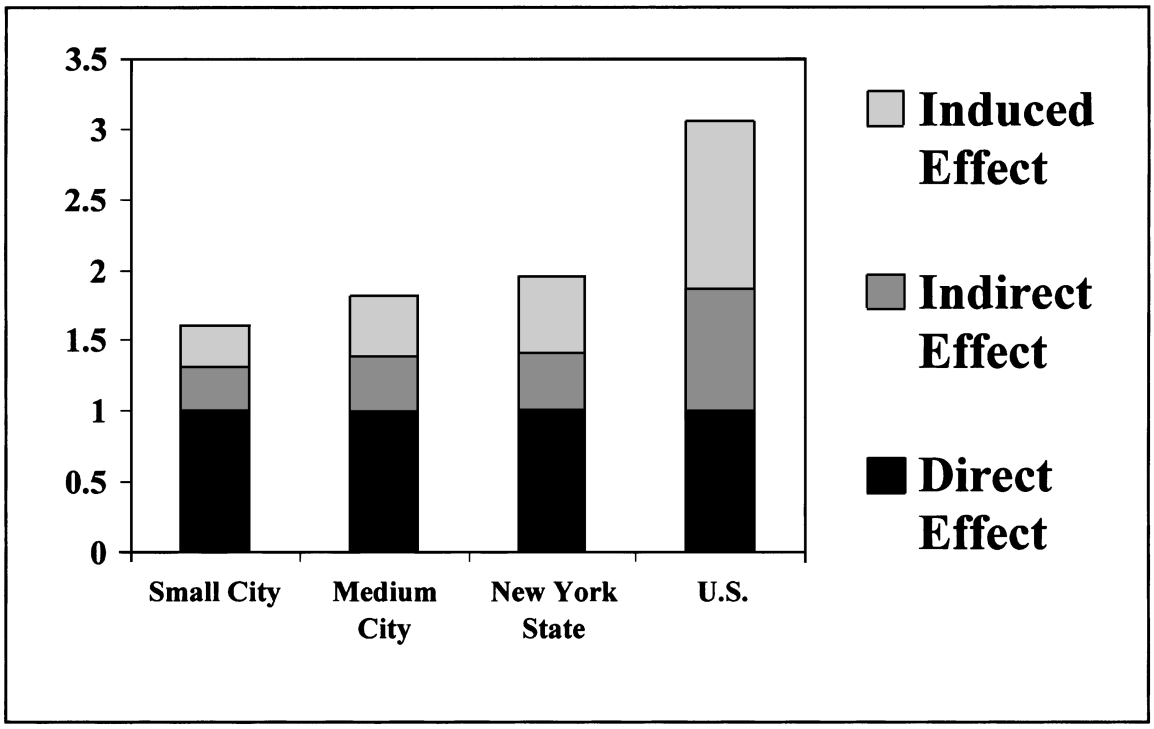
2B. SHORT-TERM ECONOMIC BENEFITS AND COSTS OF ECEC TO AN ECONOMY

A program multiplier measures the economic activity generated by an extra dollar spent on that program. For example, a multiplier of two means that two dollars worth of economic activity are generated per dollar of program costs. In the literature, ECEC program multipliers are estimated to be higher than those for other key sectors of the economy and some other government programs.

Estimates for ECEC program multipliers range from slightly over a dollar to several dollars (see Table 9). Generally, multipliers for smaller regions are lower than multipliers for larger regions because of higher "leakages" or purchases made outside the local region (see Figure 1). For the U.S., Warner et al. (2003) estimates that the (direct, indirect and induced) multiplier from ECEC is around 1.5 for a small city, 2.0 for a state, and 3.0 for the whole U.S. For Canada, Prentice (2007) finds that the multiplier for a rural area of Manitoba is around 1.6.

Bartik (2006a) shows that ECEC is a better investment than business subsidies from a U.S. national economic development point of view (see Table 10). While business subsidies are a boon to the individual region where they are located, they generate a loss to the country as a whole. ECEC programs, however, have positive effects for both the region in which they are located and the country as a whole. This is because out-migration by people from an area with an ECEC program enhances the quality of the labour force elsewhere in the country. ECEC in the U.S. is found to yield higher benefits than agriculture, job training and hospitals (see Table 11).

FIGURE 1: Multipliers by Size of Region



Source: Warner et al., (2003).

Table 8: Cost and Benefits of Targeted vs. Universal ECEC		
Program	**Costs (2004 $, billions)**	**Benefits (2004 $, billions)**
Targeted pre-school	11.0	51.5
Universal pre-school (best estimate)	50.0	172.0
Universal pre-school (conservative estimate)	50.0	102.0
Source: Barnett (2004a).		

Table 9: Multipliers of ECEC In Various Regions		
Reference	**Location**	**Multiplier**
Bartik (2006a)	U.S.	2.78 (state), 3.79 (national)
Pratt and Kay (2006)	New York State	1.35 (Type I), 1.78 (Type II)
Warner et al. (2003)	Tompkins County, NY	1.60 (Type II)
Warner et al. (2004)	New York City, NY	1.91
Ribeiro and Warner (2004)	New York State	2.04 (Type II)
Ribeiro and Warner (2004)	Kansas	1.98 (Type II)
Warner and Liu (2004)	U.S.	1.49 (Type I), 1.91 (Type II)
Prentice (2007)	Manitoba	1.58 (local, rural)

Table 10: ECEC Program vs. Business Subsidy Multipliers		
	National Multiplier	**Regional Multiplier**
Pre-school	3.79	2.78
Business Subsidies	0.65	3.14
Bartik (2006a).		

Table 11: Multipliers of the Child Care (ECEC) and Other Key Sectors		
Sector	**Type I Multiplier**	**Type II Multiplier**
Child care	1.49	1.91
Agriculture	1.34	1.63
Manufacturing	1.31	1.61
Services	1.29	1.79
Job training	1.32	1.84
Hospitals	1.25	1.79
Water supply and sewage	1.33	1.67
Source: Warner and Liu (2004).		

2C. CANADIAN SHORT AND LONG-TERM BENEFITS OF ECEC

An economic impact assessment was conducted in order to accurately estimate the short-term economic benefits to the economy from an increase in ECEC activities. The gross output multiplier is commonly used to show the importance of an industry to the economy. However, gross output multipliers exaggerate the importance of industries with complex contractual and production relationships. Therefore, using a gross output multiplier as an indication of the economic benefits of an industry can be misleading. GDP multipliers provide a more accurate picture of the economic impact from an increase in spending or production on overall economic activity and growth.[27]

ECEC output has one of the highest GDP multipliers and the highest employment multiplier of all major industries. Furthermore, since the incomes of ECEC staff are below average, the induced economic impact will be higher per dollar increase in ECEC output than for industries with higher wages because less of the income gains will be saved. The authors calculated the induced effect for this report. After combining the direct, indirect and induced economic effects, the ECEC sector is found to have one of the highest—if not the highest—GDP multipliers of all major industries in Canada.

ECEC expenditure and output also provides considerable long-term benefits that many other industries do not. The authors also undertook a long-term benefit-cost analysis in order to provide a more complete assessment than an economic impact assessment can provide of the benefits to society from ECEC. The analysis of the estimates of ECEC costs and overall benefits to participating children and mothers produces an overall benefit-cost ratio per hour of ECEC of 2.54.

2C.i. Canadian Input-Output Impact Assessment of ECEC Output

In order to accurately estimate the short-term economic benefits from an increase in ECEC activity the CCHRSC commissioned the production of a simulation by Statistics Canada using the agency's detailed input-output model. The impact assessment 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.[28] The "Child care, outside the home" output was increased by $100,000 in the input-output model in order to simulate the direct and indirect impacts on the economy. This custom simulation is helpful because it illustrates these impacts on the overall Canadian economy from increasing ECEC output and by design can be compared with the impacts on the economy from increasing output in other industries.[29]

Input-output simulation models provide a detailed assessment of the impacts on the economy from a change in expenditure or industry output. The summary information from the custom simulation is provided in Table 12. The most common metrics used to illustrate the importance of an industry to the economy are the gross output, GDP and employment multipliers. As pointed out by Cross and Ghanem (2006), these multipliers are typically misunderstood and misused.

Gross output or revenue multipliers show the linkage between a change in output in one industry and its ripple effect on others. The revenue multiplier for any 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. The gross output multipliers by industry in the

[27] See Cross and Ghanem (2006) and Amadeo (2008) for discussions of different types of multipliers.

[28] 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.

[29] These results are for Canada as a whole. There are significant differences in the direct and indirect multipliers for different provinces and territories, but the full range of regional simulations was not done.

Input/Output tables of the National Accounts capture direct and indirect inter-industry effects (but not the induced impact of spending by the extra people working in these industries). [30]

Table 12: ECEC Outside the Home - Ratios and Multipliers	
GDP	
Direct GDP	0.71
Total GDP multiplier	0.90
Ratio of total-to-direct GDP	1.26
Labour income	
Direct labour income	1.02
Total labour income multiplier	1.14
Ratio of total-to-direct labour income	1.11
Employment	
Employment multiplier (per million dollars)	39.54
Ratio of total-to-direct employment	1.07
Gross output (thousands $)	
Gross output multiplier	1.35
Ratio of total-to-direct gross output	1.35
Source: Statistics Canada Custom Simulation.	

As Cross and Ghanem (2006) indicate, industries with more linkages to other sectors will have higher gross output multipliers. However, this does not mean that these industries are more important to economic growth. The researchers indicate that one of the most common mistakes in analysis is to use revenue multipliers as proof of the importance of an industry to the overall economy. These multipliers only show linkages to other industries 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.

The GDP multiplier reflects the increase in overall output in Canada from a change in output by a particular industry. The results for these multipliers can be dramatically different than for gross output multipliers. The values for these 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 its production to other industries), but its output multiplier for creating GDP in Canada ranks last among the major industry groups.[31]

The gross output and GDP multipliers from Cross and Ghanem (2006) are replicated in Table 13, and are combined with the results from the input-output simulation for the ECEC sector. Statistics Canada's estimate shows that the total direct and indirect impact on gross output is $1.35 per dollar increase in ECEC output, which is below average compared with the gross output multipliers from other industries. In contrast, the GDP multiplier for the ECEC sector is 0.90 and is tied for the fifth highest of all the major industries highlighted by Cross and Ghanem (see Table 13).

Not only is the GDP multiplier for the ECEC sector one of the highest of all industries, but a comparison of the employment multipliers from Table 12 with similar employment multipliers for major industries illustrates that per dollar of increased output, the ECEC sector has by far and away the highest employment multiplier of all these industries.

[30] This section relies on Cross and Ghanem (2006). They also discuss limitations of input-output multipliers.

[31] Cross and Ghanem (2006).

The direct employment multiplier for the ECEC sector is 36.92 jobs per million dollars compared to 20.40 jobs for the next closest industry, "other services", which is a difference of 43.5% (see Table 14).

Table 13: Industry Multipliers per Dollar Increase in Output

Industry	GDP Multiplier	Gross Output Multiplier
Child care outside the home	**0.90**	**1.35**
Finance, insurance & real estate	0.95	1.37
Education	0.94	1.39
Retail trade	0.92	1.53
Non-profit institutions	0.92	1.42
Wholesale trade	0.90	1.56
Administrative	0.90	1.46
Other services	0.90	1.42
Government	0.90	1.48
Utilities	0.89	1.30
Professional and technical	0.89	1.53
Mining	0.88	1.41
Health care	0.88	1.40
Recreation	0.87	1.67
Transportation	0.86	1.63
Accommodation and food	0.85	1.78
Information	0.84	1.54
Forestry	0.79	1.65
Primary support	0.78	1.53
Construction	0.78	1.76
Agriculture	0.77	1.97
Fishing	0.77	1.53
Manufacturing	0.61	1.67

Source: Cross & Ghanem (2006) and Statistics Canada Input-Output. Impact Assessment for 2005.

Table 14: Employment Multipliers Jobs per $Million			
Industry	Direct Jobs	Indirect Jobs	Total Employment Multiplier
Child care outside the home	**36.92**	**2.62**	**39.54**
Other services (except public services)	20.40	7.16	27.55
Educational services	24.57	2.90	27.46
Accommodation and food services	19.79	5.16	24.95
Arts, entertainment and recreation	17.29	5.98	23.27
Retail trade	17.68	3.82	21.50
Non-profit institutions serving households	16.88	3.10	19.98
Health care and social assistance	13.45	5.88	19.33
Administrative & support, waste and remediation	16.53	2.36	18.89
Crop and animal production	8.00	6.26	14.26
Professional, scientific and technical services	10.05	4.16	14.21
Government sector	8.92	4.41	13.33
Wholesale trade	7.72	4.13	11.85
Transportation and warehousing	6.90	3.83	10.73
Support activities for agriculture and forestry	9.34	0.85	10.20
Construction	5.70	4.27	9.98
Information and cultural industries	5.18	3.61	8.79
Fishing, hunting and trapping	5.59	2.94	8.54
Forestry and logging	4.14	4.21	8.35
Manufacturing	3.05	3.66	6.71
Finance, insurance, real estate and rental and leasing	3.07	2.01	5.08
Utilities	2.47	1.79	4.26
Mining and oil-and-gas extraction	1.16	1.54	2.70
Source: Statistics Canada Input-Output Impact Assessment & Employment Multipliers for 2005.			

Statistics Canada's multipliers explicitly exclude the induced effect on the economy from changes in the income of those employed as a result of the increase in output. The induced multiplier effect will vary depending on the marginal propensity to consume and tax rate of those employed. Generally speaking, higher income individuals save more per dollar of increased income than lower income individuals. Conversely, lower income individuals will spend more per dollar increase in income.[32]

Therefore, the induced effect multiplier will be higher when lower income workers are hired or their hours of work and pay are increased. One way to determine the relative short-term multipliers from changes in employment and wages is to compare the average incomes of workers.

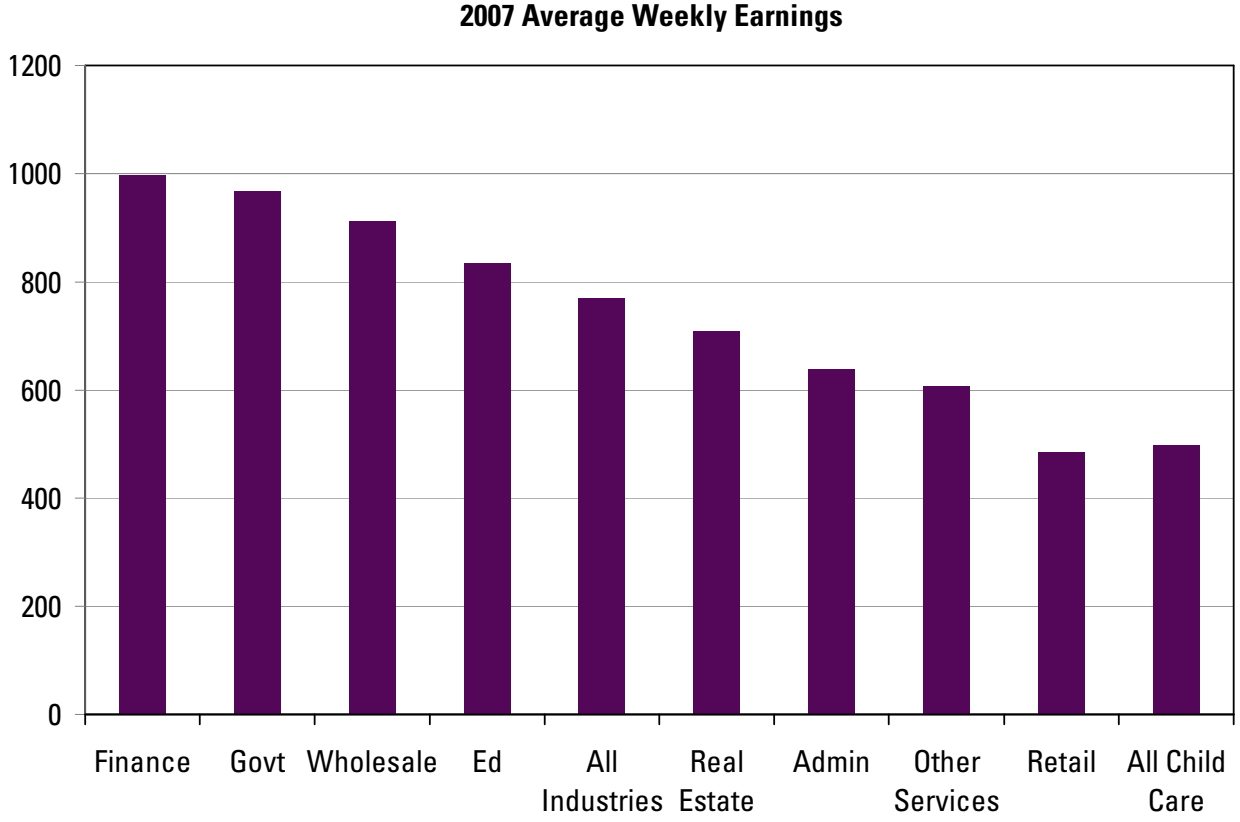
Figure 2 shows the average weekly earnings for 2007 from the Survey of Employment Payrolls and Hours (SEPH) for the industries that have a higher or the same GDP multiplier as the ECEC sector, with the exception of the non-profit institutions for which there are no data. Given the inverse relationship between wages and the marginal propensity to consume, one can conclude that stimulus to the ECEC sector would provide more induced stimulus to the economy than all of the other industries with a similar or higher GDP multiplier except for the retail sector.

[32] Dynan et al. (2004).

For example, Dynan et al. (2004) found for the U.S. that the marginal propensity to save was 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 α=1/(1-marginal propensity to consume) or α=1/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.

The tax leakage rises with income in Canada because of the progressive tax system. Using Ontario as a representative province, a per dollar increase in wage income at an annual salary of $25,895.48 (the annualized weekly earnings of the NAICS 6244 "Child day-care services" industry) would boost personal income taxes payable by 21 cents, while an income earner in the top marginal tax bracket would experience a tax increase of 47 cents per dollar. For workers who earn a mid-level of income equal to the average income of finance industry workers of $51,905 per annum, the marginal tax rate of an extra dollar of income was 31 cents in 2007.

FIGURE 2: Lower Wage Industries Provide Higher Short-Term Stimulus



There are other tax leakages beside income tax leakages. A portion of each dollar of earned income will be transferred to government via payroll taxes for employment insurance (EI) and the Canada and Québec pension plans (CPP and QPP). Notably, these payroll taxes have pensionable and insurable maximums above which additional amounts are not collected. So the marginal tax rates for these taxes become zero in the $40,000-$45,000 range.[33] As well, a portion of each dollar

[33] Ontario, which was used as the representative province, also has a health care levy that has periodic marginal tax rates of up to 25%. However, none of the industries examined had average wages in the range affected.

spent will go towards sales taxes. Sales tax rates and rules vary substantially across the country, with the combined federal and provincial sales tax rates (in 2008) ranging from 15.5% for PEI to only 5% for Alberta and the territories.

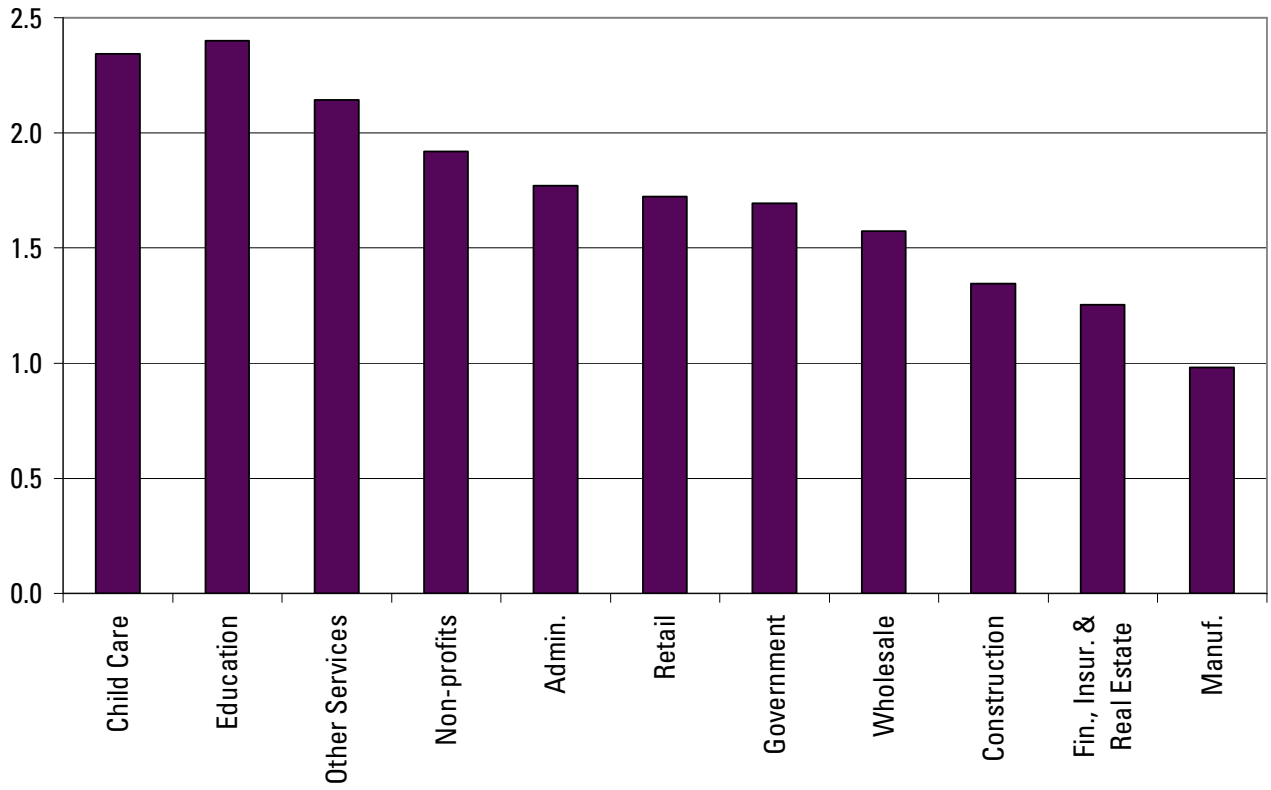
Lower income households have a lower effective indirect tax rate because they spend relatively more money on shelter and food, which have a lower incidence of indirect taxation. Using the information from the household spending survey for the lowest quintile shows an average incidence of 8.3% versus 10.9% for the highest quintile and 9.4% for a mid-level earner.

Assuming a marginal import leakage of 33 cents per dollar, which reflects the aggregate-imports-to-GDP ratio, and a sales tax leakage differentiated by level of income as indicated above, the induced multiplier for an increase in "Child day-care services" employment and wages would be 1.38 per dollar increase in employment income. This compares with a multiplier of 0.93 for the top tax bracket and a multiplier of 1.24 for mid-level earners. This means that the induced multiplier would be 11% higher for low-income earners than mid-level earners, using the same import leakage for the two categories of earners. Since higher income workers also tend to consume more imported goods and services per dollar increase in income, the divergence between these estimates would become even more pronounced. Using an import leakage of 20 cents per dollar of spending for low-income earners, 33 cents for mid-level earners and 40 cents per dollar for high-income earners, the induced income multipliers would be 1.81, 1.24 and 0.89 respectively.

In order to quantify what the total direct, indirect and induced effects would be for the "Child day-care services" industry compared with other industries, an additional set of calculations were performed to estimate the induced effect. For each industry, the direct employment effect was multiplied by the average annual wages for that industry in 2007 to estimate the direct wage effect. The average annual wage was estimated by multiplying the average weekly wage for that industry from the SEPH for 2007 by 52 weeks. The indirect employment effect for each industry was multiplied by the average industrial wage for 2007 to derive the indirect wage effect. Since there are different rates of leakages at different levels of income, these wage effects were adjusted to reflect the tax and import leakages. The tax leakage was estimated using the 2007 tax rates for Ontario as a representative province. 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.[34] It was assumed that there would be an additional sales tax leakage of 8.3 cents per dollar of consumption in the direct effect round, but 9.4 cents in subsequent rounds. This reflects the assumption that average workers would be employed as the economic stimulus spreads beyond the ECEC sector. No other adjustment was made to reflect different consumption patterns for different groups of consumers. It was also assumed that the average import leakage for the economy would be used to estimate the multipliers. Since lower-income workers consume proportionately fewer imported goods per dollar spent, this assumption will have a depressing effect on the estimated multiplier for low-income industries, such as child care versus other industries.

[34] This assumption essentially means that the estimate reflects an increase in average hours worked for those already employed, 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 therefore a higher multiplier. This is particularly true if many work part-time, which would lower the personal income tax leakage.

FIGURE 3: Lower Wage Industries Provide Higher Short-Term Stimulus



The results of the above analysis are reflected in Figure 3. The chart shows the combined direct, indirect and induced multiplier for the industries with the highest GDP multipliers plus the construction and manufacturing industries. The multiplier for the child care (ECEC) sector is much higher than for most of the major sectors listed. The reason for the high multiplier is two-fold. First, the industry has a very high direct employment multiplier per dollar of increased output because wages are low and wages are a very large share of total costs in the sector. Second, the low wages mean 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 ECEC output provides considerable short-term stimulus to the economy. This is not to say that the CCHRSC or the authors of this report are advocating for a continuation of a low wage for the sector, but only that an expansion of the child care sector as it currently exists would result in a large short-term multiplier.[35]

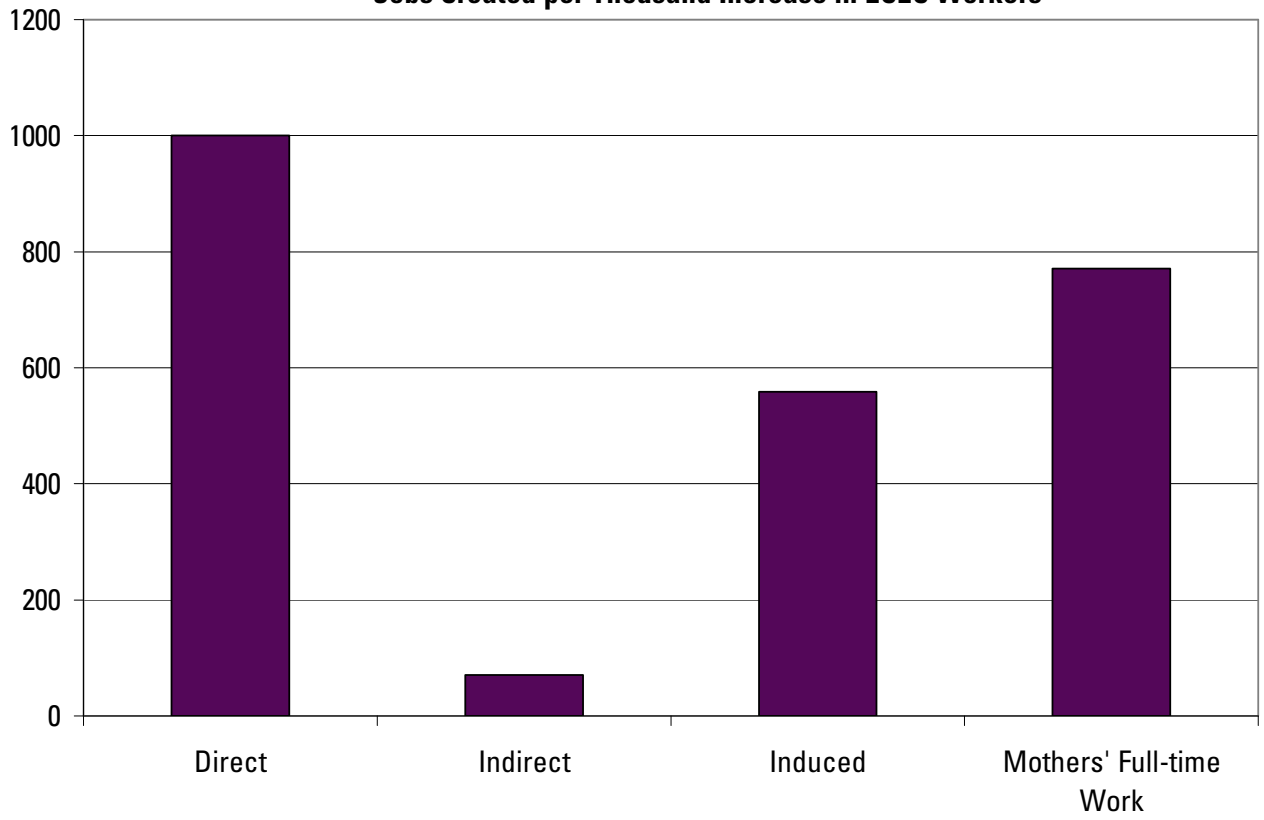
This view is corroborated by results found for the United States. In an examination of state-level multipliers for the child care sector Liu et al. (2004) find that the dominance of low-paid households among ECEC workers and in the service industries where the sector makes most of its purchases helps to explain why its multipliers are higher than most other sectors. These workers tend to spend all of their income on basic goods and services, which are more likely to be available in the local economy. In contrast, wealthier households are more likely to save, invest or purchase specialty

[35] A change in wage levels would impact the short-term multiplier in a number of ways. Clearly, the employment multiplier would be less, although the direct income effect would be the same. The induced effect would be affected because the marginal propensity to save and the tax rate are higher at higher income levels. There could also be an impact on parents depending on how the expansion is funded. If it is fully funded by an increase in child care fees, there would be a reduction in the demand for child care services and therefore on mothers' participation and employment rates.

goods or services outside the regional economy. Liu et al. (2004) estimate the induced effect from child care to be 0.42 compared with 0.39 for all other industries on average.

Notably the above discussion does not include the impact on the economy from more parents being available for work. This calculation is illuminating. It is assumed that for every extra full-time child care centre space, 0.22 mothers work full-time—a number extrapolated from Cleveland and Krashinsky's (1998) analysis. Using the age distribution of children and the child/staff ratios, one can conclude that for every 1,000 extra ECEC workers, 7,000 child care spaces would be created. If half of these are full-time spaces, then there would be 3,500 children put into full-time care, and then 770 (3,500*0.22) extra mothers would work full-time. The estimated number of direct and indirect jobs created is based on the input-output simulation. The number of jobs created by the induced effect was estimated by scaling up the wage effects from the direct and indirect effects using the multipliers estimated above for the low-wage and mid-level-wage groups respectively. Further, it was assumed that 60% of increase in GDP was wages, salaries and supplementary labour income (WSSL). To estimate the number of jobs that this increase in WSSL represents, the estimate was divided by the average increase in WSSL per job from the indirect input-output impact estimate, or specifically, $42,051, which is similar to the full-year full-time average employment income for women from the census of $41,331 for 2005.

FIGURE 4: Induced Plus Mothers' Job Effects more Important than Direct Jobs Created per Thousand Increase in ECEC Workers



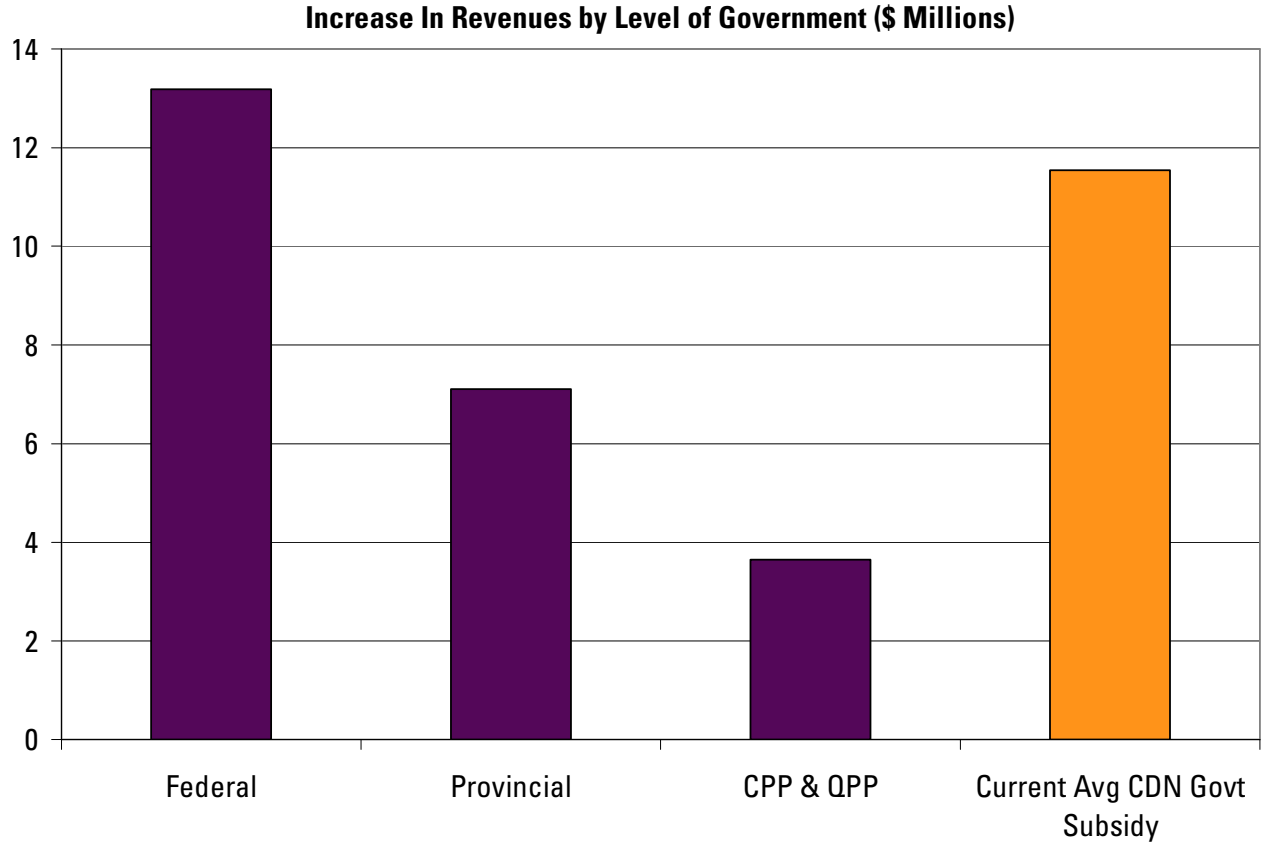
The increase in personal income, consumption and overall economic activity will also generate government revenues. In order to estimate the impact on government revenues, Ontario is used as a representative province. It is also assumed that all additional ECEC workers earn the average ECEC wage in 2007, and that all other workers earn the industrial average. The local government effects were very small in the direct and indirect estimate and were therefore not included in the analysis.

By assuming that all ECEC workers earn the average wage, the 2007 tax scheduled for Ontario can be used to estimate federal, provincial, EI and CPP deductions. These estimates were then scaled up to represent 1,000 additional ECEC

workers. Similarly, the average industrial wage was used with the Ontario tax schedule to determine the taxes owing for an additional job, and the results were scaled up to reflect the additional increase in jobs for the indirect, induced and mothers' increase in full-time jobs estimates. Furthermore, the various links in the multiplier chain were decomposed so that the sales tax leakages based on the marginal propensity to consume (MPC) and the estimated effective sales tax rates for people with different levels of income as discussed above could be 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 these assumptions. All other rounds assumed that workers had an average wage, an average MPC and an average effective sales tax rate. It was assumed that the import leakage would be the average rate of 33 cents per dollar for all income levels.

Once these calculations are done, it can be shown that all levels of government benefit from the increase in economic activity. The federal government gains the largest increase in revenues (including EI), followed by the provincial government and the Canada and Québec pension plans (CPP and QPP). 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 GST to PST tax rates, which are fairly constant across all income classes.

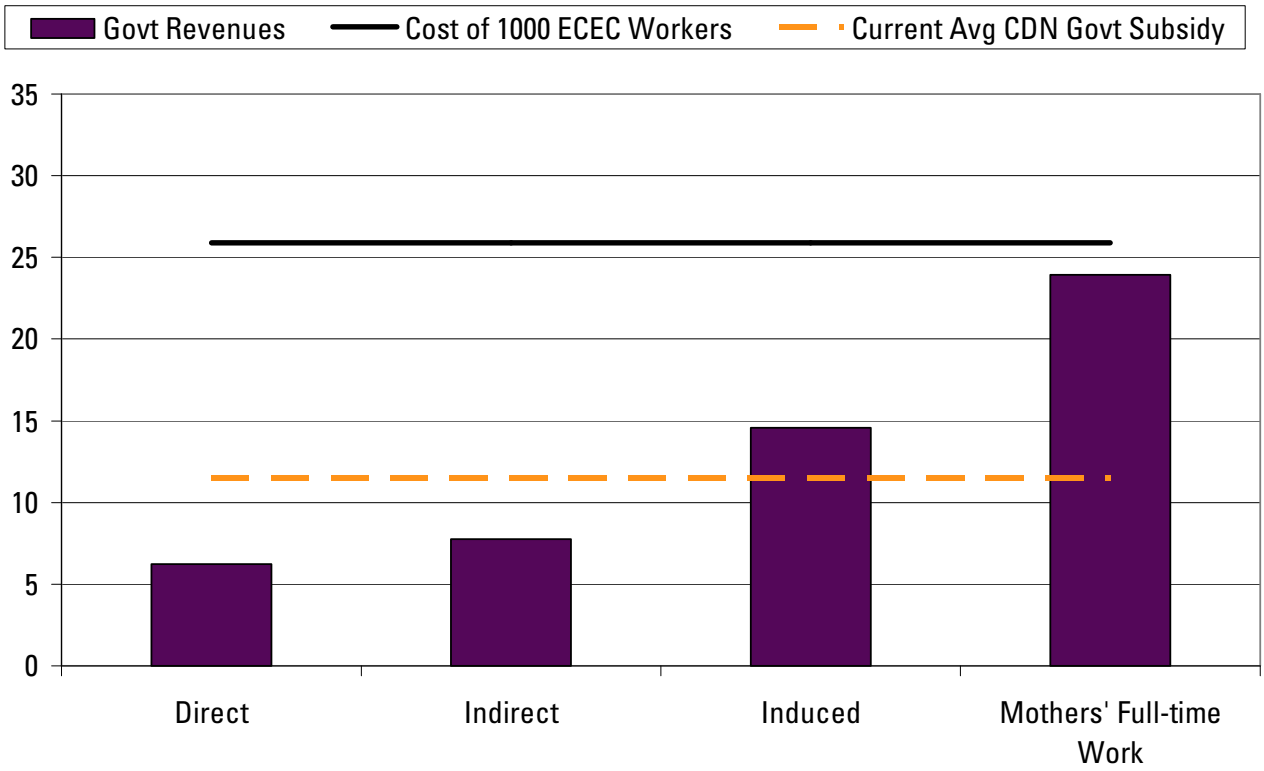
FIGURE 5: All Levels of Government Experience Higher Revenues



Notably, the cost of hiring 1,000 ECEC workers—total wages, salaries and supplementary labour income—is slightly more 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. And since some of these additional revenues accrue to the CPP and QPP the gap is even larger. However, the increase in governments' collective revenue is more than the increase in the average Canadian subsidy as identified by the input-output simulation. Also, it is useful to note that provincial governments are responsible for ECEC, and this level of government gains less revenue than the average subsidy and significantly less than the total cost of more ECEC workers. It is also important to keep in mind that

these wage costs do not include other costs of an expansion of the ECEC 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.[36]

FIGURE 6: Cumulative Total Government Revenues Exceed ECEC Costs



2C.ii. ECEC Long-Term Benefit-Cost Summary

Beyond the short-term stimulus that changes in expenditure and output provide to the economy, ECEC also affords considerable long-term benefits. This section summarizes a benefit-cost analysis that provides a more complete assessment of the benefits to society from ECEC than an input-output economic impact assessment can produce. (The full benefit-cost analysis is included in Appendix I and II.) Both the costs of providing ECEC and the overall benefits to participating children and mothers are estimated. The main parts of the benefit-cost analysis are:

[36] The impact of the expansion of ECEC services depends on if there is pent-up demand for ECEC 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 ECEC will find employment. Notably, the assumption of 0.2 mothers finding a job per new child care space along with the assumption that 0.6 informal child care spots are eliminated implies that the job finding rate must be around 50% for the 0.4 child care spots not taken by those previously in informal child care. In comparison, the average employment rate for all women with children at home under six was 62.8% in the 2001 cenus and was 63.8% in the 2006 census. If 10% of women do not want to put their children into child care no matter the circumstances, which is what has been reported by OECD (2006) for Sweden despite a universal child care system, and another 10% cannot find child care of acceptable quality and do not place their child in ECEC, then the employment rate would be 79%. Given that during the past two recessions the employment rate for mothers with children less than 6, or for women in general aged 25-44 fell by one percent or less the assumption of a 50% job finding rate seems conservative.

- ECEC costs and cost savings;
- child benefits and costs of ECEC;
- mother benefits and costs of ECEC; and
- calculation of benefit-cost ratio.

The net present value (NPV) calculations of formal ECEC costs and cost savings, benefits to children and benefits to mothers, along with an overall benefit-cost ratio for 2005 current Canadian ECEC are listed in Table 15 (using a real discount rate of 3%).

These calculations show that the benefit-cost ratio is 2.54. This estimate is based on conservative assumptions and is in the range of the benefit-to-cost ratios that other researchers have estimated for universal programs.[37] Note that the benefit-to-cost ratio for universal ECEC programs is generally lower than benefit-to-cost ratios for programs that target disadvantaged children.

Table 15: Summary of Costs and Benefits from 2005 Current Canadian ECEC

	Net Present Values (NPV)
NPV hourly costs of formal ECEC	$5.08
NPV hourly cost savings on informal child care	-$2.31
NPV hourly net costs of formal ECEC	$2.77
NPV hourly net benefits mothers	$5.42
NPV hourly net benefits children	+$1.62
NPV hourly net benefits from formal ECEC	$7.04
Benefit-cost ratio of formal ECEC	2.54

[37] Cleveland and Krashinsky (1998) estimated high quality ECEC would return over $2 for every $1 invested. Karoly and Bigelow (2005) estimated that a universal ECEC program in California would yield benefits of $2-$4 for every $1 invested. Belfield (2005) estimated that every $1 invested provides future benefits worth $2.25 for the Louisiana ECEC system.

2D. CONCLUSION OF BENEFITS AND COSTS

Benefits and costs of ECEC programs to an economy can be illustrated through dollar amounts and the benefit-cost ratio (long-term effect) and through a measure called a multiplier, which illustrates the rise in overall economic activity per dollar increase in expenditure for that particular program or project (short-term effect). Benefits of ECEC programs are consistently found to exceed costs, particularly for disadvantaged groups. The Chicago child-parent centres program and two randomized U.S. studies show benefits vastly exceeding costs. Benefit-cost analyses of broader ECEC programs show positive albeit smaller net benefits to society per dollar spent in the range of 2 to 1 or even higher. Our estimates for the Canadian ECEC sector show a benefit-cost ratio of 2.54 to 1.

ECEC program multipliers are shown to be higher than multipliers for other key sectors of the economy and for business subsidies. Multiplier estimates for Canada show that the ECEC sector has one of the highest multipliers of all major sectors. The sector also benefits the economy by allowing mothers to participate in the labour market. Mothers' labour market participation effect has a larger impact on GDP than the direct, indirect or induced effects. If this effect was also included in the multiplier estimate, this sector would have the largest short-term benefit of all the sectors in the economy. The boost to total government revenues from increased economic activity caused by an expansion in the number of additional workers almost equals the direct labour costs of hiring these workers. But no one level of government receives enough extra revenue to offset these costs and provincial government revenues gain by much less than the increase in total costs, and by less than the average Canadian direct subsidy to the sector.

The costs and benefits that were found in this report will be used in a later report to estimate the socioeconomic impact of workforce shortages in the ECEC sector across Canada.

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APPENDIX I : BENEFIT-COST ANALYSIS

This section contains a benefit-cost analysis that provides a more complete assessment of the benefits to society from ECEC than an input-output economic impact assessment can produce. As well, Appendix II examines the long-term human capital benefits of quality ECEC. Costs of providing ECEC are estimated, as are the overall benefits to participating children and mothers. The analysis concludes with an overall benefit-cost ratio per hour of ECEC in 2005. The three main parts of the benefit-cost analysis are:

- ECEC costs and cost savings;
- child benefits and costs of ECEC; and
- mother benefits and costs of ECEC.

ECEC Costs and Cost Savings

The analysis focuses on the costs and cost savings to society from changes in the number of children served by formal (centre) ECEC. An expansion in the number of children served by formal ECEC means that fewer children will use informal care. From the viewpoint of the formal ECEC sector, ECEC costs include wage and non-wage costs, while cost savings refer to savings from fewer informal child care spaces being used as the number of formal spaces increase. Wage costs refer to gross wages paid to all staff, while non-wage costs refer to non-wage labour costs, such as fringe benefits, as well as other operating expenses.

There are data from Statistics Canada for wage costs of workers in the "Child day-care services" Industry (NAICS 6244) from the Survey of Employment, Payrolls and Hours (SEPH). These data are available for all of Canada as well as the provinces and territories. Weekly and hourly earnings of employees paid by the hour and salaried employees are available from SEPH. There are also data on employment and hours worked for hourly paid and salaried employees. The hours worked data for salaried employees represent their standard work week. There are, however, some gaps in the publicly available wage data from Statistics Canada for confidentiality reasons. These restrictions affect the available data for the territories and Atlantic Canada to varying degrees. Average hourly wages for all workers in the industry are found by estimating the percentage of total hours worked by salaried employees and employees paid by the hour and multiplying these proportions by hourly wages for salaried and hourly paid workers respectively.

There are no data available that directly show current non-wage costs. There are data from Doherty et al. (2000) that show that in 1998 centres used 75.3% of their budget on average for wages, 8.9% for benefits, 10.0% for rent or mortgage and 5.6% for utilities. Once these fixed costs were covered, 3.0% or less of the average centre's budget remained for food, supplies, toys and equipment, in-service training for staff, repairs or unexpected emergencies, and consultation services. Notably, the ratio of wage to non-wage costs of around 3:1 is the same as the estimate that was used by Karoly and Bigelow (2005) for California. Doherty et al.'s wage and non-wage cost percentages are used to calculate the wage and non-wage costs in this analysis.

Wage and non-wage costs are converted into hourly terms for formal ECEC by taking into account the distribution of children in ECEC by age of the child and the child-staff ratio by age of the child. Hourly cost savings from informal care are found by multiplying the 0.63 informal child care spaces that are replaced by one formal space [38] by Cleveland and Krashinsky's (1998) estimate of hourly costs of informal care of $3 in 1998, which translates to $3.7 in 2005 after using 3% nominal wage growth. Wage and non-wage costs per hour for formal ECEC are estimated as $5.08, while cost savings on informal care per hour of formal ECEC are estimated as $2.31. Temple and Reynolds (2007) use net costs (costs less cost savings) for their estimate of the benefit-cost ratio of the Abecedarian program. This analysis will use the same methodology, which gives a net cost of formal ECEC of $2.77 per hour.

[38] Author's calculation based on Cleveland and Krashinsky 's (1998) predicted increase in formal child care spaces and decrease in informal spaces when universal ECEC is offered.

Benefits to Children

The benefits to children from current Canadian ECEC are approximated through several steps. First, key results from the Carolina Abecedarian program are selected for the estimation of current Canadian ECEC costs and benefits. Second, the above results are adjusted to reflect the Canadian situation. This is done to make it possible to estimate benefits from quality ECEC to an average Canadian child rather than a disadvantaged American child (these benefits are called the "adjusted Abecedarian benefits"). Third, adjusted Abecedarian benefits are converted to reflect current Canadian ECEC benefits by making an adjustment for differences in ECEC quality. Fourth, current Canadian ECEC benefits are converted to hourly terms.

Benefits from the Abecedarian Program

There are a large number of studies that have examined the benefits of quality ECEC. These studies were examined earlier in this report. Studies that follow a randomized experimental approach are the gold standard of research and provide unbiased estimates as to the benefits of ECEC. Of the two main experimental studies of ECEC costs and benefits, the Carolina Abecedarian study is preferable to the High/Scope Perry pre-school study, since the Carolina Abecedarian study is more recent and analyzes full-day rather than part-day ECEC. Five main results of the Carolina Abecedarian program are used to calculate current Canadian ECEC costs and benefits (see Table A.1).

Table A.1: Carolina Abecedarian Results

	Participants	Controls
Grade retention rate	31%	55%
Years in special education	1.0	1.5
Smoking rates	39%	55%
High school dropout rate	33%	49%
Math score (Woodcock Johnson)	93	82

Adjusted Abecedarian Benefits

The Carolina Abecedarian program deals with disadvantaged children, while current Canadian ECEC deals with all children. Since many articles have shown that disadvantaged children benefit more from quality ECEC, the Carolina Abecedarian results are adjusted downwards. To determine by how much to adjust the results downwards, estimates from Loeb et al. (2007) on ECEC score increases for disadvantaged and all children are used (see Table A.2). Dividing the average score increase for all children by the average score increase for disadvantaged children (very low income) gives an adjustment factor of 0.55. The adjustment factor is applied to the percentage achievement difference between Carolina Abecedarian participants and controls. The resulting Abecedarian adjustments are listed in Table A.3 on the next page.

The adjusted difference is then multiplied by Canadian data for the various results (retention, smoking, etc.)[39] and the consequent percentage point change in the Canadian results is multiplied by the value assigned to the results in order to give benefits per Canadian participant (see Table A.4). This gives a slight underestimate of the benefits from ECEC since the control group includes both participants and non-participants.

[39] Source for grade retention rates: Guèvremont et al. (2007), source for years of special education: http://www.tdsb.on.ca/wwwdocuments/about_us/environmental_scan_2007/docs/3-OurStudents080731.pdf

Table A.2: ECEC Score Increase			
	Math	Verbal	Average
Score increase – all	1.116	1.196	1.156
Score increase – very low income	2.015	2.191	2.103

Table A.3: Adjustments to Reflect Average Versus Disadvantaged Cohorts				
	Participants	Control	Difference	Adjusted Difference
Grade retention rate	31%	55%	-44%	-24%
Years in special education	1.0	1.5	-33%	-18%
Smoking rates	39%	55%	-29%	-16%
High school dropout rate	33%	49%	-33%	-18%
Math score (Woodcock Johnson)	93	82	13%	7%

Table A.4: Canadian Benefits Based on Adjusting Estimated Abecedarian Benefits (Five-Year-Olds, 2005)				
	All Children	Participants	Values	Benefits
Grade retention rate (grades 1-8)	34%	26%	9,700	797
% funding for special education	12%	10%	9,700	1,762
Smoking rates	20%	17%	396,923	12,633
Canadian high school dropout rate	13%	10%	9,700	219

The benefits for five-year-olds are listed in Table A.4 for illustration purposes. While the benefits for all age cohorts from zero to five are calculated, only the benefits to five-year-olds are listed in the table since it would be impractical to list benefits for each age cohort from zero to five. Note that due to discounting of future costs and benefits, the cost and benefits for zero to four-year-olds will be slightly lower than those for five-year-olds. It will take longer for the benefits to materialize since we assume that they occur at the same age for all participants (see Table A.7).

Benefits from decreased smoking are by far the highest benefits in Table A.4. The reduction in the need for special education is the second largest benefit, while the benefits from a reduction in grade retention rates are significantly lower and the estimated benefits from a reduction in high school dropout rates are the smallest. It should be noted that these estimates probably represent a conservative estimate of the total benefits since studies of the High/Scope Perry pre-school program found that there can be a reduction in criminal justice costs.

As shown in Table A.4, high quality ECEC results in the Canadian high school dropout rate falling from 13% to 10%. Assuming these additional graduates make the same postsecondary educational choices as current high school graduates, the percentage increase in postsecondary graduation rates can be calculated from the percentage decrease in those with less than high school (LHS) educational attainment. The additional postsecondary costs for ECEC participants are calculated using projected distributions of secondary and postsecondary certificates, diplomas or degrees of children born between 2000 and 2005 (see Table A.5). All costs/benefits are distributed along the participating child's lifetime according to assumptions to reflect when those costs would occur.

Table A.5: Estimated Future Postsecondary Costs for Five-Year-Olds					
	Graduation Parchment	LHS % Decrease	Cost/Year ($)	Education (Yrs)	Cost/Participant
High school	21.2%	-	-	-	-
Trades	12.5%	2.3%	10,586	2	60
College	23.0%	2.3%	10,586	2	110
Some university	2.6%	2.3%	16,000	2	19
Bachelor	21.5%	2.3%	16,000	4	311
Post-Bachelor	6.6%	2.3%	25,000	6	319

Table A.6: Benefits of ECEC to Five-Year-Olds (2005)	
	NPV (3% Discount Rate)
Earnings of participating children	$17,326
Total adjusted Abecedarian earnings	$21,772

Growth theory underscores the importance of education (human capital accumulation) to long-term economic growth. A long-term growth model was used in order to estimate the long-term benefits that are provided by quality ECEC. Specifically, the education gap between ECEC participants and non-participants was used to estimate the impact of ECEC participation on long-term economic growth following the approach used by Dickens et al. (2006). (See Appendix II for details.) The net present value (NPV) of enhanced long-term growth for a five-year-old child in 2005 is estimated as being $17,326 (at a 3% real discount rate).

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 ECEC 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 ECEC benefits from higher earnings among future offspring of ECEC participants. For the Canadian situation, these calculations would result in a higher NPV of $1,984 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 A.6, one can see that the future earnings of participants represent the most important benefit for them. Table A.7 lists the NPV of benefits by age of child. The age cohorts of one through four account for most of the children in ECEC.

Table A.7: 2005 Child Benefits by Birth Cohort			
Cohort	Age of Child	NPV Child Benefits	Percentage of Children
2000	5	$21,772	5.5%
2001	4	$21,379	18.9%
2002	3	$20,993	23.0%
2003	2	$20,616	21.2%
2004	1	$20,247	24.8%
2005	0	$20,318	6.6%

Adjusting Benefits for Quality

The adjusted benefits calculated above are converted to reflect current Canadian ECEC by adjusting for quality differences. Two structural quality measures are used in this analysis: staff-child ratios and staff education. Staff-child ratios for the Carolina Abecedarian program and for current Canadian ECEC are listed in Table A.8 below. Current Canadian staff-child ratios are calculated from provincial child-staff ratios, weighted by population. According to Galinsky (2006), most of the Carolina Abecedarian teachers had college degrees. For current Canadian ECEC, data on the percentage of workers with ECE qualifications is used (see Table A.9).

The method used for this analysis is to connect ECEC benefits to structural quality measures through test score observations. First, the adjusted Abecedarian benefits are connected to test scores. Abecedarian program quality is the baseline quality measure and is assumed to yield quality benefits of 100%. The Abecedarian program is found to increase Woodcock Johnson math scores by 7.4 points. Therefore, each point increase in test scores yields 13.4% of the child benefits from the Abecedarian program. Second, test scores are connected to the main process quality measure of child care centres—the Early Childhood Environment Rating Scale (ECERS)—where the maximum score is seven and minimum score is one. Helburn (1995) connected these two quality measures by estimating that a point increase in ECERS will increase Woodcock Johnson test scores by 1.2 points. Third, process quality is linked to structural quality by using estimates from Doherty et al. (2000)[40], which measures the impact of staff-child ratios and staff education on ECERS (see Table A.10).

Table A.8: Child-Staff Ratio by Age of Child

Age of Child	Carolina Abecedarian	Current Canadian
6m - <1 yr	3	3.8
1 year	3	4.8
2 years	3	7.0
3 years	6	8.1
4 years	6	8.6
5 years	6	10.8

Table A.9: ECEC Worker Education

	% of workforce
ECE	37
Non-ECE	63

Table A.10: Impact of Structural Quality Measures on ECERS

Room characteristics' impact on ECERS	
Staff-child ratio	0.18
Teacher education impact on ECERS	
Percentage of staff with ECE education	0.32

The results in Table A.10 show that higher staff-child ratios and a higher proportion of ECE-educated staff enhance quality. Since most Carolina Abecedarian staff had college degrees and the Abecedarian program was of high quality (and

[40] Doherty, G., D. Lero, H. Goelman, J. Tougas and A. LaGrange (2000). *You Bet I Care - Caring and Learning Environments: Quality in Regulated Family Child Care Across Canada.* Centre for Families, Work and Well-Being, University of Guelph, Ontario.

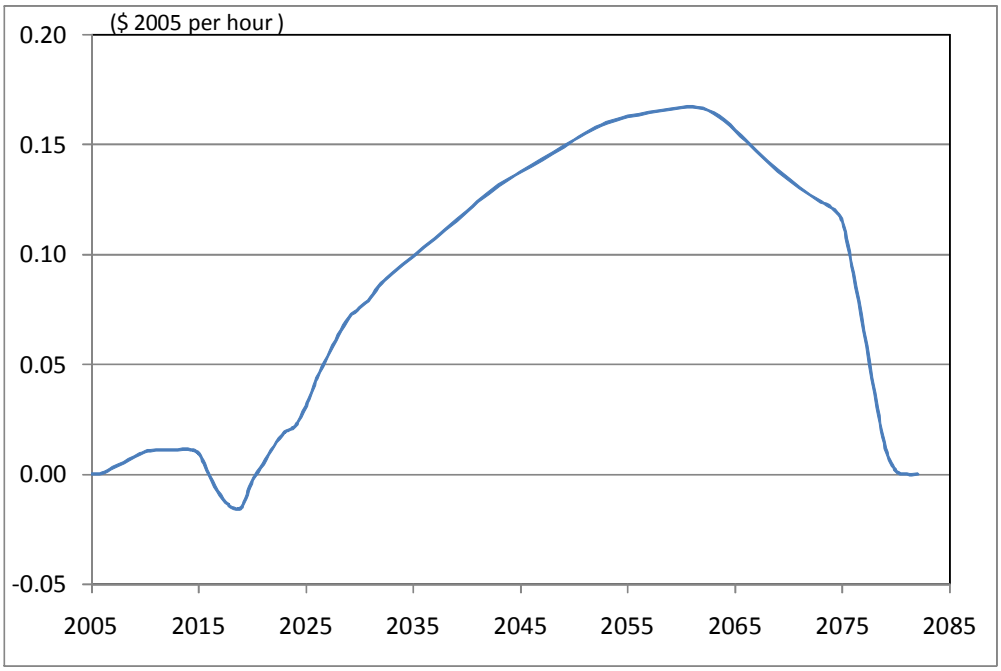
due to the difficulty of comparing Canadian and American degrees), the impact on ECERS from Carolina Abecedarian education is set equal 0.32, since all Carolina Abecedarian educators have ECE degrees. If anything, this assumption will decrease the benefits from current Canadian ECEC, since the education gap between Abecedarian and Canadian ECEC workers is most likely lower than assumed in the analysis.

Overall, the impact of higher child-staff ratios (or lower staff-child ratios) and less qualified workers in current Canadian ECEC on child benefits is around 2%-3%. That is, child benefits from current Canadian ECEC are about 97%-98% of benefits from the adjusted Abecedarian program results discussed in the previous section.

Hourly Benefits to Children from Current Canadian ECEC

The Abecedarian program ran for 50 hours a week, 50 weeks a year for five years. This means that the total amount of time a Carolina Abecedarian participant spent in ECEC is 12,500 hours. The NPV of current Canadian ECEC is found by multiplying the quality-corrected benefit NPVs of differently aged children by their percentage distribution in ECEC. Dividing the NPV of current Canadian ECEC by 12,500 gives an hourly benefit per participant of $1.62. Undiscounted child hourly benefits over time are illustrated in Figure A.1.

FIGURE A.1: Hourly Benefits per Participating Child



Benefits to Mothers

The majority of mothers using ECEC choose to participate in the workforce. An additional formal ECEC space will create an additional 0.22 full-time workers[41] (for every formal child care space created 0.63 informal child care spaces are eliminated). This section considers the maternal employment benefits from formal ECEC.

There are two main benefits to full-time employed mothers using ECEC: immediate wage gains from participating in the workforce and future wage gains accruing from greater work experience. Although some mothers are in an educational program, this is not explicitly considered in the analysis. It is assumed that staying at home with children does not change educational decisions but does delay entry into the workforce.

[41] Author's calculation based on Cleveland and Krashinsky's (1998) predicted increase in formal ECEC spaces and maternal employment when universal ECEC is offered.

To make estimating current and future wage gains as simple as possible, the earnings comparison will be between a mother spending a year at home with a child versus a mother of the same age spending a year in the workforce with a similarly aged child in ECEC. We assume that the length of time the mother is out of the labour force makes no difference to hourly maternal benefits (earnings in Table A.11 for a full year leave are twice those in Table A.12 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 A.13 show 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 ECEC to upgrade their training and therefore have a higher future income path.

Table A.11: Earnings to Mother of a Five-Year-Old Child from Working an Extra Year (2005$)

Age of Mother	2005	2006-2080 NPV	2006-2080 (Undiscounted)
20	29,685	31,266	99,063
25	32,306	30,180	94,255
30	35,284	28,466	54,396
35	38,263	26,423	47,065
40	38,914	26,483	42,272

Table A.12: Earnings To Mother Of A Five-Year Old Child From Working an Extra Half Year (2005$)

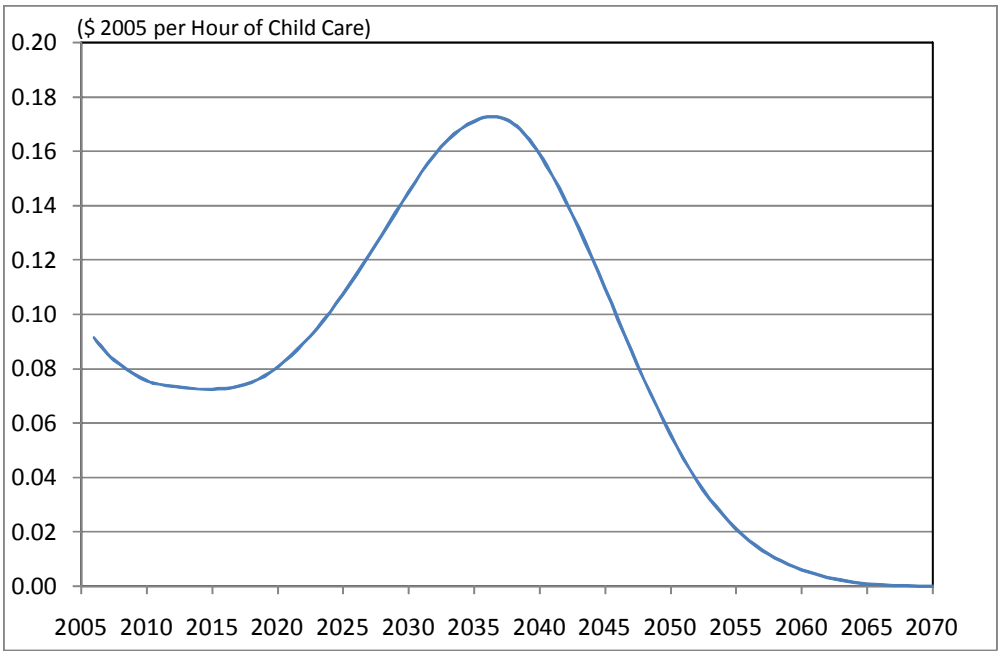
Age of Mother	2005	2006-2080 (NPV)	2006-2080 (Undiscounted)
20	14,843	15,633	49,531
25	16,153	15,090	47,127
30	17,642	14,233	27,198
35	19,131	13,211	23,532
40	19,457	13,241	21,136

Table A.13: 2005 Maternal Benefits by Birth Cohort (2005$)

Cohort	Child Age	NPV Benefits	Percentage of Children (%)
2000	5	$63,267	5.5
2001	4	$63,060	18.9
2002	3	$62,824	23.0
2003	2	$62,582	21.2
2004	1	$62,291	24.8
2005	0	$61,979	6.6

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 ECEC space to find mothers' hourly benefits from ECEC. The NPV of mothers' hourly benefits from ECEC is $5.42, of which $2.84 are immediate wage gains. Figure A.2 shows the undiscounted future hourly benefit profile to mothers giving birth in 2005.

FIGURE A.2: Maternal Benefits



APPENDIX II : GROWTH MODEL

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

$$(1)\ Y_t = A_t K_t^a \left(H_t L_t\right)^{1-a} H_t^y$$

Where,
Y_t is GDP
A_t is technology (often referred to as total factor productivity)
K_t is (physical) capital
H_t is human capital
L_t is hours 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:

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

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. The constant a is set equal to the Dickens et al.value of 0.347. L_t is extrapolated from population and labour-force participation rate (LFPR) forecasts for the period 2006-2080. H_t is extrapolated from population, LFPR, earnings by degree and degree distribution forecasts for the period 2006-2080. Unlike in Dickens et al.. H_t is assumed to develop independently of Y_t and K_t. This is done in order to more accurately measure the development of human capital through rich Canadian data for earnings, degrees and LFPR. Although the approach of Dickens et al. is closer to that of the original version of the Solow human capital model, the dataset they use is more inaccurate and is furthermore not readily estimable using Canadian data.

A_t can be estimated for the period 2006-2036 through equation 2 since the values for Y_t, K_t, H_t and L_t are known in that period. A_t is then assumed to grow at the 2006-2036 annual rate in the period 2036-2080. K_t can be extrapolated in the period 2036-2080 using the following capital growth equations (H_t does not enter as it evolves independently of Y_t and K_t):

$$(3)\ K_{t+1} - K_t = sY_t - \delta K_t$$

The constants s and δ stand for savings rate and depreciation rate respectively. Assuming steady state this equality can be set equal to zero giving:

$$(4)\ K_t = \frac{s}{\delta} Y_t \quad \text{or} \quad (5)\ K_{t-1} = \frac{s}{\delta} Y_{t-1}$$

Inserting equation 2 into equation 4 and rewriting gives:

$$(6)\ K_t = \left(\frac{s}{\delta} A_t\right)^{\frac{1}{1-a}} \left(H_t L_t\right)$$

Combining equation 4, 5 and 6 gives:

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

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 (AM) is estimated on the basis of one extra child attending ECEC. A_t is the same as before. L_t and H_t differ slightly from before due to a slightly different degree distribution. K_t is calculated from equation 8 (see below) which multiplies the base model K_t by the proportional adjustment between the base model and the alternative model. Y_t is then calculated through equation 2. The growth impact per participant is found by subtracting base model Y_t from alternative model Y_t.

$$(8)\ K_t^{AM} = \frac{\left(\frac{H_t L_t}{H_{t-1} L_{t-1}} K_{t-1}\right)^{AM}}{\left(\frac{H_t L_t}{H_{t-1} L_{t-1}} K_{t-1}\right)^{BM}} K_t^{BM}$$

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.

Asymmetric Information or Information Asymmetry- A transaction where one party has more or better information than the other. This creates an imbalance of power in the transaction. In other words, a consumer can know less about the attributes of a product than the seller. The costs of finding out information are prohibitive so the consumer remains less knowledgeable. For example, if a car is a lemon, only the seller of the car knows it is not a good car. Asymmetric information means that there is still a market for cars that are lemons.

Base Year - The time period used to determine the base for dollar calculations—normally the first year of the analysis.

Baseline - A term used to describe: (1) use of status quo costs and benefits as a basis for developing costs and benefits for alternatives during the cost-benefit analysis and, more importantly, (2) use of costs and benefits projected for the selected alternative during the cost-benefit analysis as a basis for comparing actual costs and benefits during cost-benefit measurement.

Benefits - Quantitative and qualitative improvements expected or resulting from a systems investment.

Benefit-Cost Ratio - An economic indicator of cost-effectiveness—the amount of benefits returned for each dollar invested. The ratio is computed by dividing present value benefits by present value costs.

Business Subsidies: Transfers from government to the business sector toward current costs of production. These transfers represent additions to the income of producers from current production. Subsidies can be linked to production factors (such as capital and labour) or products.

Constant Dollars - Dollars which reflect the prices of the base year of the system's life. Constant dollars do not consider the effect of inflation and are normally used in cost-benefit analysis. Constant dollars are always associated with a base year—such as, "Fiscal Year 1994 constant dollars"—normally the first year of the analysis. (Constant dollars are sometimes referred to as real dollars.)

Correlation Study - Usually synonymous with non-experimental observations study; a study that simply observes the size and direction of a relationship among variables.

Cost Effective - Returning a benefit that justifies the initial investment.

Cost Savings - Benefits realized by eliminating a planned expenditure, such as a budgeted or contractual expense.

Current Dollars - Dollars which have been adjusted to reflect the effect of inflation on prices. Current dollars are normally used in budget projections. (Current dollars are sometimes referred to as nominal dollars.)

Discount Rate - A rate used to relate present and future dollars. Discount rates are expressed as a percentage and are used to reduce the value of future dollars in relation to present dollars. This equalizes varying streams of costs and benefits, so that different alternatives can be compared. Discount rates reflect the time value of money.

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

Discounted Costs or Benefits - Future years' costs or benefits that have been multiplied by a discount factor to convert them to their present value; also called present value costs or benefits.

Economic Development - Economic development is typically measured in terms of jobs and income, but it also includes improvements in human development, education, health, choice and environmental sustainability.

Economy - The realized 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, wherein each organization involved in system development, operation and use estimates, averages, and projects its costs. Sometimes referred to as the bottom-up method.

Experiment - A study in which an intervention is deliberately introduced to observe its effects.

Fixed Cost - Costs that do not vary over time.

General Equilibrium – Equality of supply and demand in all markets of an economy simultaneously.

GDP – Gross Domestic Product.

Human Capital - The sum total of a person's productive technical knowledge, skills and experience.

Indirect Effects - Counts the multiple rounds of inter-industry purchases spurred by ECEC industry spending. ECEC 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.).

Inflation - A persistent rise in the general level of prices over time.

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

Moral Hazard - Related to information asymmetry, this is a situation in which one party in a transaction has more information than another, especially with respect to its actions and intentions. The party with more information has a tendency or incentive to take advantage of the other party in a commercial transaction.

Market Failure – An economic concept where the allocation of goods and services by a free market is not efficient. Market failure is a situation where the free market outcome is an unsatisfactory result for the society.

Natural or Quasi-Experiment - A naturally occurring instance of observable phenomena which approximate or duplicate the properties of a controlled experiment. In contrast to laboratory experiments, these events aren't created by scientists, but yield data which nonetheless can be used (commonly through the use of instrumental variables) to make causal inferences. Natural experiments are a common research tool in fields where artificial experimentation is difficult, such as economics, cosmology, epidemiology, and sociology.

Net Benefit or Cost - The result of subtracting the total present value costs from the total present value benefits. Where benefits exceed costs, the result is a positive number, referred to as a net benefit. Where costs exceed benefits, the result is a negative number, referred to as a net cost. See also "Net Present Value".

Net Present Value (NPV) - The result of subtracting the total present value costs from the total present value benefits. Also referred to as net benefit or net cost.

Nominal Dollars - A synonym for current dollars.

Non-experimental - also known as **correlational**, **passive observational**. Presumed cause and effect are identified and measured via correlational analysis, but other features of experiments are missing.

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

Present Value - The estimated current worth of future benefits or costs derived by discounting the future values using a selected discount rate and factor.

Quasi-experiment –An experiment in which units are not assigned to conditions randomly. Often matching, as opposed to random, assignment is done.

Randomized Experiment - An experiment in which units are assigned to receive the treatment or an alternative condition by a random process.

Real Dollars - A synonym for constant dollars.

Sensitivity Analysis - A technique of assessing the extent to which changes in assumptions or input variables will affect the ranking of alternatives.

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

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

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

Undiscounted Costs or Benefits - Future years' costs or benefits that have not been multiplied by a discount factor to convert them to their present value - in other words, projected costs or benefits.

Variable Costs - Costs that are volume-sensitive: for example, charges for computer services are often volume-sensitive.

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