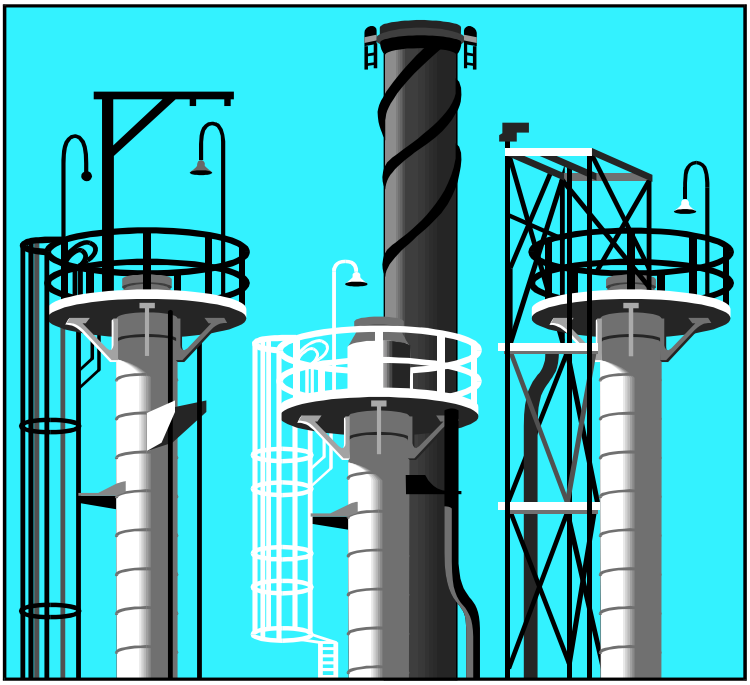


Ontario Chemical Industries Council

Human Resources Initiative

Labour Market Scan: A Demographic Analysis of the Production Work Force in Ontario's Chemical and Chemical Products Industry - Final Report

Prepared by

RAL Consulting Limited
Stoney Creek, Ontario

July 2000

Part 1: Introduction

Purpose, Approach, and Scope of the Report

The purpose of the report is to conduct a preliminary demographic analysis of two strategic components of the production worker force within Ontario's chemical and chemical products industry -- the Process Operator and Skilled Trades occupational categories. The case study approach is employed. The work force profiling is based on data provided on a confidential basis by two companies in different segments of the industry.

The scope of the report encompasses three substantive components:

1. The identification of economic and demographic trends in the external environment of the chemical and chemical products industry in Ontario.

2. The development of demographic profiles of the participating companies' current and past production workers in the selected occupational categories.

3. Observations and recommendations regarding the strategic human resource issues facing the industry and an agenda for future research.

Demographic Analysis

Overview

Demographics is the study of human populations. In simple terms, its focus is people. Demographers are interested in understanding the trends and market or public policy implications associated with the natural increase in the population (i.e., the difference between births and deaths); the migration of people from one city or region to another or between countries; and the distribution in the population of characteristics such as age, gender, ethnicity, and race. These concerns can be adapted to the study of "organizational populations".

From an economic perspective, people can generate demands for private or public goods and services and they can be involved in the production and supply of these goods and services. In other words, people can be customers and clients as well as employers and workers in the economy. David K. Foot has demonstrated the strategic value of conducting economic analysis on the foundation of demographics. Foot's "life cycle" approach places primary emphasis on the explanatory power of two variables, age and population size. The utility of demographic analysis for decision-makers in business and government is that it explains "about two-thirds of everything"[1].

Demographic analysis has implications for every business sector in Canada, both in terms of the demand for goods and services and the capacity of the labour market to supply the workers necessary for the production of the goods and services in demand. With respect to the labour market, two perspectives should be kept in mind. First, by the 1980s the sheer size of the "baby boom generation" began to put pressure on the vertical structure and linear career paths

[1] David K. Foot with Daniel Stoffman, Boom, Bust & Echo 2000: Profiting From the Demographic Shift in the New Millennium (Toronto: Macfarlane Walter & Ross, 1998), page 8.

characteristic of large-scale public and private corporations, thereby making the transition to flatter corporate structures with spiral and transitory career paths inevitable. By the 1990s economic factors, some global in origin, increased the pressure on corporate leaders to improve short-term financial performance. Downsizing, with its emphasis on containing costs through job cuts and related measures, met this short-term goal but created longer-term problems that will be exacerbated by future demographic trends. Downsizing, in conjunction with population aging, has created organizations that are characterized by varying degrees of "age imbalance". This issue has a significant impact on an organization's effectiveness and efficiency. Among other factors the age profile of an organization potentially affects technological literacy, client responsiveness, and succession planning.

Boom, Bust & Echo

Population aging is now a well-established trend in Canada and the United States that is expected to continue into the new millenium. Our analysis is based on the perspective that the aging of the massive (approximately ten million) "baby boom generation" born in Canada between 1947 and 1966 drives this trend:

- In 2000 the boomers range in age from 34 to 53, a period in which they constitute about 49 percent of the labour force in Ontario. Since "every year boomers will get a year older", over the next ten years they will age into the 44 to 63 range. During this period some of those born at the front end of the boom will either retire or change significantly their participation in the labour force.

- The "baby bust" cohort, born between 1967 and 1979, is the group that followed the boom and in 2000 its members range in age from 21 to 33. It is considerably smaller than the boom cohort (55 percent of the boom) but its significance, for our purposes, is where the members of the bust cohort are currently positioned and will be positioned over the next ten years in the life cycle. At present, some members of this cohort are in the post-secondary educational system while others are attempting to establish themselves in their careers. During the first decade of the millenium, the bust cohort will age into the 31 to 43 range and be almost fully deployed in the labour force.

- The "baby boom echo" is the cohort that represents, for the most part, the children of the boomers. Its members were born between 1980 and 1995, with births reaching a peak in Ontario in 1990. "Echo kids" constitute the bulk of Ontario's youth, ranging in age from 5 to 20 in 2000. As the front end of this cohort prepares to enter college and university or the labour market, those born at the back end are enrolled in day care and on the cusp of moving into the primary level of the educational system. The echo cohort is about 65 percent of the boom cohort. Therefore, as it ages over the next ten years (into the 15 to 30 range), there will be a discernible impact on the educational system and the labour market. Members of the echo cohort will be at the forefront of workers who understand the latest technology.

Data Sources

The report is based on both private and public data sources. Two companies furnished the private data on a confidential basis. The companies' data cover most of the variables we required to conduct our analysis including the age, gender, employment status, occupational category, and attrition patterns of almost 400 workers in Ontario's chemical and chemical

products industry. We acknowledge the support provided by the companies' staff who assisted with the categorization and collection of data.

Most of the public data are available from Statistics Canada. We acknowledge the strategic role of Canada's national statistical agency in the collection of demographic, economic, and social data that is important for planning and decision-making in both the public and private sectors.

Organization of the Report

The remainder of the report is organized in terms of three parts:

- *Part 2* looks at *External Environment*. It examines the economic and demographic context of Ontario and the chemical and chemical products industry. The population and the labour force of Ontario are analysed from the perspective of past, current, and projected trends. This part sets the stage for the analysis in the rest of the report.

- *Part 3* contains the profiles of the production work forces of the participating companies. The work forces are analysed with respect to age and gender, occupational category, and employment status. The factors of recruitment and retirement are also examined.

- *Part 4* identifies the major Observation*s and Recommendations* emanating from our analysis. The emphasis is on the identification of issues and an agenda for future research.

Project Team

RAL Consulting Limited has carried out this project under contract to the Ontario Chemical Industries' Council Human Resources Initiative. The members of the RAL project team are:

Richard Loreto (project manager)
President
RAL Consulting Limited

Tom McCormack
President, Strategic Projections Inc.
Associate, RAL Consulting Limited

Gerald Bierling
McMaster University
Associate, RAL Consulting Limited

Part 2: Ontario's Chemical and Chemical Products Industry - External Environment

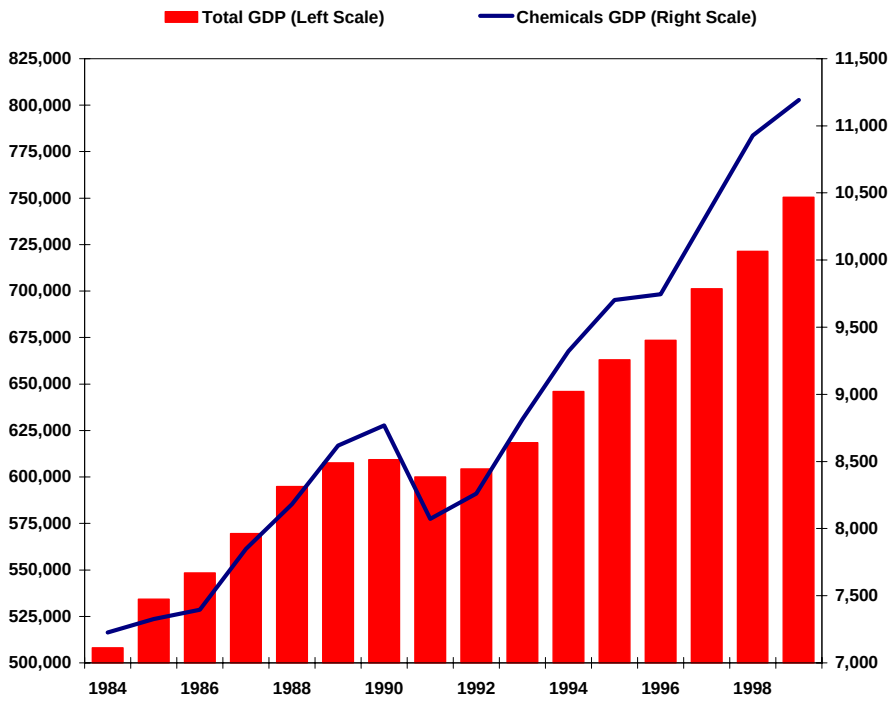
This part of the report reviews the economic and demographic environment within which the Ontario chemical and chemical products industry has operated in recent years, and within which it is expected to operate over the next decade.

The Economic Environment

Canadian Chemical and Chemical Products Industry: Overview

The chemical and chemical products industry (hereinafter referred to as the "chemical industry) in Canada was hard hit by the recession of the early 1990s, relatively more so than the economy as a whole (Chart 2-1). Chemicals output fell by 7.9 percent in 1991 compared to a decline of just 1.5 percent for economy-wide production. However, chemicals output has been growing steadily in recent years. Indeed, between 1991 and 1999, the industry's real domestic product – its value added measured in millions of constant 1992 dollars – grew at an average annual rate of 4.4 percent, well ahead of the 2.7 percent pace achieved by the economy as a whole.

Chart 2-1
Canada's Chemical Industry Output Compared to Economy-Wide Output
Real GDP in Millions of Constant 1992 Dollars

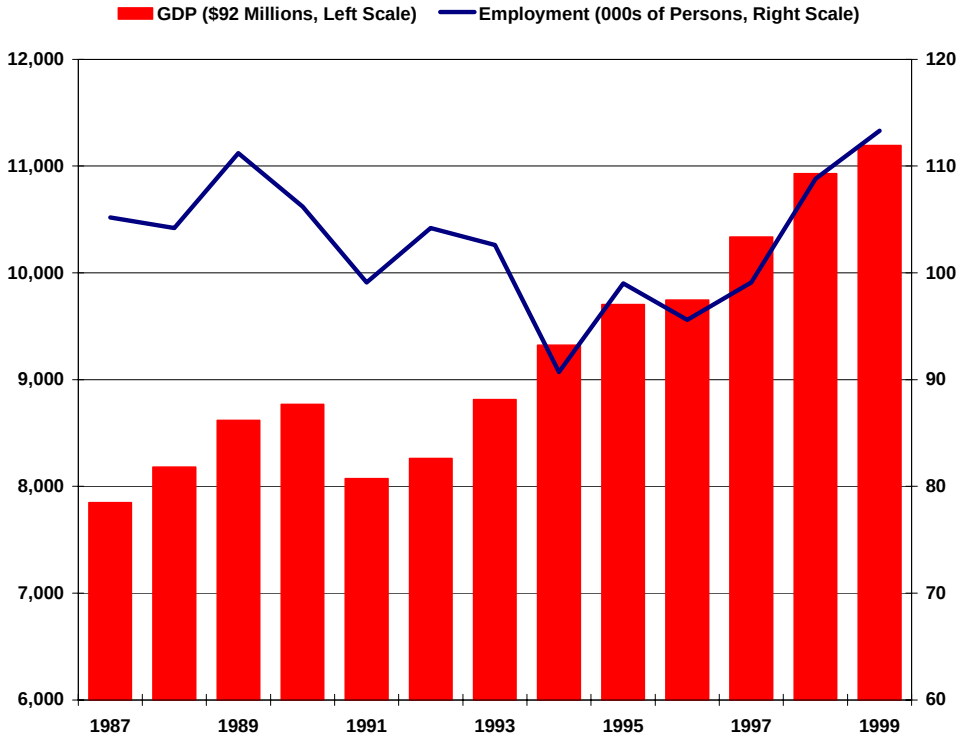


Source: Statistics Canada

Between 1987 and 1994 the number of jobs held by workers in the chemical industry in Canada fell gradually, even though the industry's production levels – except during the

recession period – were generally increasing over this period (Chart 2-2). This period of restructuring resulted in an increase in the average output per worker in the industry from just under $75,000 in constant 1992 dollars in 1987 to more than $100,000 per worker in constant 1992 dollars by 1994, or a gain of one-third over a period of just 7 years. The decision to restructure was, no doubt, mandated by management to consolidate the industry's position within the free-trade environment, and it appears to have paid off since the industry grew considerably faster than most others in Canada over that time. Although the productivity gains have slowed for the moment, the rate of industry job creation has kept pace with production since 1994. As of 1999 some 113,000 persons were employed in the chemical industry in Canada, more than in the pre-recession peak employment year of 1989.

Chart 2-2
Canada's Chemical Industry
Real GDP and Employment

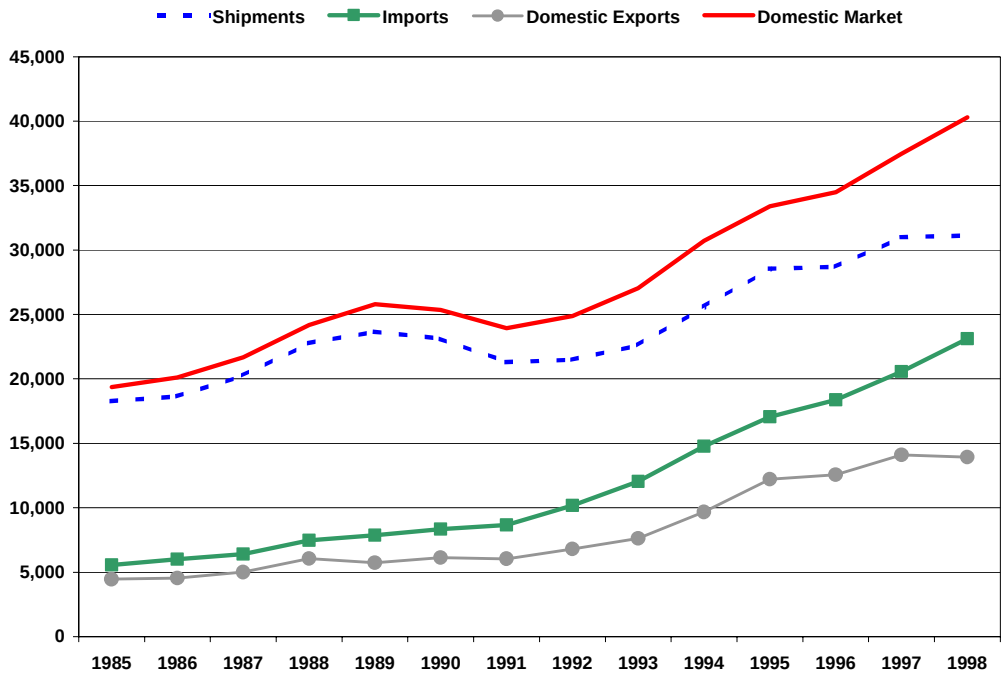


Source: Statistics Canada and Strategic Projections Inc.

The shipments of chemical products by Canadian producers have not kept pace with the fast growing domestic market for chemical products (Chart 2-3). The domestic market – estimated by taking the value of shipments of Canadian chemical producers less that portion of such shipments headed for foreign markets (exports) but augmented by the shipments of foreign producers to Canada (imports) – grew from just under $20 billion in 1985 to just over $40 billion in 1998. Over the same period the shipments of chemical producers grew from

just over $18 billion to just over $31 billion. Over this period the industry's export orientation (exports as a percent share of shipments) increased from 24 percent to 44 percent, while the import penetration (imports as a percent share of the domestic market) it faces increased from 29 percent to 57 percent.

Chart 2-3
The Domestic Market for Chemicals in Canada
Chemical Industry Shipments, Imports and Exports
Millions of Dollars



Source: Statistics Canada and Strategic Projections Inc.

Canadian Chemical Industry by Segment

Statistics Canada breaks the chemical industry into nine separate categories (see Table 2-1).

Chemicals produced for other industries are broken into four segments: those produced for the agricultural sector, those produced for the plastic and synthetic resin sector, those that are inorganic (and not captured elsewhere), and those that are organic (and not captured elsewhere). Between 1984 and 1998 agricultural chemicals grew by just 33 percent while plastic and synthetic resin chemicals grew by 257 percent. Industrial organic chemicals grew by almost 63 percent compared to just under 16 percent for the inorganic segment. Among these four sectors, plastic and synthetic resin chemicals now account for the largest volume of industrial chemicals value added.

Chemicals produced mainly for the household sector also witnessed a mixed growth pattern from 1984 to 1998. Only the pharmaceuticals/medicine segment grew faster than chemicals

as a whole – its value added grew more than 91 percent over this period – while the paint and varnish and the toilet preparations segments barely grew at all. The soaps and cleaning compounds segment grew by just 21 percent and the "other" chemical industry, which includes inks, adhesives, etc., by just over 22 percent.

As a point of reference, Canada's total population grew by 18 percent between 1984 and 1998. Thus, every segment of the chemical industry witnessed production growth exceeding that of the population except for the inorganic industrial, paint and varnish, and toilet preparations segments.

Table 2-1
Canadian Chemical Industry Output by Segment
Real GDP in Millions of Constant 1992 Dollars
1984 and 1998

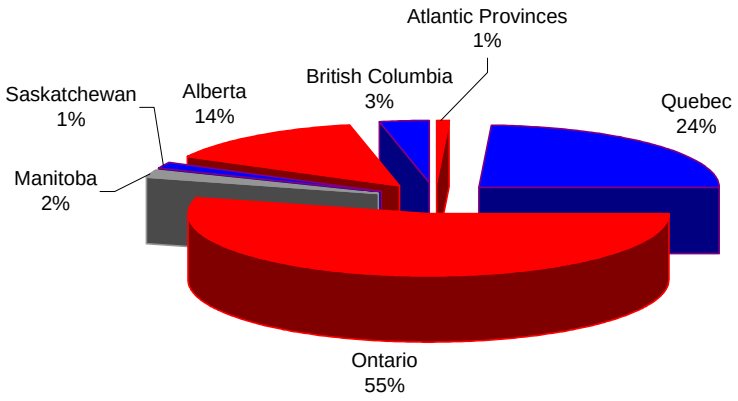
	1984	1998	% Change 84-98
Total Chemicals	7,202	10,928	51.7
Agricultural Chemical Industries	460	612	33.0
Plastic & Synthetic Resin Industry	389	1,389	257.4
Industrial Inorganic Chemicals N.E.C.	973	1,125	15.6
Industrial Organic Chemicals N.E.C.	852	1,385	62.6
Pharmaceutical & Medicine Industry	1,556	2,975	91.2
Paint And Varnish Industry	597	636	6.6
Soap & Cleaning Compounds Industry	576	697	21.0
Toilet Preparations Industry	539	568	5.3
Other Chemical Products Industries	1,260	1,541	22.3

Source: Statistics Canada

Canadian Chemical Industry by Province

The province of Ontario accounted for more than 54 percent of the entire Canadian chemical industry's value added in 1998, and it accounted for a similar share of jobs in Canada's chemical industry. Quebec is the next most important chemical production location, accounting for 24 percent of the nation's value added in chemicals in 1998. Alberta is also an important location accounting for 14 percent of Canada's chemicals output that year. The remaining provinces are mainly small players with British Columbia accounting for just over 3 percent, followed by just under 2 percent in Manitoba, between 1 and 2 percent in Saskatchewan, and less than 1 percent in Atlantic Canada. These shares are summarized in Chart 2-4.

Chart 2-4
Canadian Chemical Industry Output by Province
Real GDP in Millions of Constant 1992 Dollars
Percent Share of Canada Total in 1998



Source: Statistics Canada

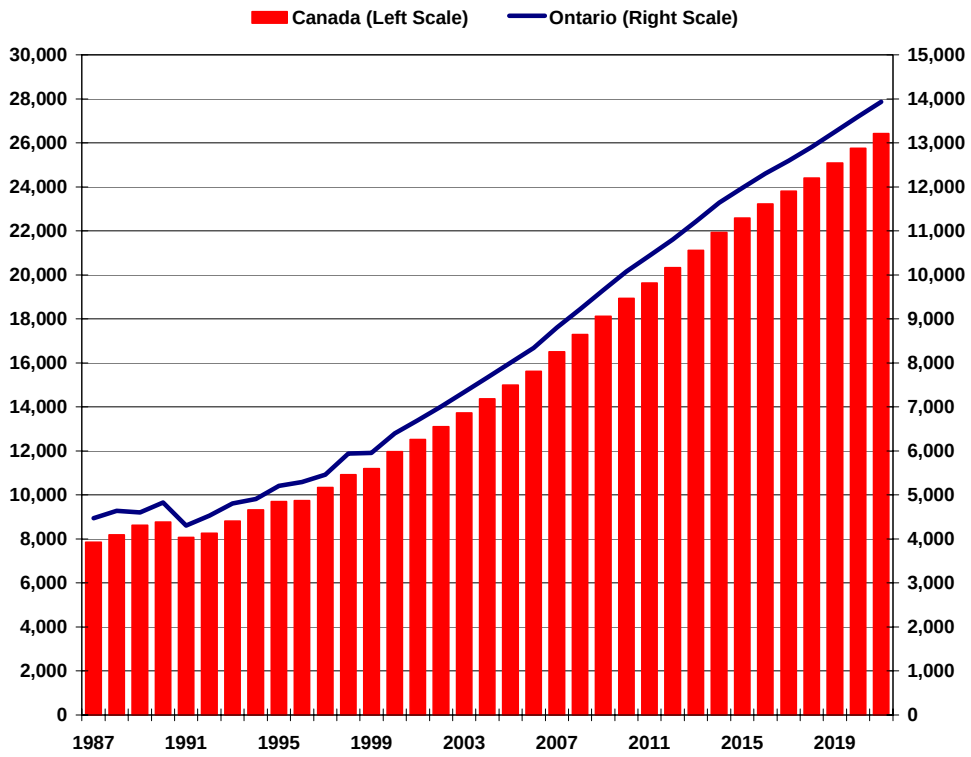
Long-Term Outlook for Chemical Products

Strategic Projections Inc., an associate of RAL Consulting Limited, projects that the output of Canada's chemical industry will grow at an above-average pace over the next two decades reflecting:

- the impacts of an aging society on pharmaceutical and other medicinal product needs, and
- the further expanded use of chemical products in other sectors (such as in agricultural nutrients and in construction materials) to achieve cost reductions.

We project the chemical industry will grow by between 4 and 5 percent per year over the next few years in real terms, then gradually slow to a pace of between 2 and 3 percent by the latter half of the next decade. This gradual slowing reflects our expectation that population growth in both Canada and the United States will itself gradually slow over this period. We expect Ontario to holds its share within Canada as the major centre for chemical industry production (Chart 2-5).

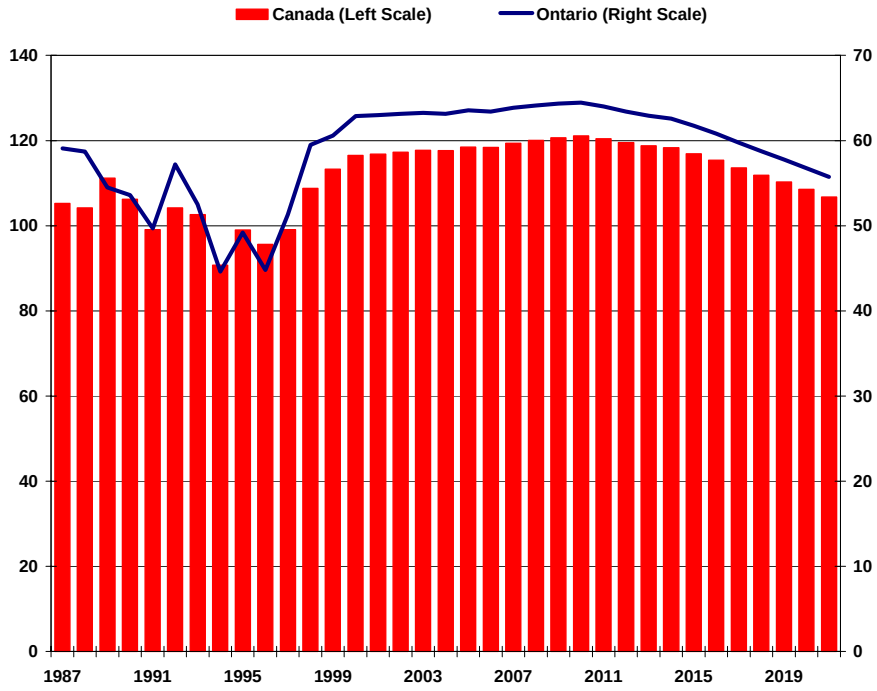
Chart 2-5
Chemical Industry Output
Real GDP in Millions of Constant 1992 Dollars
Canada and Ontario
1987 to 2021



Source: Statistics Canada and Strategic Projections Inc.

The need for workers in the industry over the longer-term will depend largely on the rates of productivity growth the industry can achieve over this period. Between 1987 and 1999 the industry achieved a very high average annual productivity gain of 3.7 percent. If the industry sustains that high pace over the next two decades, it will need increasing numbers of workers up until about 2011. Beyond 2011, however, the industry will require fewer workers each year as the production growth rate of the industry falls below 3.7 percent annually.

Chart 2-6
Chemical Industry Employment
Thousands of Persons
Canada and Ontario
1987 to 2021



Source: Statistics Canada and Strategic Projections Inc.

The likelihood that a high pace of productivity growth can be maintained in the industry over so long a time period is, of course, a matter of conjecture. Chart 2-6 illustrates actual and projected employment in the industry from 1987 through 2021. The projections assume the slowing pace of demand for the industry's output described above and a steady annual gain of 3.7 percent in productivity.

If chemicals demand grows as forecast here, and if high productivity growth cannot be sustained, employment growth in the industry could continue beyond 2011. The duration of employment growth will depend on how much productivity growth slows. Of course, the reverse is true, as well: if productivity growth accelerates in the future, employment declines could begin earlier than in 2011.

The speculation is offered here to illustrate an important point: future employment trends in the industry depend in large part on how aggressively the industry implements new technologies and new techniques.

A Further Word on Future Growth in Canada's Chemical Industry

Future Canadian and Ontario chemical industry output by segment will be affected by a number of factors including the extent to which new chemical products are introduced, the degree to which foreign markets can be penetrated by Canadian producers, and the extent

to which foreign producers compete successfully in Canadian markets. These factors will all be of importance, but their relative significance cannot be predicted with certainty.

Demographic changes, however, can be predicted with much greater certainty. We know, for example, that because of the relative size of the boomer generation in both Canada and Ontario, persons over the age of 40 years will dominate population growth in the near term. These trends will be described more thoroughly in later sections of this report in relation to their impacts on future labour force growth.

We also know that spending patterns on individual products and services change with age, and that such differentials are preserved across time (for example, a 45 to 54 year old householder today spends more on vacations than householders under 45, and that was also true a decade ago). By combining known consistencies in spending profiles by age with our known trends in population by age in the future, we can determine the extent to which demographic change will impact the demand for certain products and services over time.

Table 2-2 illustrates the relative growth rates we project for individual products produced by the chemical industry in Canada based on projected changes in the age profile of Canada's population. The data suggest that between 2000 and 2010 several household spending items can be expected to grow faster than households in general, including fertilizers, soil, and soil conditioners; bleach; make-up, skin creams, lotions, and manicure products; liquid detergent; and toilet-bowl cleaner and cleaning/scouring powders. In contrast, growing less quickly than households will be hair care products; deodorants, soaps, and other toilet preparations; disinfectants and deodorizers; laundry detergent; automatic-dishwasher detergent; fabric softeners; polishes, waxes, and other cleaning/polishing supplies; fragrance products; and oral hygiene products.

The projected trends are expected to change, in many cases dramatically, in the 2010 to 2020 period, however, as immigration flows to Canada accelerate due to labour market requirements. We expect Canada's unemployment rate will decline and that its labour force participation rate will decline after rising for several years. As a result, Canada will require more and more immigrants to fill the jobs we create over this period. Since migrants tend to be young people – usually between the ages of 18 through 35 – the resumed growth from 2010 to 2020 in households headed by persons in younger age groups will bolster the underlying growth rates for such chemical industry products as liquid detergent; bleach; toilet-bowl cleaner and cleaning/scouring powders; oral hygiene products; and polishes, waxes, and other cleaning/polishing supplies.

Table 2-2
Spending Projections of Selected Chemical Industry Products
2000 to 2020[2]

	Total Spent in 2000 ($ millions)	Annual % Change 2000-10	Annual % Change 2010-20	Relative Growth Index 2000-10	Relative Growth Index 2010-20
	Household Operations Items				
Laundry detergent (including soap)	$968	1.51	1.08	94	102
Liquid detergent (excluding laundry detergent)	$266	1.61	1.23	100	116
Automatic-dishwasher detergent	$200	1.52	0.99	94	94
Toilet-bowl cleaner and cleaning/scouring powders	$350	1.61	1.14	100	108
Polishes, waxes and other cleaning/polishing supplies	$260	1.52	1.12	95	106
Bleach	$150	1.67	1.19	104	113
Fabric softeners	$282	1.52	1.08	94	102
Disinfectants and deodorizers	$202	1.48	1.08	92	102
Fertilizers, soil, and soil conditioners	$352	1.75	1.28	109	121
	Personal Care Items				
Make-up, skin creams, lotions and manicure products	$980	1.63	1.02	101	96
Fragrance products	$745	1.54	0.93	96	88
Hair care products	$1,239	1.48	0.94	92	89
Deodorants, soap and other toilet preparations	$886	1.48	0.99	92	93
Oral hygiene products	$562	1.59	1.14	99	107
Other personal care supplies and equipment	$610	1.40	0.85	87	81

The Demographic Environment

Population Growth: Fertility, Mortality, and Migration

Canada's population has many dimensions, but two features stand out above the rest: its age distribution is heavily skewed, and many of its inhabitants were not born here. These two issues will be addressed in turn.

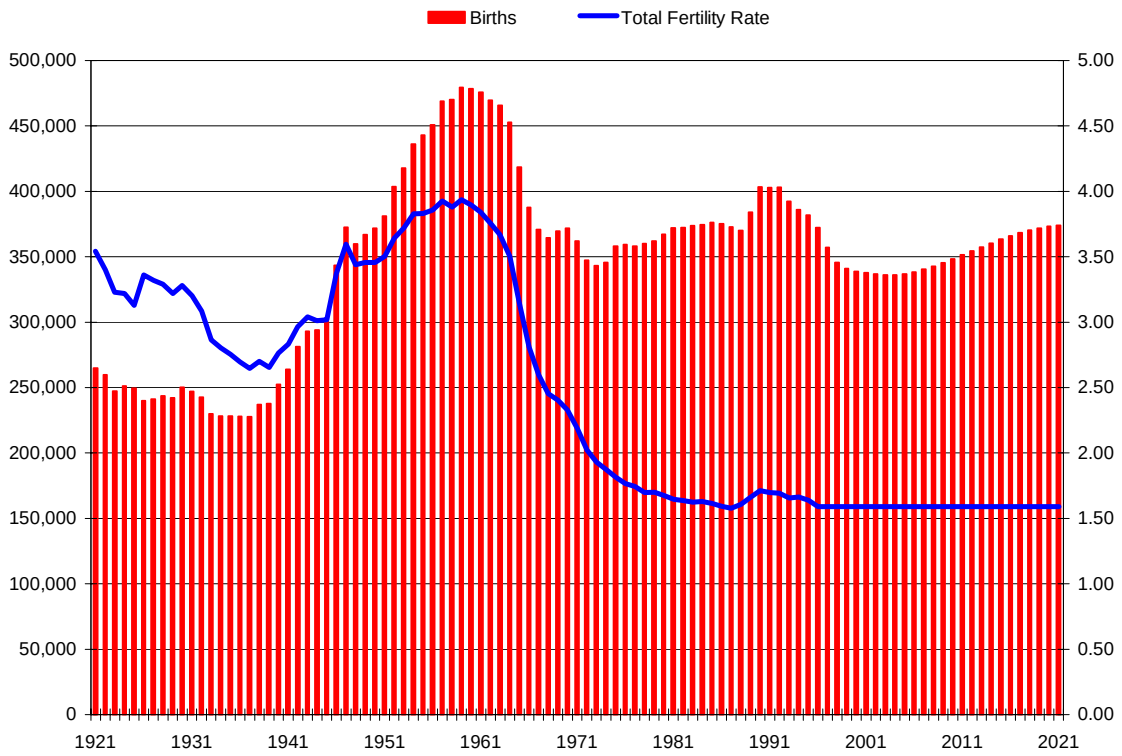
The rise and fall in the total fertility rate[3] over the last 80 years led to a coincident rise and fall in the number of births. That cycle, in turn, led to the creation of the post war "baby

[2] Spending data from Statistics Canada, *Family Expenditure Survey* (1996), using Canada-wide data. The relative growth index expresses the projected average annual growth rates for each category or item relative to the average annual growth rate for households (total spending). The working assumption of the model is that the rate of household growth is the same as the rate of spending growth. That is, spending increases as the number of households increases. A growth index above 100 indicates that the category or item is growing at a faster rate than total spending. A growth index below 100 indicates that the category or item is growing at a slower rate than total spending. Household and age projections provided by Strategic Projections Inc.

[3] The total fertility rate in any given year reflects the number of children to which the average female would give birth over her lifetime if she were to bear children at the various stages of her life equal to the rates prevailing in that year among females in each of the seven five-year age categories spanning the ages from 15 to 49 years. Thus the total fertility rate is a *synthetic* lifetime rate indicating the long-term implications of currently prevailing fertility rates by age.

boom" generation. Though the total fertility rate in Canada has remained steady for the last three decades, an "echo" generation emerged through the late 1980s and early 1990s as the majority of the boomers passed through their family formation years. Since the early 1970s the total fertility rate has remained below 2.1, the rate required for the average couple to replace itself. As the fertility rate is likely to hold steady over the next two decades, another baby boomlet will occur from 2011 through to 2021 as the offspring of the boomers reach the age of family formation (Chart 2-7).

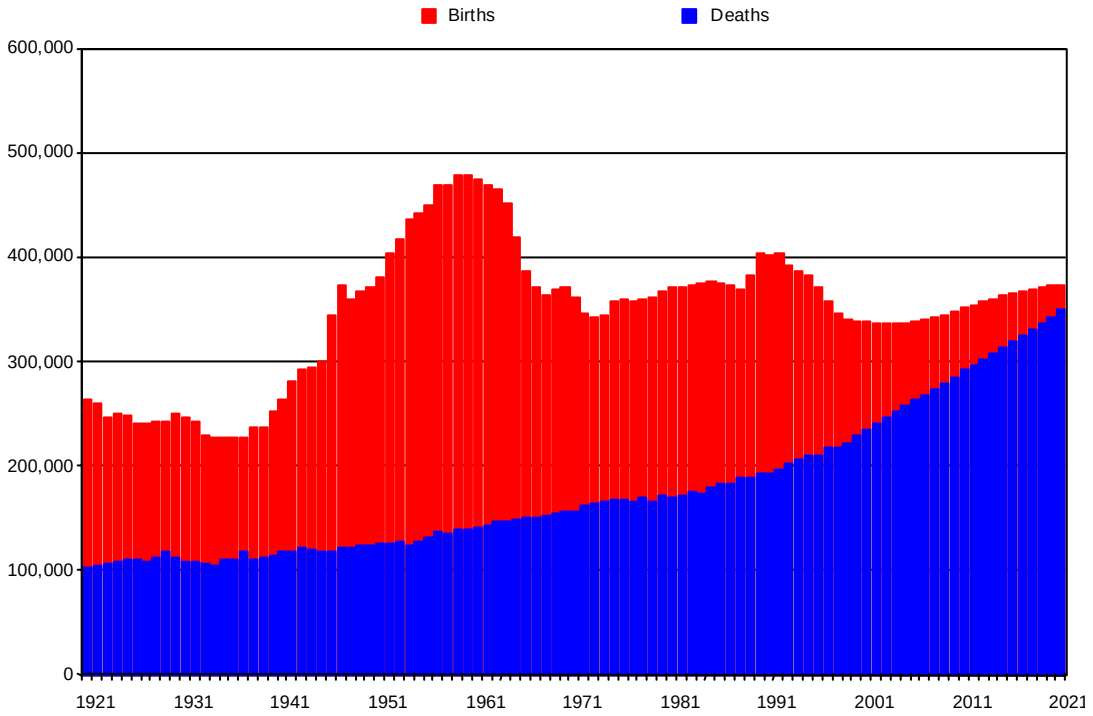
Chart 2-7
Canada's Total Fertility Rate (right scale) and Births (left scale)
1921 to 2021



Source: Statistics Canada and Strategic Projections Inc.

Deaths in Canada have followed a steadier path than births over the last 80 years. Deaths will increase over the next two decades at a faster pace than over the last 80 years simply because Canada's population is aging (Chart 2-8). By 2021 deaths will almost equal births, the readily predictable outcome of a population with a total fertility rate persistently below the replacement rate.

Chart 2-8
Births and Deaths
1921 to 2021

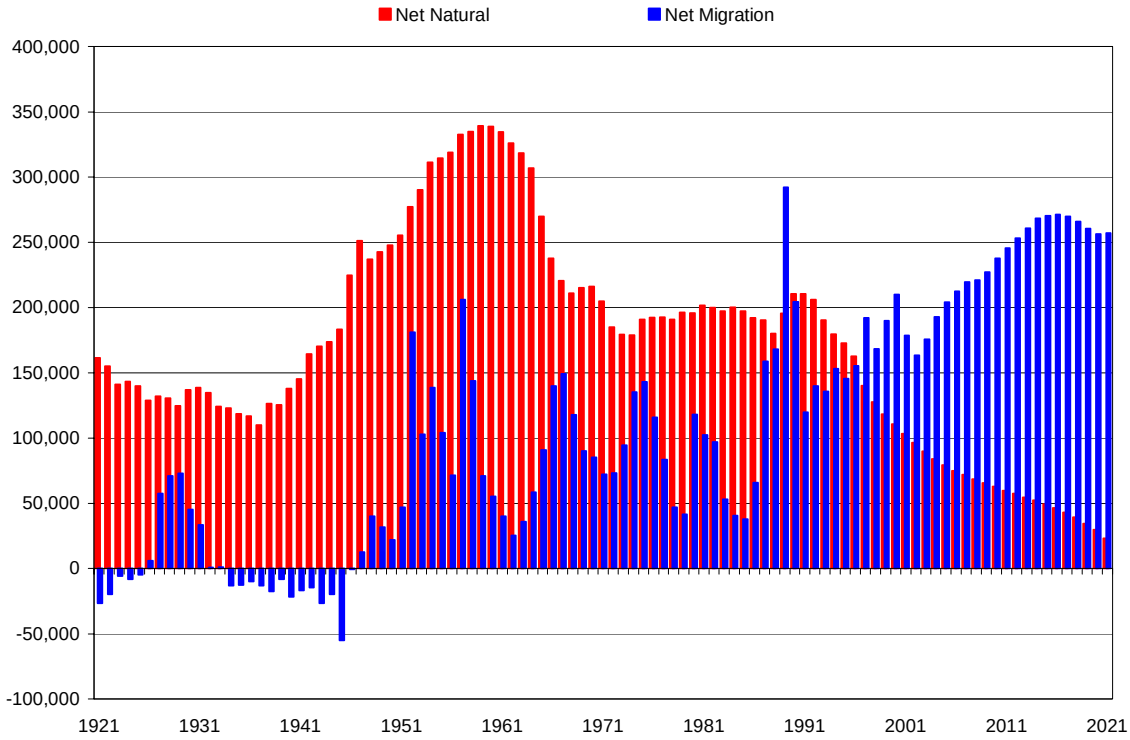


Source: Statistics Canada and Strategic Projections Inc.

Immigration has always been a major contributor to Canada's population growth (Chart 2-9). Over the next two decades it is expected to become increasingly important as net natural population growth (births less deaths) approaches zero. Strategic Projections Inc.'s base case forecasts suggest increasing flows of immigration will be required in Canada to meet future labour market requirements, especially beyond 2011.

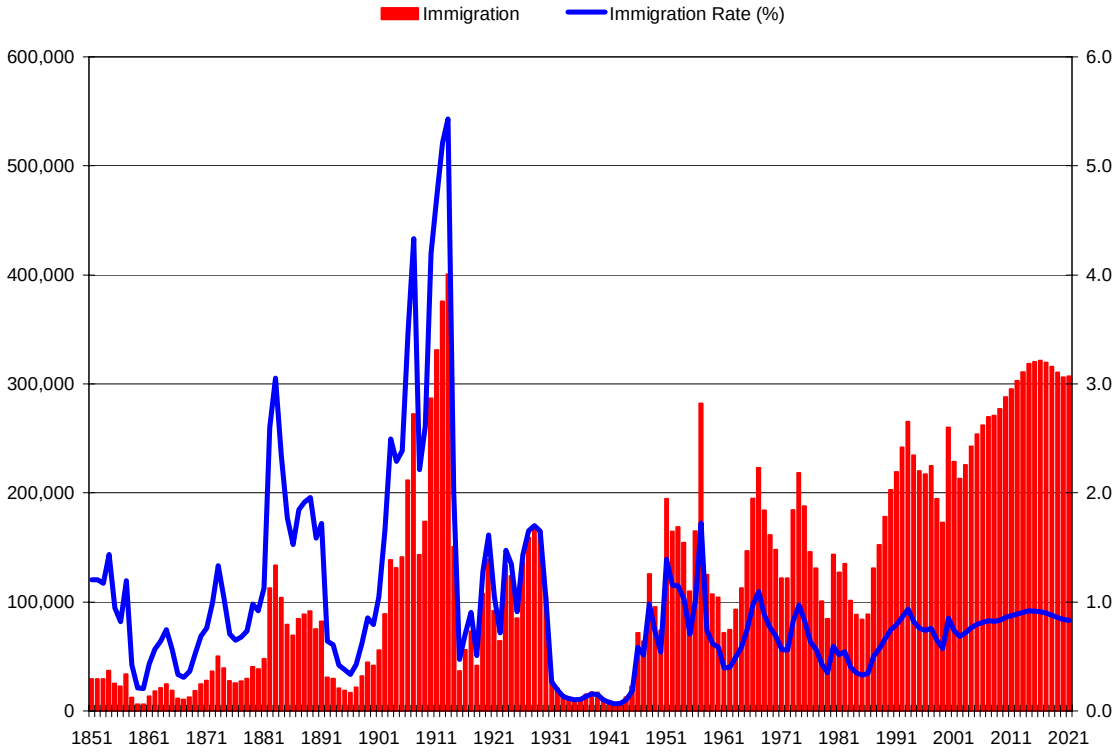
The projected immigration flows seem large by today's standards. We expect immigration to increase to 300,000 per year between 2011 and 2021 compared to 200,000 currently. Compared with Canada's long history of immigration flows, however, our projected contribution of immigration to population growth pales against the contribution it made in the 1880s and in the first decade of the 20th century (Chart 2-10). We do not expect immigration to exceed 1.0 percent of the total population in any year between now and 2021. To keep these projections in perspective it is useful to recall that – despite major net immigrant inflows over the decade from 1986 to 1996 – the immigrant share of Canada's population in 1996 was just 17.4 percent, well below the 22.3 percent share reached in 1922 (Chart 2-11).

Chart 2-9
Sources of Canada's Population Change
1921 to 2021



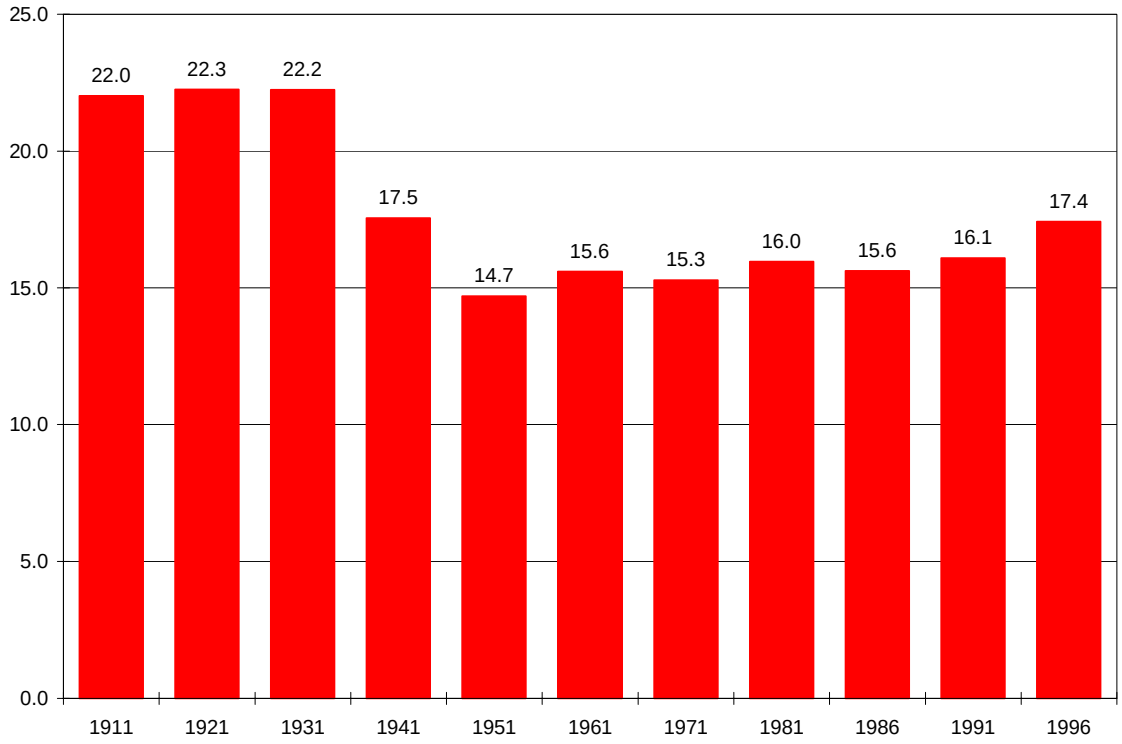
Source: Statistics Canada and Strategic Projections Inc.

Chart 2-10
Canadian Immigration and the Immigration Rate
1851 to 2021



Source: Statistics Canada and Strategic Projections Inc.

Chart 2-11
Immigrant Share of the Total Population
1911 to 1996

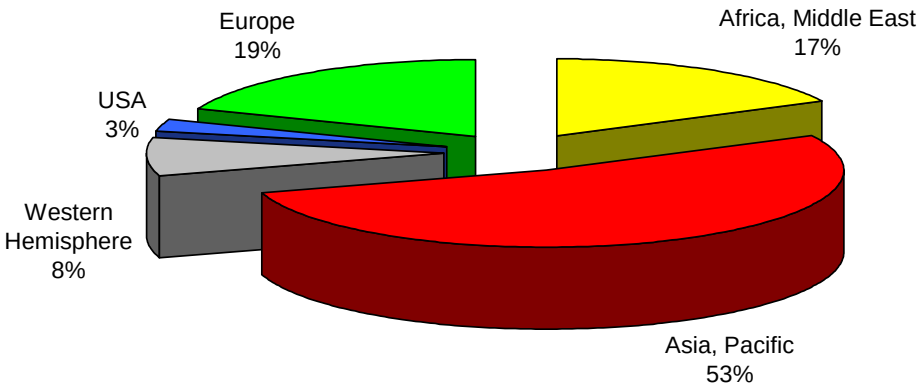


Source: Statistics Canada

There are several other important points about immigrants and migrants that should be made.

The first relates to the source of Canada's immigrants. Over the last fifty years the flow of immigrants to Canada has gradually shifted away from Europe towards Asia. In recent years the Caribbean, Central and South America, and Africa have assumed increasing importance (Chart 2-12). Between 1996 and 1998 Asia and the Pacific Islands accounted for 53 percent of Canada's immigrants, Europe for 19 percent, Africa and the Middle East for 17 percent, the Western Hemisphere excluding the United States for 8 percent, and the United States for 3 percent.

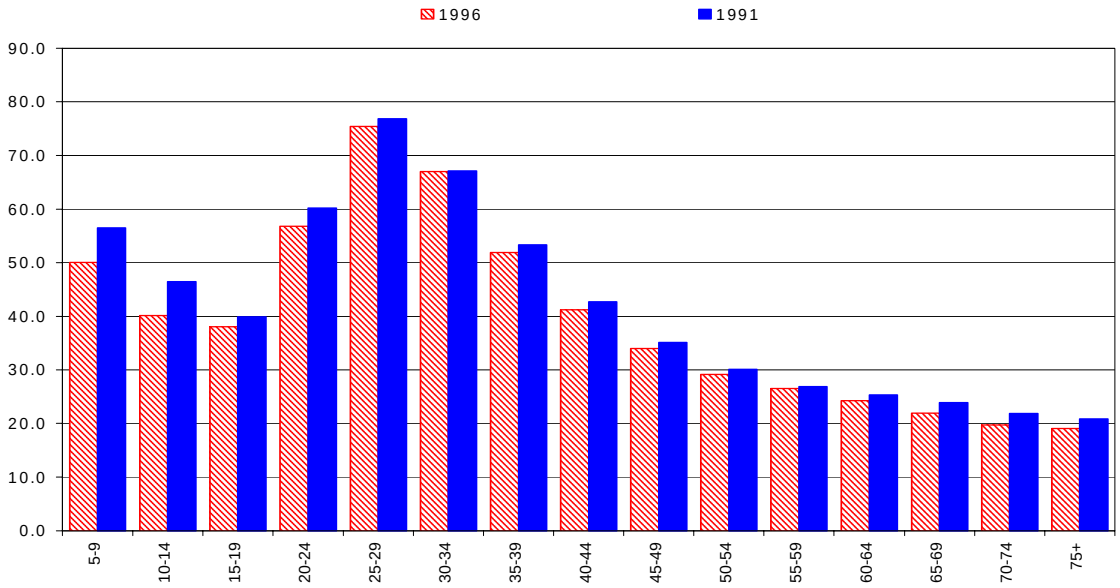
Chart 2-12
Canadian Immigration by Source
1996 to 1998



Source: Citizenship and Immigration

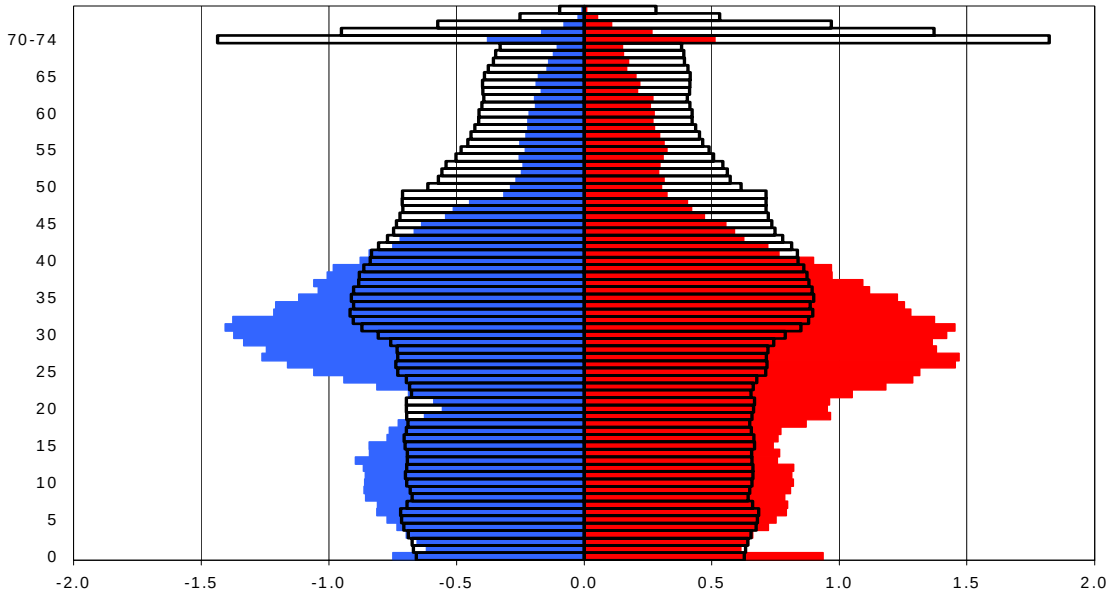
The second relates to the age of migrating people. Migrants, be they from another country, another province or another country, tend to be very young. Chart 2-13 reveals that those who moved to one municipality in Canada from either another municipality, another province, or another country between 1991 and 1996, or between 1986 and 1991, were most likely between the ages of 20 and 39 with young children in tow. Similarly, the age of immigrants in 1996 was dramatically skewed towards the younger age groups compared to the population as a whole (Chart 2-14).

Chart 2-13
Inter-Censal Movers by Age in Canada
As a Percent Share of the Total Population
1991 and 1996



Source: Statistics Canada

Chart 2-14
Immigrants by Age and Gender (solid bars)
As a Percent Share of Total Immigrants
Relative to the Total Population by Age and Gender (black outline)
As a Percent Share of the Total Population
1993 to 1996



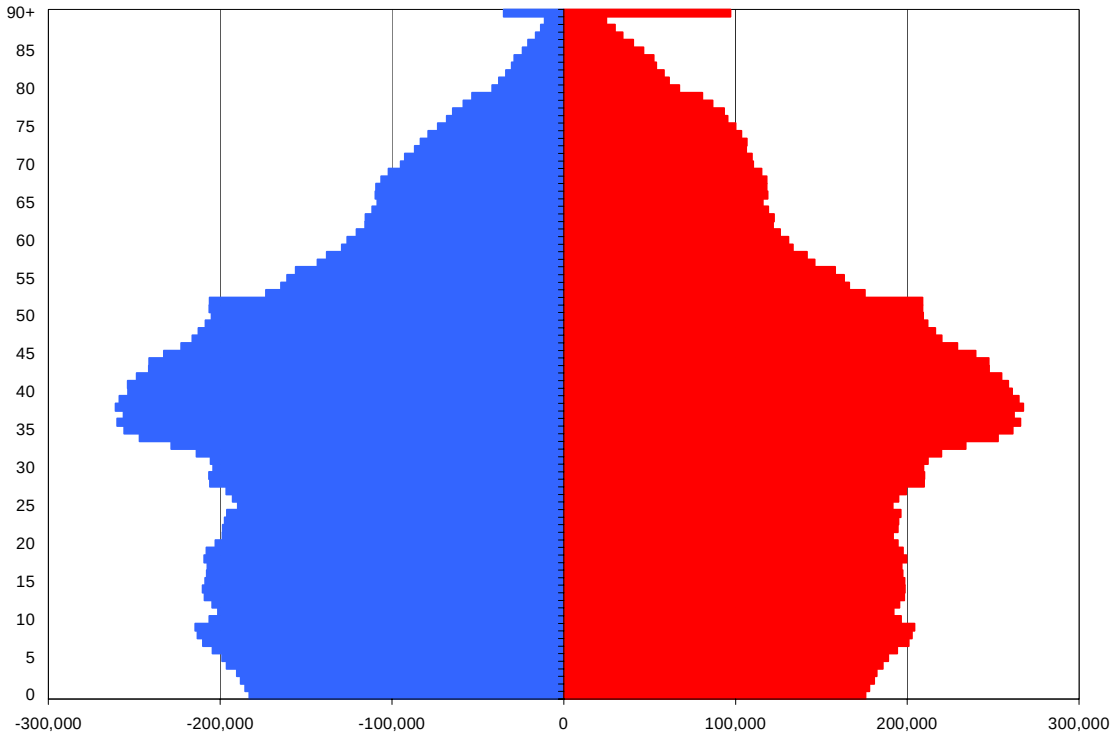
Source: Statistics Canada and Strategic Projections Inc.

All of these factors have combined to provide Canada with a population whose age distribution as of 1999 is decidedly skewed towards persons aged 33 to 52 years (born between 1966 and 1947) – the aforementioned boomers generation (Chart 2-15).

Between 1999 and 2009 those already living in Canada will age – not surprisingly -- by ten years. The total population will increase by a net gain of almost 2 million people, largely through net international migration. Despite the importance of this latter source to Canada's population over this period, the age profile of 1999 will largely be mirrored in 2009, though it will obviously be 10 years older (Chart 2-16). The age profile of Ontario (Chart 2-17) is almost identical to that of the country as a whole as of 1999.

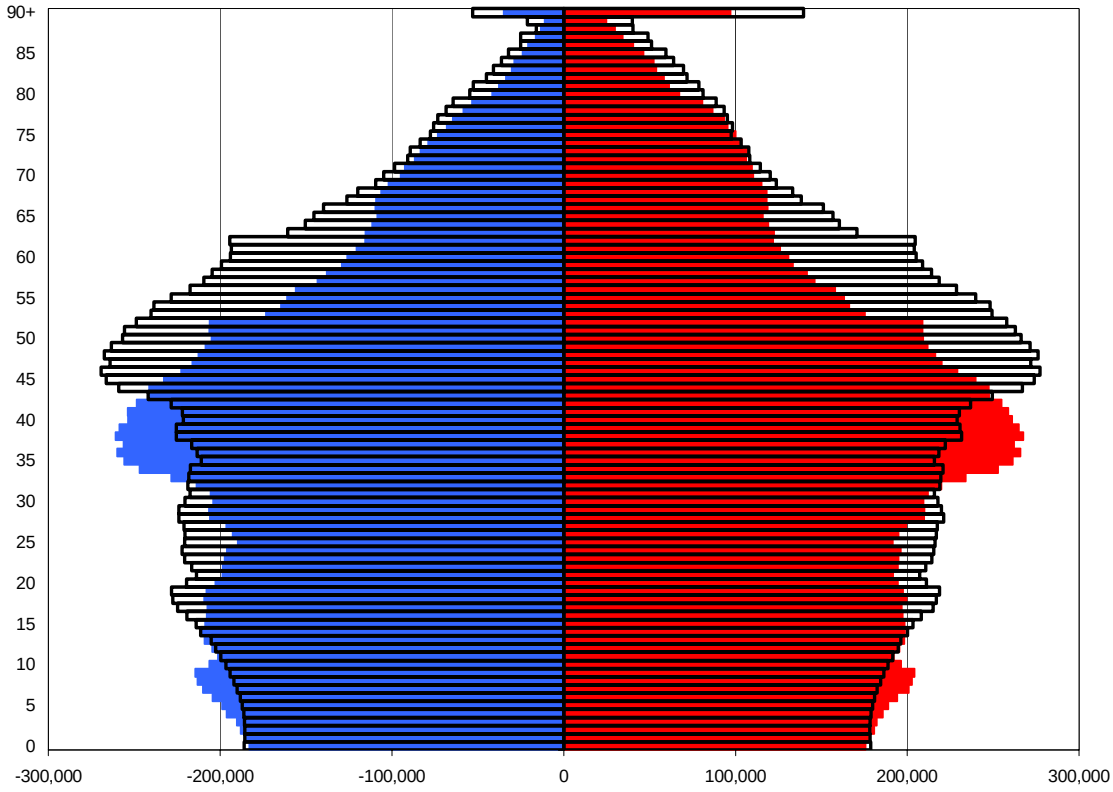
Over the 1999 - 2009 period Canada's population growth on an age basis (Chart 2-18) will be primarily concentrated among persons aged 43 to 63, as the boomers, now 33 to 53, gain another ten years, and among persons 17 to 32, as the echo generation also gains another decade. The population will decline among those under 15 years of age and among those aged 33 to 44 (the bust generation). For the province of Ontario the change in population by age will reflect that of Canada but, because Ontario will attract relatively more migrants per capita, its gains by age will differ slightly, especially among those aged 10 to 50 where most migrants are found.

Chart 2-15
Canada's Population by Age and Gender, 1999
Males (left) Females (right)



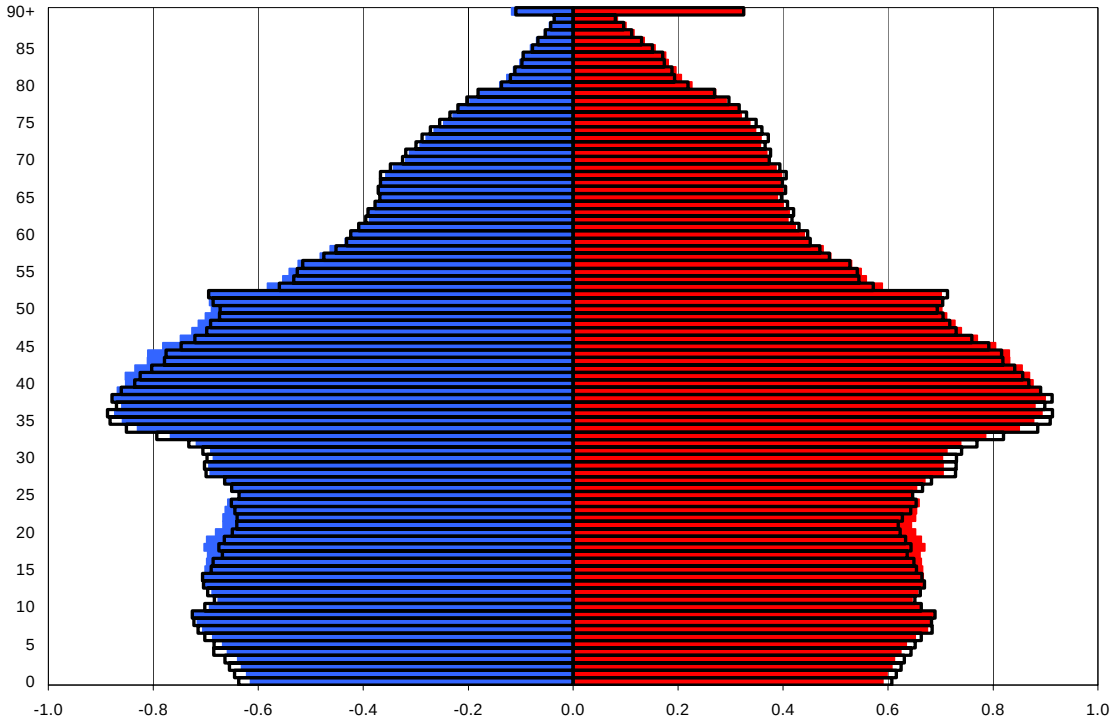
Source: Strategic Projections Inc.

Chart 2-16
Canada's Population by Age and Gender
1999 (solid bars) versus 2009 (black outline)



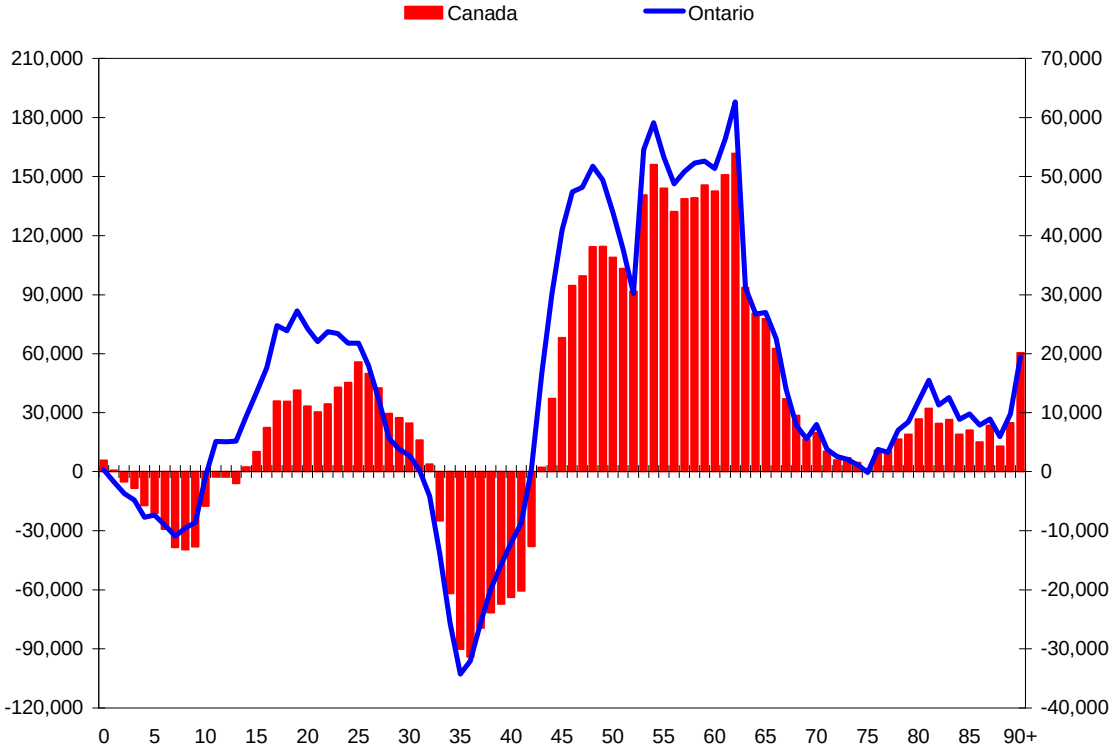
Source: Strategic Projections Inc.

Chart 2-17
Population by Age and Gender
As a Percent Share of the Total Population, 1999
Canada (solid bars) versus Ontario (black outline)



Source: Strategic Projections Inc.

Chart 2-18
Change in Population by Age
Canada (solid bars) Ontario (line)
1999 to 2009



Source: Strategic Projections Inc.

The Labour Market in Canada

Concepts and Definitions

Before proceeding further it is useful to explain a number of terms that describe the labour market in Canada.

People choosing to participate in labour market activities represent only about one-half of the total population (Chart 2-19). For analytical purposes the group from which the economy can draw workers -- the labour force source population, which is considered to include all those legally eligible and physically able to work – is defined to include everyone 15 years of age and over not living on an Indian Reservation or not institutionalized in a penal or mental facility.

The labour force source population consists of two key groups: those who participate in labour market activity and those who do not. The latter group includes primarily the elderly, students not working part-time, the disabled, and stay-at-home parents.

Source Population = Labour Force + Not In Labour Force

Those participating in labour market activity are said to form the labour force. The participation rate -- the share of the source population choosing to participate in labour market activity -- is calculated as the labour force divided by the source population expressed as a percent. The participation rate in Canada is currently about 65.5 percent.

Participation Rate = (Labour Force/Source Population) X 100

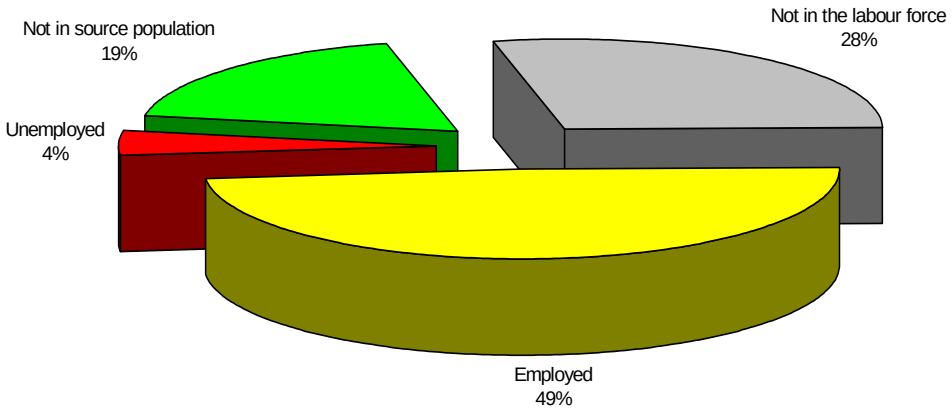
Labour market participants, in turn, can be broken into two groups: those with jobs (whether full-time or part-time), and those without jobs but looking for work. The latter are designated as unemployed.

Labour Force = Employed + Unemployed

The unemployment rate – an indicator known to most -- is calculated as the number of unemployed expressed as a percent share of the total labour force. The unemployment rate rises and falls with the business cycle and is considered a key indicator of overall economic performance. It currently stands at about 6.5 percent nationally in Canada.

Unemployment Rate = (Unemployed/Labour Force) X 100

Chart 2-19
Canada's Total Population by Labour Market Activity



Source: Statistics Canada

Labour Market Implications of the Aging of the Population

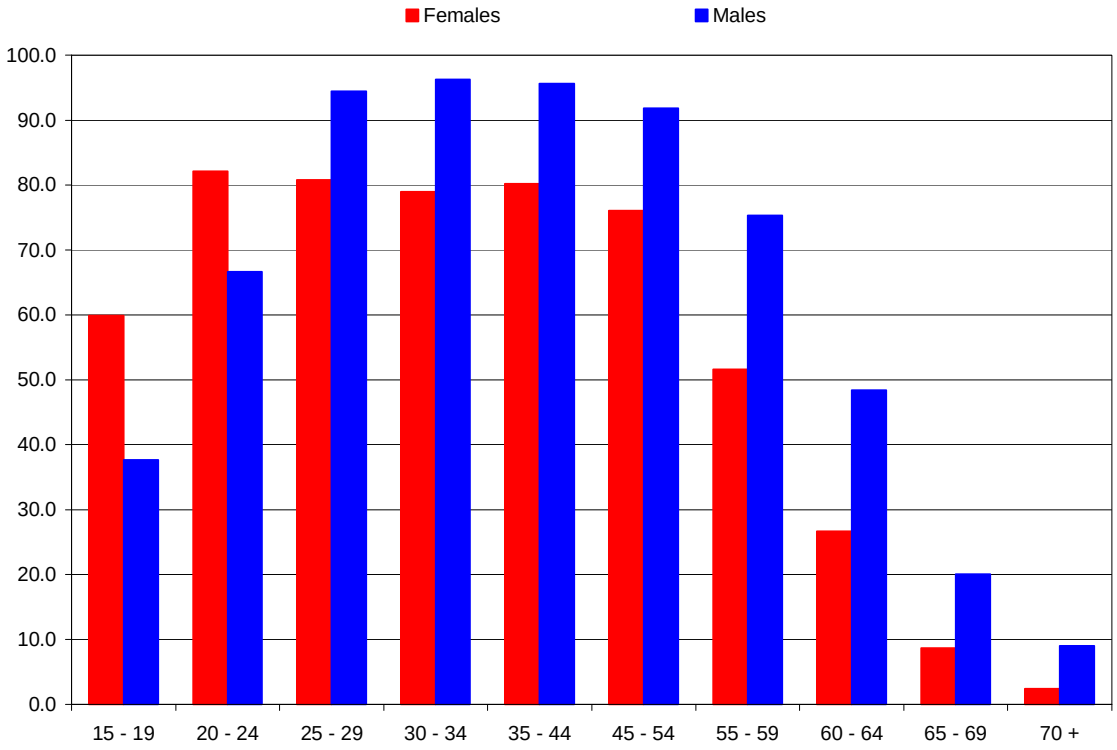
Participation rates vary among the different age and gender groups. For the province of Ontario as a whole in 1998, it was generally the case that (Chart 2-20):

- among those 25 and older participation rates of males exceeded those of females by anywhere from 10 to 15 percentage points;
- rates of both males and females are at their highest among those aged 25 to 54;
- rates of both males and females decline rapidly from the age of 55 onward;
- rates of females under 25 exceed those of males; and
- rates of both males and females 20 to 24 exceed those of males and females 15 to 19.

Over time participation rates of those under the age of 35 have changed (Chart 2-21). In particular:

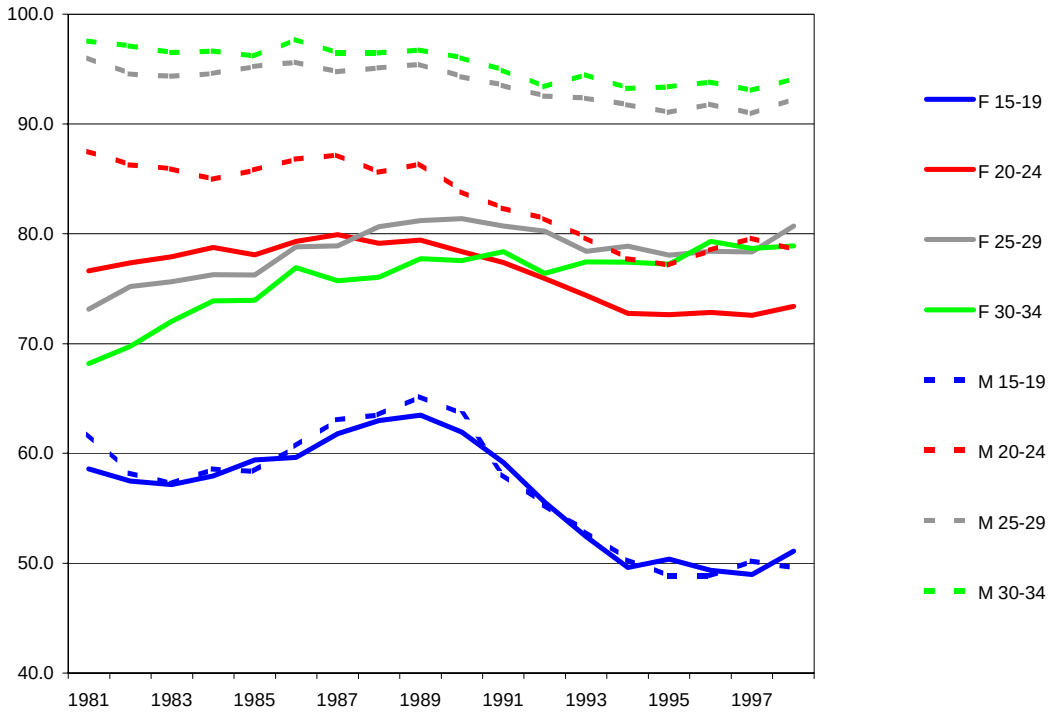
- The participation rate of both males and females 15 to 19 is much lower today than it was a decade or more ago. This reflects the fact that both males and females remain in full-time studies to a later age today.
- The rate of both males and females 20 to 24 is also lower today than a decade ago, but the drop is not so significant as among those 15 to 19.
- The rate among males 25 to 29 gradually fell from 95 percent to 90 percent over the 1981 to 1998 period – reflecting a higher proportion in post-graduate studies – while the rate among females in the same age group increased through most of the 1980s and remained high through the 1990s. The male rate in this age group exceeds that of females by about 15 percentage points.
- The rate among males 30 to 34 also declined slightly over this period while that among females increased through most of the period, though less slowly in the 1990s than in the 1980s. Once again, the male rate exceeds the female rate by about 15 percentage points.

Chart 2-20
Labour Force Participation Rates by Age in Ontario (percent)
1998



Source: Statistics Canada

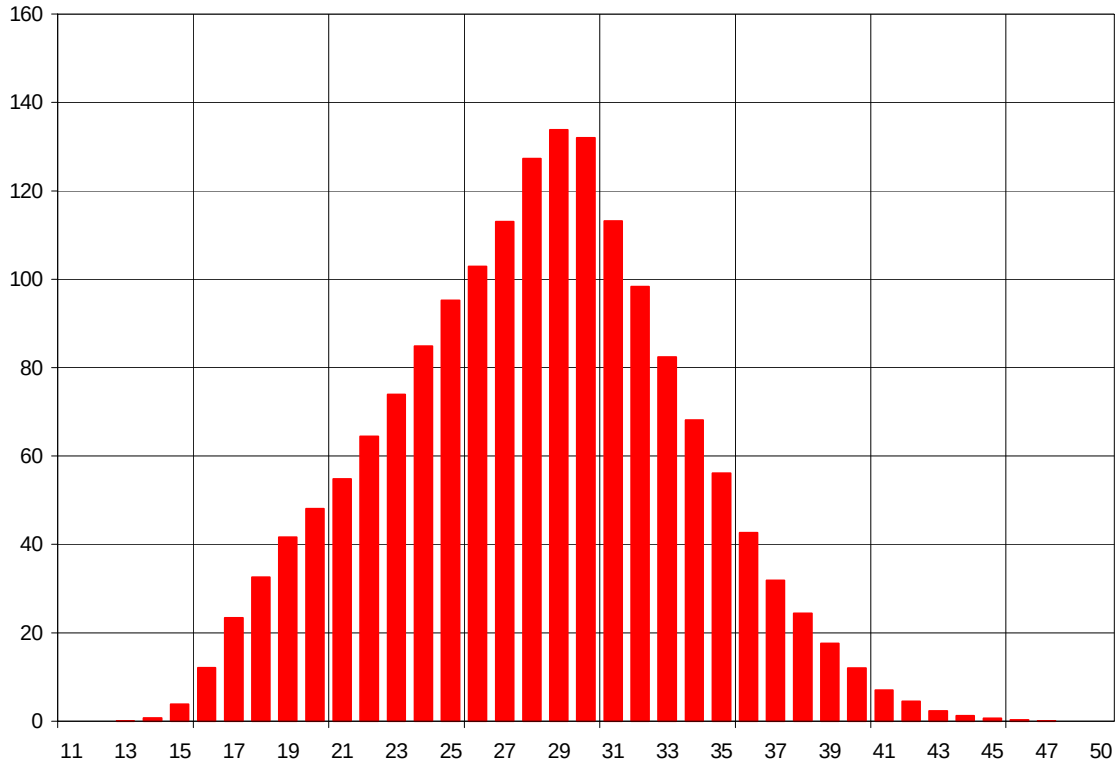
Chart 2-21
Participation Rates by Age and Gender in Ontario (percent)
Persons Aged 15 to 34 Years
1981 to 1998



Source: Statistics Canada

A key reason for the male-female labour force participation rate differential among the younger age groups is the fact that females are often otherwise occupied in carrying and/or caring for babies. Chart 2-22 reveals that the birth rate among females aged 22 to 34 exceeds 60 per 1,000, and among those aged 26 to 31 it exceeds 100 per 1,000, meaning that anywhere from 6 to 10 percent of females in these age groups give birth each year.

Chart 2-22
Fertility Rates by Age in Ontario, 1996
Births per 1,000 Females



Source: Statistics Canada and Strategic Projections Inc.

Among those 35 and older participation rates vary widely, though longer-term trends have been more stable than among those under 35. For example (Chart 2-23):

- There was a slight downtrend in the participation rate among males 35 to 44, though this age group has the highest participation rate of any age or gender group. The rate among females 35 to 44 increased through the 1980s then stabilized during the 1990s at around 80 percent.

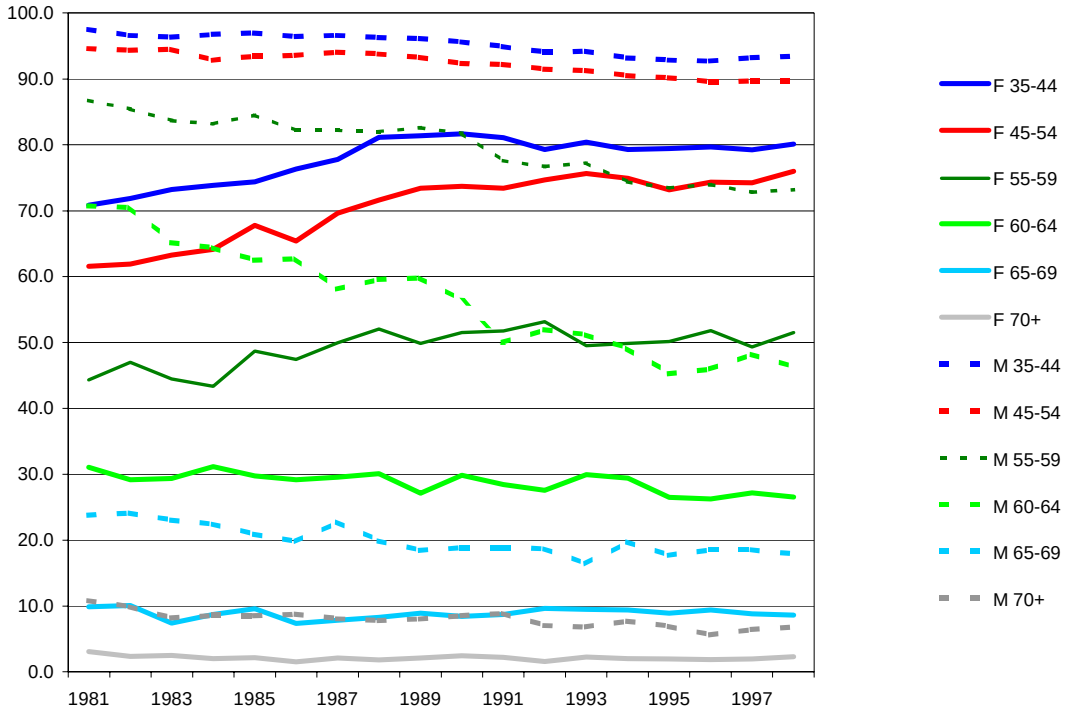
- The rate among males 45 to 54 followed a similar path to that among males 35 to 44, though it has run a point or two lower. The rate among females 45 to 54 followed a path similar to that among females 35 to 44, though it runs about 5 percentage points lower.

- The rate among males aged 55 to 59 fell significantly in recent years, from almost 90 percent in the early 1980s to just over 70 percent currently. This reflects the earlier retirement of such individuals today, both for voluntary and involuntary reasons. Among females 55 to 59 the rate held steady at about 50 percent in recent years

after increasing slightly in the 1980s. Their rate is 20 to 25 points lower than that among females 45 to 54 and this likely reflects a generational difference that could disappear as those now 45 to 54 age into this group.

- Participation rates among those 60 years of age and older across both genders remained remarkably steady throughout the last two decades, with the exception of the rate among males 60 to 64 which, like that among males 55 to 59, fell by 20 percentage points.

Chart 2-23
Participation Rates by Age and Gender in Ontario (percent)
Persons Aged 35 to 64 Years
1981 to 1998

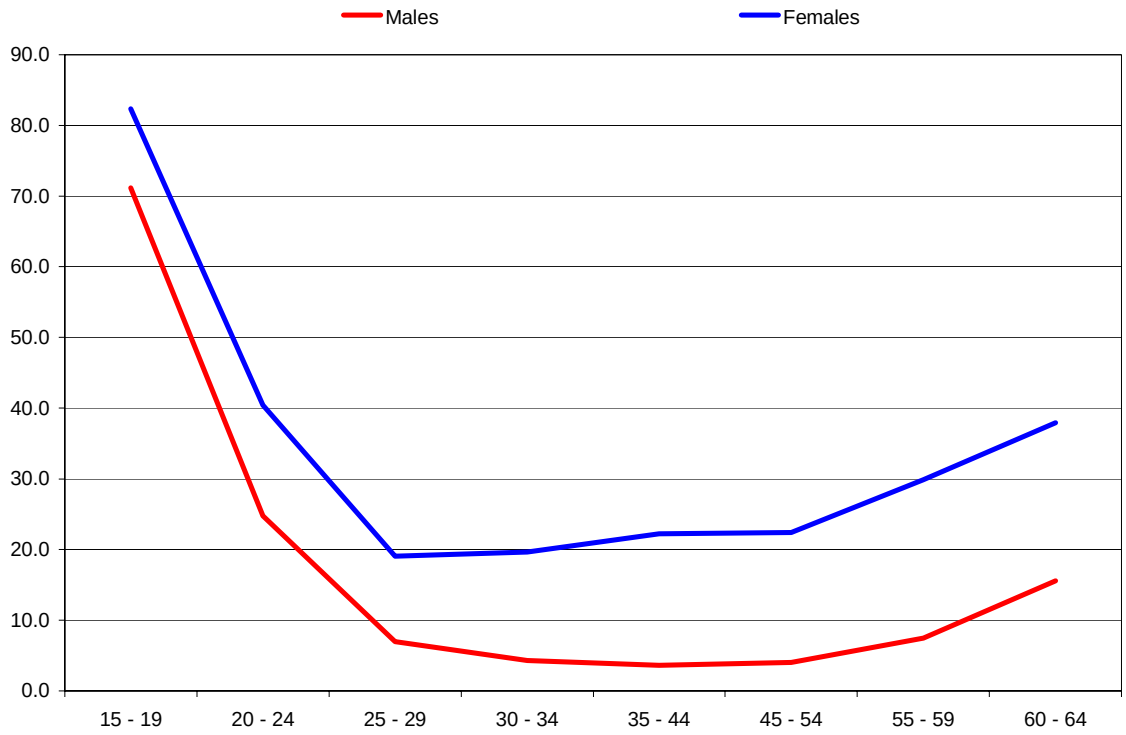


Source: Statistics Canada

Chart 2-24 reveals that part-time employment as a share of total employment drops dramatically across the age spectrum for both genders up to the 25 to 29 age group, then holds steady at a low share through to the 45 to 54 age group, then increases slightly through to the 60 to 64 age group. Not only does labour force commitment wane with age, as revealed by the declining participation rates, but those who do participate are increasingly less likely to work full-time.

It is not at all clear where labour force participation rates by age and gender are headed in the future. A more robust economic climate, coupled with dwindling local labour supplies due to the aging of society, could touch off either an arresting of the declines in participation rates among males 55 and older, or increasing flows of immigration.

Chart 2-24
Part-Time Employment by Age and Gender in Ontario
As a Percent Share of Total Employment
1998



Source: Statistics Canada

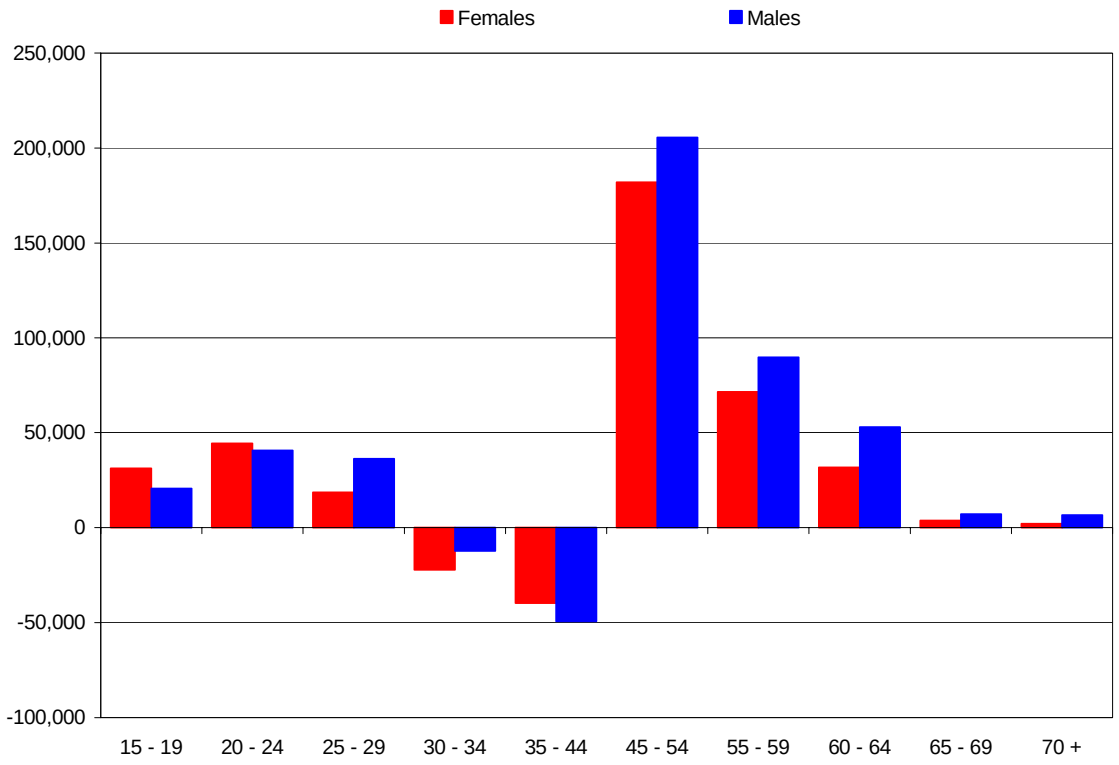
The safest bet is to assume that the rates prevailing by age and gender in 1998 hold steady throughout the next two decades. If that assumption is made, and if those rates are applied to the expected change in Ontario's population by age and gender over the next two decades, labour force growth by age and gender will come out as revealed in Charts 2-25 and 2-26. Chart 2-25, which reveals projected labour force growth in Ontario from 1999 to 2009 under the fixed participation rate assumption, reveals that most of the gain in the labour force will occur among people aged 45 to 54, 55 to 59 and 60 to 64, and that there will be only a modest increase in the size of the labour force among those aged 15 to 29. Chart 2-26, covering the period 2009 to 2019, reveals that most of the growth will occur among those aged 55 to 64, though the maturing of the echo generation suggests gains will occur among those aged 25 to 34 by that time.

Using Strategic Projections Inc.'s base case projection for the population by age and gender for the province of Ontario, we calculated the size of the labour force that would emerge province-wide assuming no change in participation rates by age and gender from those prevailing in 1998. We then compared this hypothetical labour force against that which we forecast will be required province-wide in view of our expectations regarding future economic and employment growth.

The comparison is revealed in Chart 2-27. This test reveals that the economic-driven labour force exceeds the demographic-driven labour force throughout the period, and that by 2021 there is a gap of close to 1,000,000 persons. That gap must be closed by:

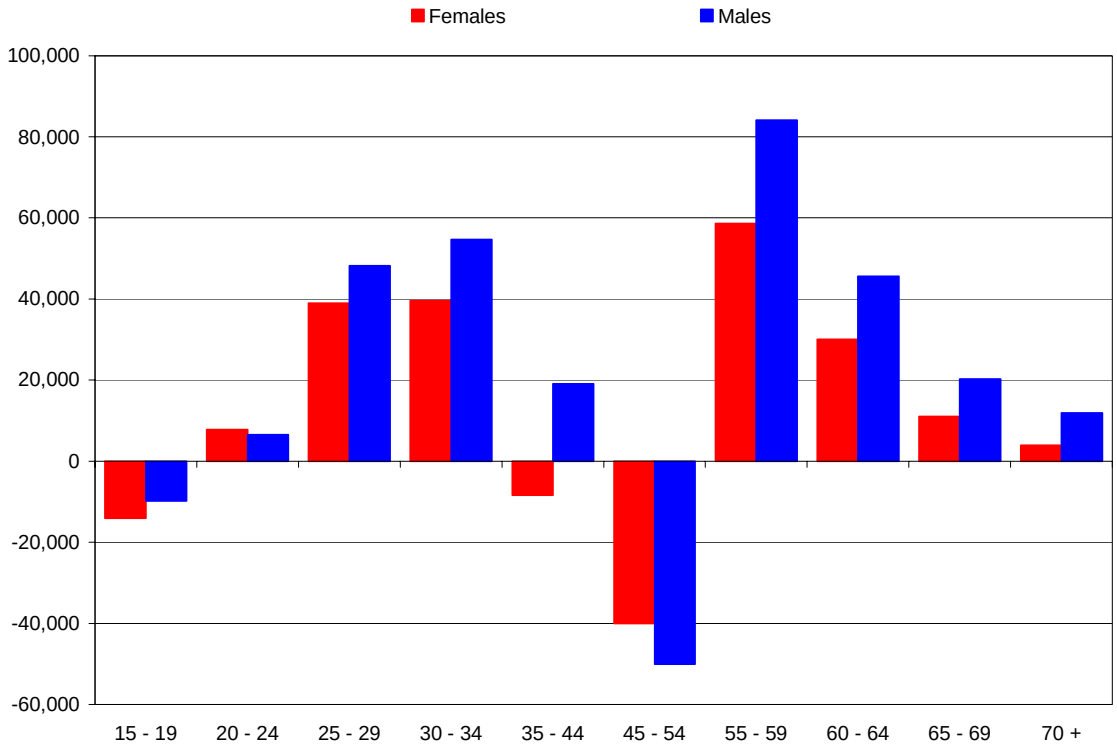
- enticing those already in Ontario's labour market to remain longer, that is, finding ways to encourage higher rates of participation from certain age and gender groups than those prevailing in 1998;
- encouraging more people from other provinces or other countries to take up residence in Ontario and participate in its economy; or
- encouraging more people from Canada's non-urbanized areas (where participation rates tend to be lower) to move to its urbanized areas (where they tend to be higher).

Chart 2-25
Ontario's Projected Labour Force Growth by Age and Gender
1999 to 2009



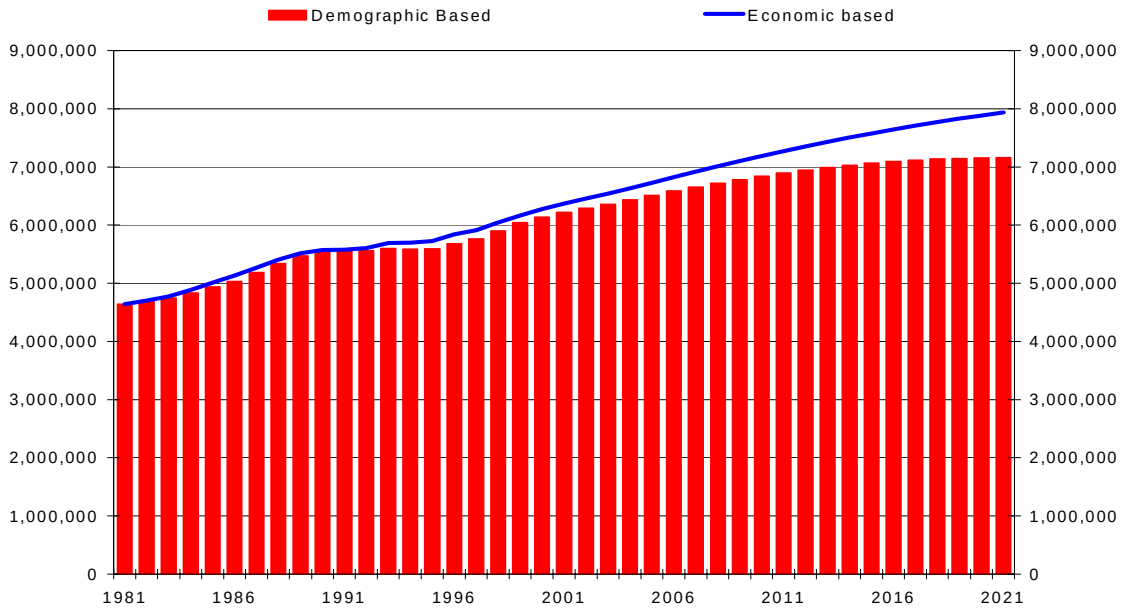
Source: Strategic Projections Inc.

Chart 2-26
Ontario's Projected Labour Force Growth by Age and Gender
2009 to 2019



Source: Strategic Projections Inc.

Chart 2-27
Ontario's Labour Force
Demographic Based and Economic Based
1981 to 2021



Source: Statistics Canada and Strategic Projections Inc.

Occupational Profile of Canada's Chemical Industry

Using occupation-by-industry coefficients from the *Canadian Occupations Projections System* (COPS) of Human Resources and Development Canada, we have estimated the number of persons employed in the chemical industry in Canada as of 1995 by occupation. According to the old Standard Industrial Classification (SIC) system on which these coefficients are based, there were 103,000 persons employed in the chemical industry in Canada in 1995.[4]

Table 2-3 provides a ranking of all those occupations found in the industry in 1995 with more than 200 persons. These occupations account for 88 percent of all of those employed by the industry in 1995. This information is provided as a reference point for the analysis of specific occupational categories within the two firms that provided the data for this report.

[4] The new North American Industrial Classification System (NAICS) suggests there were 99,000 persons employed in the chemical industry in 1995.

Table 2-3
Employment in Canada's Chemical Industry by Occupation, 1995

	Total Employed in the Chemicals Industry	103,000
6221	Technical Sales Specialists, Wholesale	8,595
9613	Labourers in Chemical Products	8,454
2211	Applied Chemical Technicians	6,169
9421	Chemical Plant Machine Operators	4,401
911	Manufacturing Managers	3,599
9232	Gas and Chemical Processing Operators	3,308
611	Sales, Marketing and Advertising Managers	3,280
2112	Chemists	3,137
1431	Accounting and Related Clerks	2,483
1471	Shippers and Receivers	2,447
1241	Secretaries (Exc. Legal and Med)	2,361
7452	Material Handlers	2,324
9212	Supervisors-Gas and Chemical Processing	2,274
7311	Construction Millwrights (Ex. Text)	2,001
6421	Retail Salespersons	1,739
16	Senior Managers-Goods Production, Utilities	1,590
2134	Chemical Engineers	1,428
1111	Financial Auditors and Accountants	1,420
7411	Truck Drivers	1,315
6663	Janitors and Building Supervisors	1,047
2162	Computer Systems Analysts	1,047
111	Financial Managers	994
621	Retail Trade Managers	983
1411	General Office Clerks	978
1453	Service, Information and Related Clerks	856
7351	Stationary Engineers	854
1221	Administrative Officers	804
9422	Plastics Processing. Machine Operators	783
1474	Purchasing and Inventory Clerks	763
2163	Computer Programmers	710
210	Engineering, Architectural and Science Managers	708
4163	Economic Development Officers, Etc.	707
7414	Delivery Drivers	686
112	Human Resources Managers	654
9495	Plastic Products Assistants, Finance and Insurance	640
7231	Machinists and Tooling Inspectors	543
1215	Supervisors-Receiving, Distributing and Scheduling Occupations	539
1422	Data Entry Clerks	531
1414	Receptionists and Switchboard Operators	511
2233	Industrial Engineering and Manufacturing Technicians	508
1225	Purchasing Agents and Officers	480
9214	Supervisors-Plastic and Rubber Products	480
1473	Production Clerks	463
3212	Medical Laboratory Technicians	445
720	Facility Operators and Maintenance Managers	443
2132	Mechanical Engineers	420
1441	Administrative Clerks	418
7242	Industrial Electricians	412
9496	Painters and Coaters, Manufacturing	399
2243	Industrial Instrument Technicians	395
114	Other Administrative Services Managers	387
213	Information Systems and Data Processing Managers	385
6623	Other Elemental Sales Occupations	380
9510	Welding and Solder Machine Operators	371
2141	Industrial and Manufacturing Engineers	365
1432	Payroll Clerks	363
113	Purchasing Managers	358
1112	Financial and Investment Analysts	356
1211	Supervisors-General Office Clerks	339
4131	College and Other Vocational Institutions	337
7252	Steamfitters and Pipe fitters	327
1121	Specialists in Human Resources	309
9423	Rubber Processing Machine Operators	304
1421	Computer Operators	302
6651	Security Guards and Related	301
2242	Electrical Service Technicians (Equipment)	289
2121	Biologists and Related Scientists	279
1122	Occupations in Business Services to Management	274
6233	Retail and Wholesale Buyers	269
6661	Light Duty Cleaners	266
1212	Supervisors-Finance and Insurance Clerks	253

9470	Printing Press and Machine Operators	236
3211	Medical Lab Technicians and Pathology Assistants	225
2253	Drafting Technicians	223
1231	Bookkeepers	214
1222	Executive Assistants	208

Source: *Canadian Occupational Projections System*, Human Resources and Development Canada

Part 3: Demographic Profiles of Company Work Forces

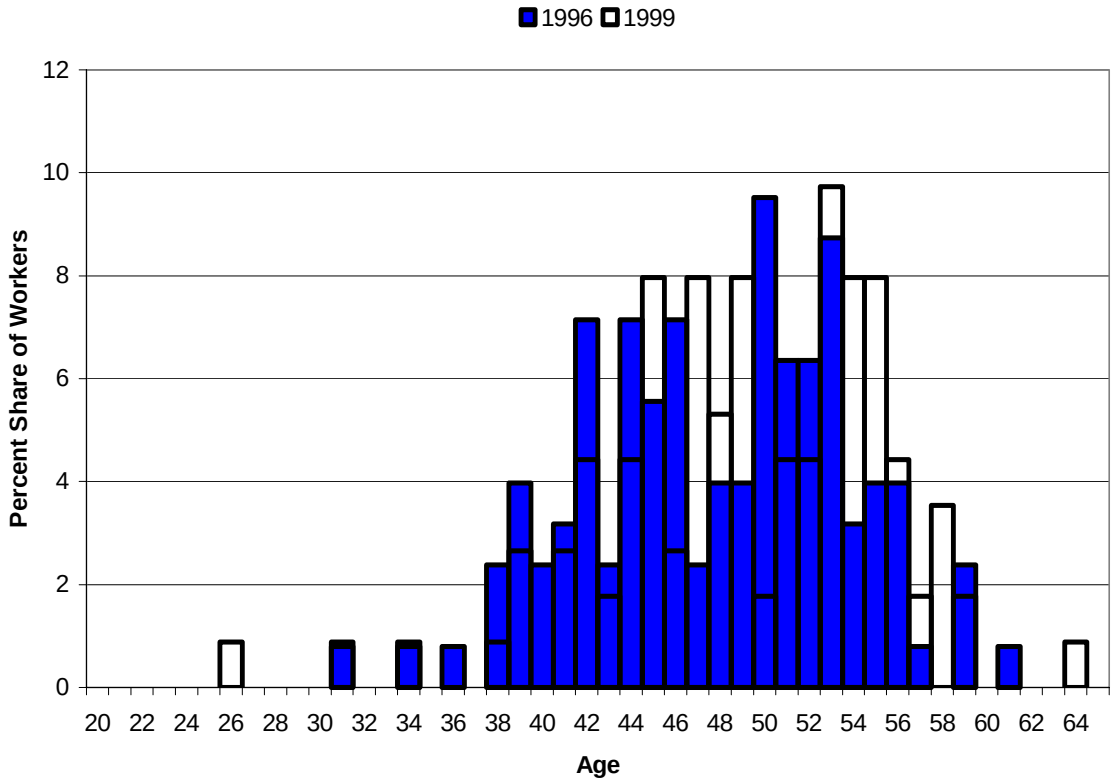
Company A

Company A is in the agricultural segment of the chemical industry. Data were provided on 113 production workers both on a current and historical basis. The database was comprehensive in that it covered all the requested demographic variables.

Age Profiles

Chart 3-1 indicates that in recent years older workers have dominated Company A's work force. In 1999 about 51 percent were age 49 or older. Few workers (6.2 percent) were below the age of 40. In 1996 about 54 percent were age 49 or older; 11.1 percent, less than 40 years. The continued aging of the work force can be measured by reference to the median and mean ages of the workers. Between 1996 and 1999 the median age increased from 48.5 to 49.3 years; the mean age, from 47.8 to 49.3 years.

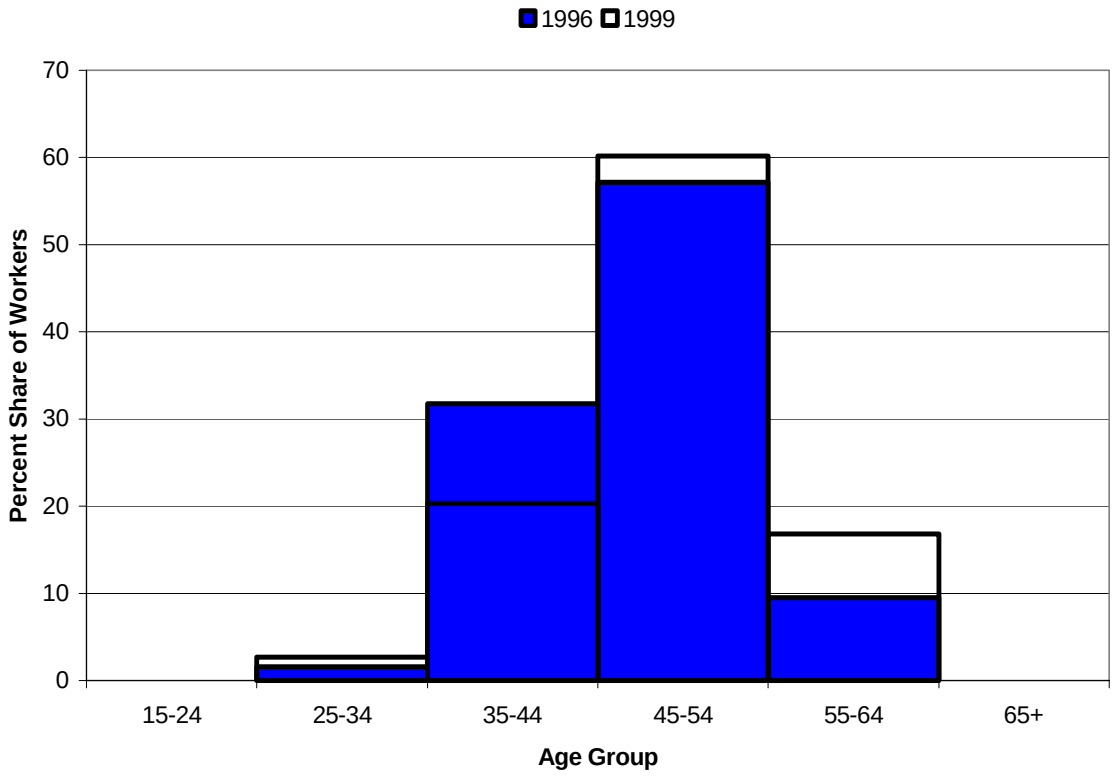
Chart 3-1
Company A Work Force by Age (single years), 1996 versus 1999



Boomers comprise the majority of the company's work force. The data in Chart 3-1 also demonstrate that in 1996 54.0 percent of Company A's workers were boomers (i.e., 30 - 49 years). The share declined to 50.4 percent in 1999 (when the boomers ranged in age from 33 - 52 years) but the majority position of the boomers was maintained.

Company A's work force declined from 126 to 113 workers between 1996 and 1999. Notwithstanding this absolute decrease in the size of the work force, the older age groups within Company A's work force increased in relative terms. The share of the 45+ age group increased from approximately two out of three workers (66.6 percent) to three out of four (77.0 percent). The 55+ share grew from 9.5 percent to 16.8 percent.

Chart 3-2
Company A Work Force by Age (five-year groups), 1996 vs. 1999



In addition to comparing the age profile of Company A's work force over time to analyse the impacts of aging from an internal perspective, it is useful to place the company's age profile in the broader context of Ontario's labour market. Charts 3-3, 3-4, and 3-5 illustrate the fact that Company A's work force is much more reliant on workers 45 years and older than is the case in Ontario's labour market. In 1999 the 45+ age group accounted for 31.3 percent of Ontario's labour force, 33.3 percent of full-time employment, and 31.3 percent of manufacturing employment. In other words about one in three workers. By contrast Company A's 45+ share was 77.0 percent or just over three in four workers.

Chart 3-3
Company A Work Force versus Ontario's Labour Force, 1999

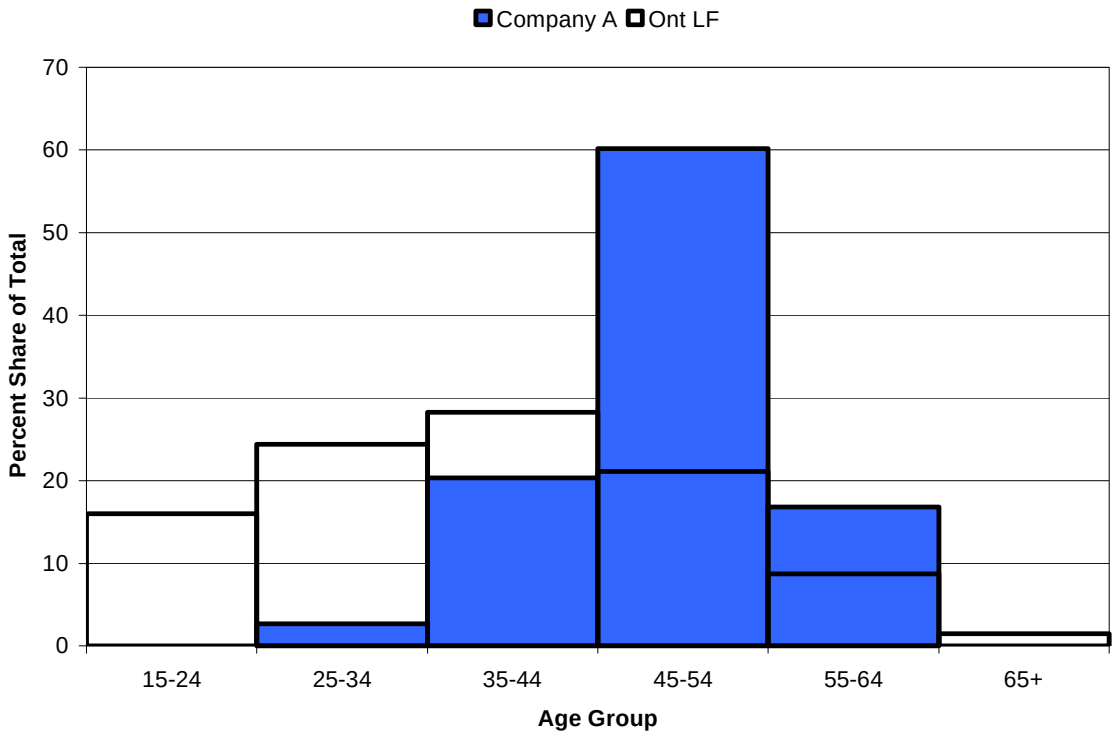


Chart 3-4
Company A Work Force versus Ontario Full-Time Employment, 1999

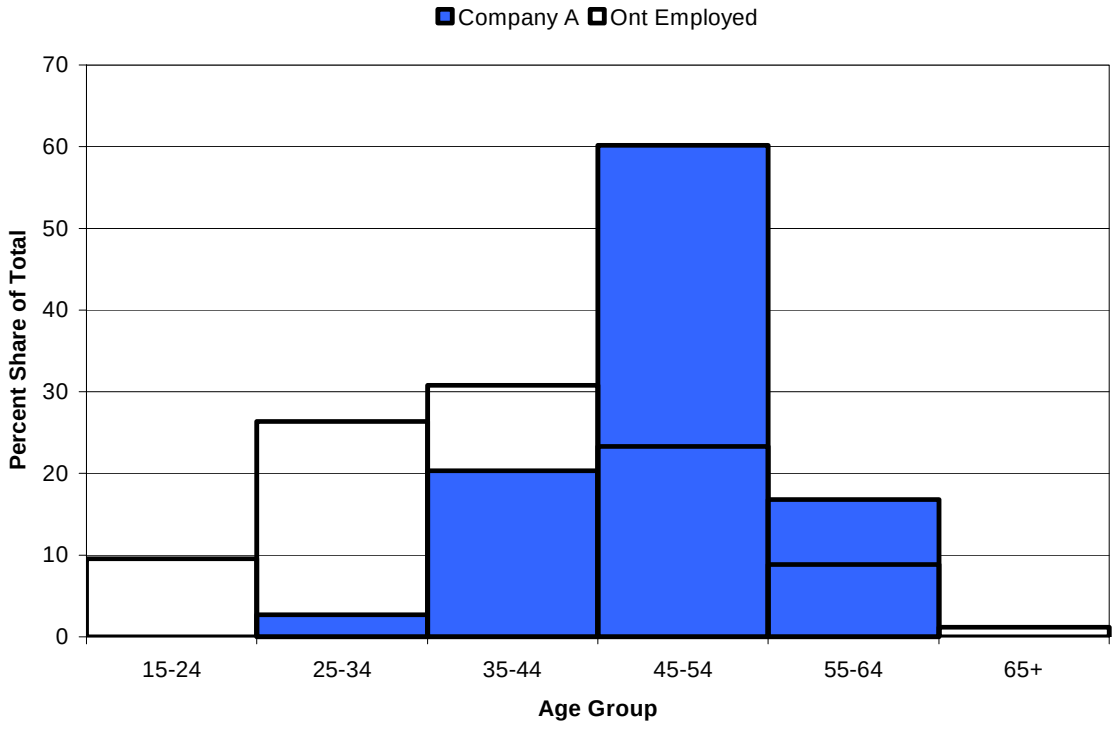
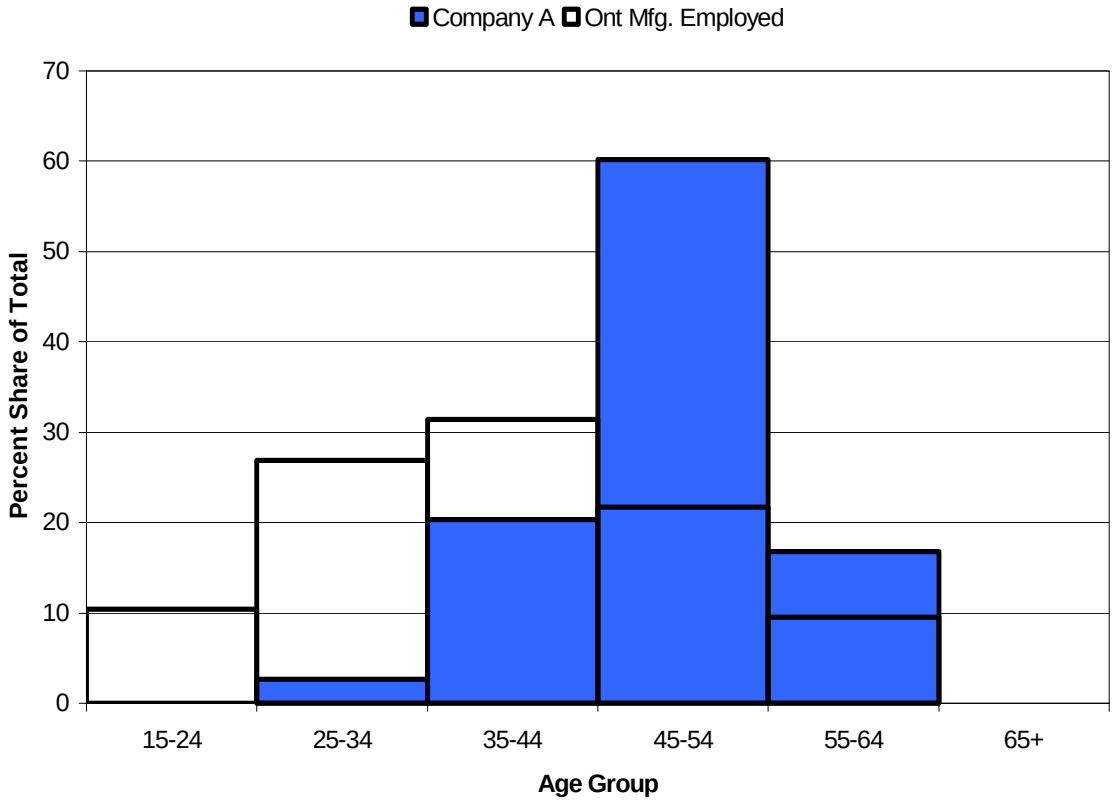


Chart 3-5
Company A Work Force versus Ontario Manufacturing Employment, 1999



Occupational Profiles

Table 3-1 contains summary data on the two occupational categories within Company A's production work force that are examined in this report. In 1999 both the median and mean ages of all workers was 49.3 years. Workers in Company A's Skilled Trades category were somewhat older (mean=50.5, median = 52.5) than workers in the Process Operator category (mean=48.8, median = 48.5).

Chart 3-6 reveals that only 10 percent of the Process Operator category were between the ages of 55-64, but 33.3% of skilled trades were in the 55+ age group. The share of the Skilled Trades in the 55- 64 group had increased from 8.8 percent in 1996. The increased share reflects the aging of existing workers, not the recruitment of additional older workers.

The 45+ age group dominated both occupational categories (see Table 3-1). The 45+ share for the Skilled Trades category was 84.8 percent; the share for the Process Operator category, 73.8 percent. Overall 77.0 percent of Company A's workers were 45 or older. Looking at the younger end of the age spectrum none of the 80 workers in the Process Operator category were under the age of 35 and only 3 of the 33 workers in the Skilled Trades category were in the 25 - 34 age group.

Chart 3-6
Age by Occupational Category, Company A, 1999

Table 3-1
Comparison of Occupational Categories, Company A, 1999

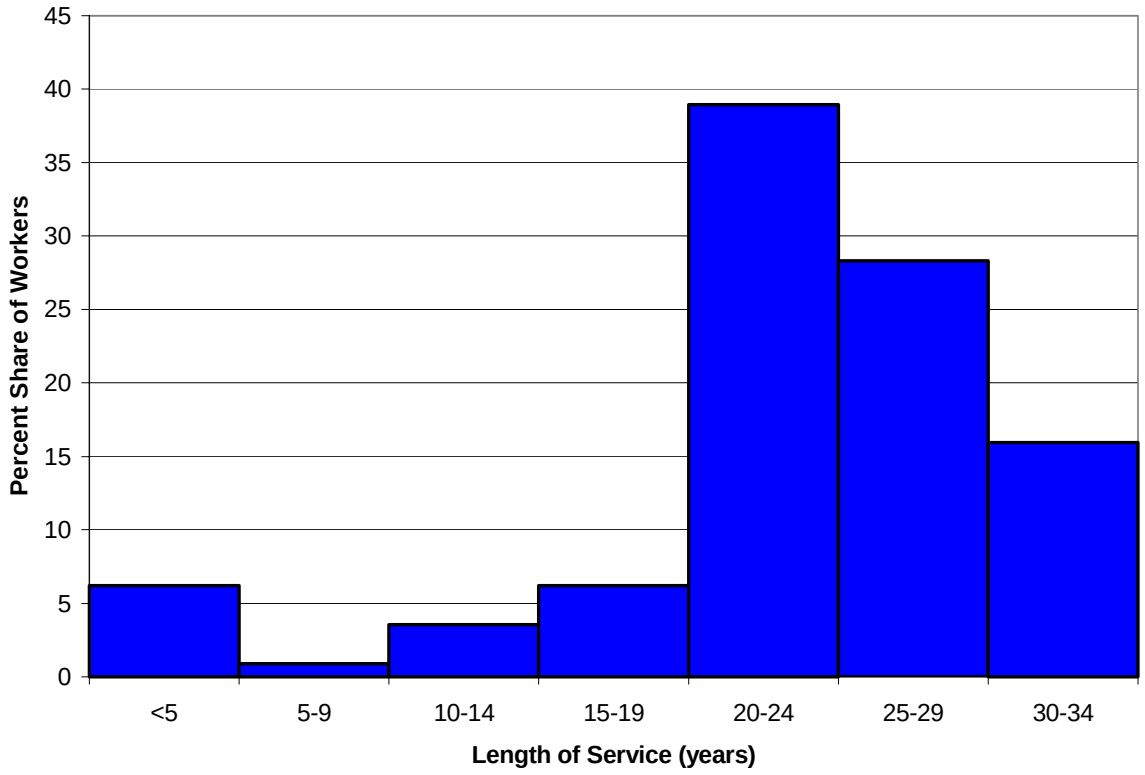
	Process Operator		Skilled Trades		Total	
	Mean	*Median*	*Mean*	*Median*	*Mean*	*Median*
Age	48.8	48.5	50.5	52.9	49.3	49.3
Years of Service	23.5	24.3	23.0	24.0	23.4	24.1
Age at Entry	25.5	23.6	27.5	25.0	25.9	24.3
Hours Worked[5]	1,878.2	1,948.5	1,919.9	2,016.6	1,889.7	1,967.3
Converted to yearly equivalent	.90		.99		NA	
Absence Hours[6]	287.6	266.0	260.6	219.1	280.0	260.0
Converted to yearly equivalent[7]	.14		.15		NA	
% Share 45+	73.8		84.8		77.0	

[5] Calculated as the 1996-1999 average.
[6] Calculated as the 1997-1999 average. Absence hours for 1996 are not available.
[7] Person-year conversion factor for process operators is 2,080 hours per year; for skilled trades, the factor is 1,941 hours per year.

Length of Service

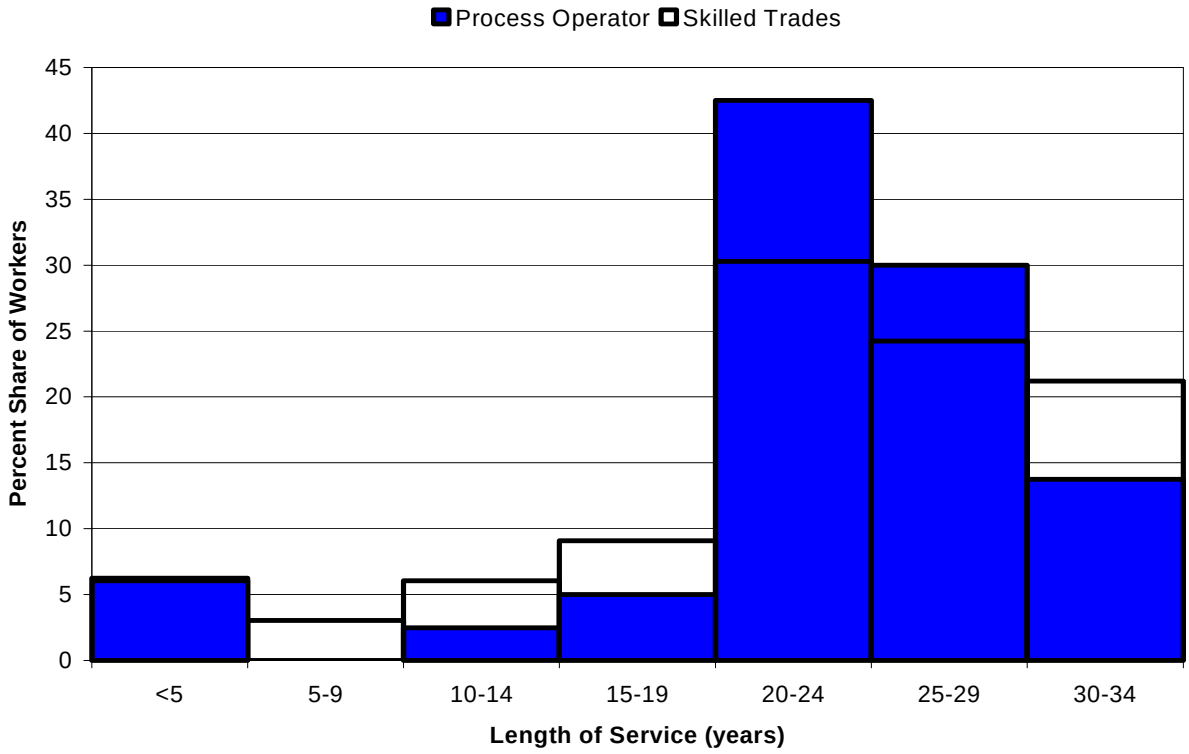
In 1999 Company A had an "experienced" work force, i.e., only 7.9 percent of its production workers had less than 10 years of service with the company (Chart 3-7). This represented an increase from 1996 when only 4.8 percent of the work force had less than 10 years of service. The bulk of the workers had 20+ years of service (73.0 percent of workers in 1996 and 83.1 percent in 1999). The mean length of service was 23.4 years and the median length, 24.1 years (see Table 3-1).

Chart 3-7
Years of Service, All Workers, Company A, 1999



In terms of occupation Table 3-1 reveals that the Process Operator category was only slightly more "experienced" (mean = 23.5 years, median = 24.3 years) than the Skilled Trades category (mean = 23.0, median = 24.0). However, in Chart 3-8 it is evident that a larger percentage of workers in the Skilled Trades category (21.2 percent) were in the highest service grouping (30-34 years) than workers in the Process Operator category (13.8 percent). A larger portion of the Process Operator category had 20 - 29 years of service (72.5 percent versus 54.5 percent in the Skilled Trades).

Chart 3-8
Years of Service by Occupational Category, Company A, 1999



Hours Worked

Company A provided data on hours worked by each of its employees during the 1996 - 1999 period. A reasonable hypothesis about who works the most hours in the industry might be: *younger workers work more hours than older workers because they have greater economic incentive, are more physically able to withstand the rigours of longer hours, and are further away from retirement.* Chart 3-9 presents data on hours worked by age for all workers at Company A. Upon analysis of these data our hypothesis cannot be sustained:

- The youngest workers (25 - 34) account for the lowest annual average; the oldest workers (55 - 64), the highest.

- Workers between the ages of 35 and 54 have roughly the same annual average.

Table 3-2 portrays the same data by occupational category. The observation that hours worked and age are inversely related holds for the Skilled Trades category but not the Process Operator category. The youngest workers in the Process Operator category and the oldest workers in the Skilled Trades category work the most, whether the measure is average annual hours or person-years. This finding is possibly explained by the different age profiles of the two groups. Also, overall workers in the Skilled Trades work more (on both an annual average hours or person-year basis) than workers in the Process Operator category do. The data do not provide a basis for explaining this finding.

Chart 3-9
Hours Worked by Age, Company A
1996-1999 Average[8]

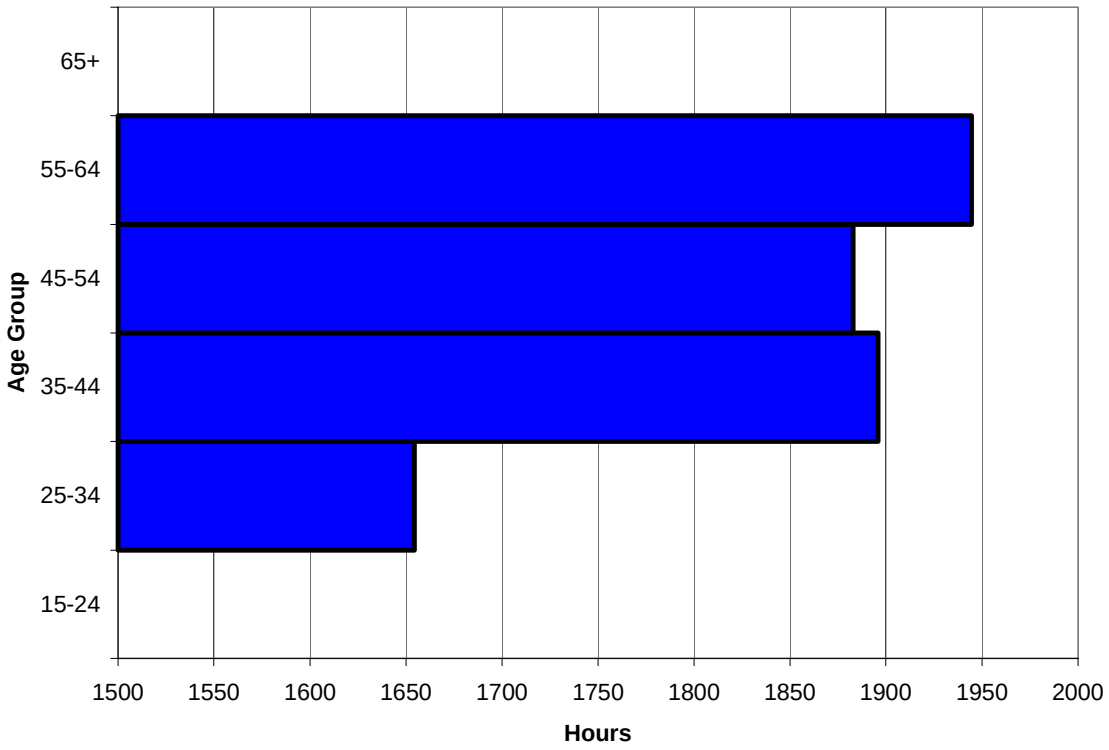


Table 3-2
Comparison of Annual Average Hours Worked by Age Group
Company A, 1996-1999 Averages

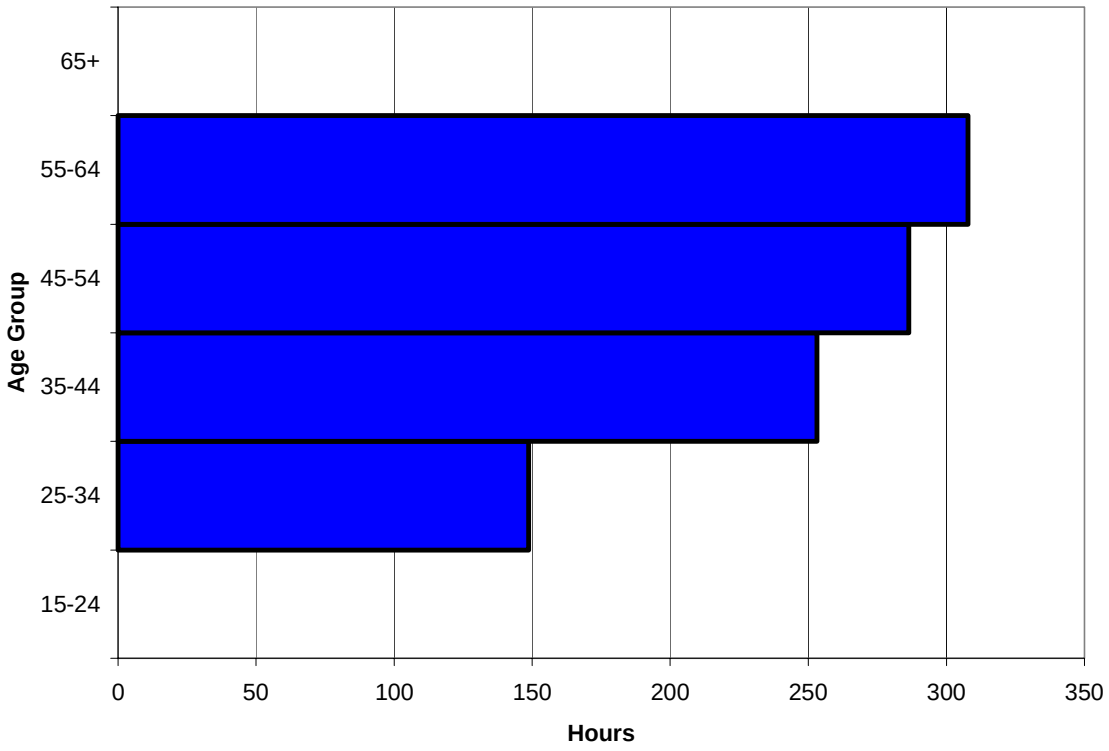
	Process Operator		Skilled Trades	
	Hours	*Person Years*[9]	*Hours*	*Person Years*[10]
15-24				
25-34	2,005.2	0.96	1,479.0	0.76
35-44	1,882.4	0.91	1,978.3	1.02
45-54	1,874.6	0.90	1,904.8	0.98
55-64	1,875.5	0.90	2,016.3	1.04
65+				
All Groups	1,878.2	0.90	1,919.9	0.99

[8] Mean = 1,890 hours, median = 1,967 hours.
[9] One person year = 2,080 hours.
[10] One person year = 1,941 hours.

"Lost Time"

In any industry workers are not always available for work. They may be ill or disabled, on leave for various reasons, or taking training. Absence from work for one or more of these reasons is commonly called "lost time". Chart 3-10 illustrates what other research has indicated about the relationship between "lost time" and age: time away from work and age are inversely related. Older workers incur more "lost time" because they are more likely to be ill or disabled and usually have higher vacation entitlements. However, there are other considerations. For example, older workers are often the most reluctant group regarding training, and younger female workers make substantial use of pregnancy leave.

Chart 3-10
"Lost Time" by Age, Company A
1997-1999 Average[11]



Examining the data on "lost time" from an occupational perspective does not change the basic finding. Table 3-3 demonstrates that for both the Skilled Trades and Process Operator categories "lost time" increases with age. The age of 45 marks the point beyond which workers in both categories exceed the averages (in annual hours and person-years) for all age groups. Several other observations can made:

- Workers in the Process Operator category miss more time (on either an annual hours or person-year basis) than workers in the Skilled Trades. This is true across all age groups except the 25 - 34 group.

[11] Mean = 280 hours, median = 260 hours.

- The greatest increase in "lost time" in the Process Operator category occurs between the 25-34 and 35-44 age groups (where it almost doubles), and then to a lesser extent from the 45-54 and 55-64 age groups.

- The greatest increase in "lost time" for the Skilled Trades occurs between the 35-44 and 45-54 age groups (an increase of 34.1 percent), and then to similar degree (31.4 percent increase) between 25 - 34 and 35 - 44 age groups.

- The increase in "lost time" between the two oldest groups (i.e., 45 - 54 and 55 - 64) is more pronounced for the Process Operator (21.1 percent) than the Skilled Trades (0.4 percent) category.

Table 3-3
Comparison of "Lost Time" by Age Group
Company A, 1996-1999 Averages

	Process Operator		**Skilled Trades**	
	Hours	*Person Years*	*Hours*	*Person Years*
15-24				
25-34	132.0	0.06	154.3	0.08
35-44	261.3	0.13	202.7	0.10
45-54	291.7	0.14	271.9	0.14
55-64	353.2	0.17	272.9	0.14
65+				
All Groups	287.6	0.14	260.6	0.13

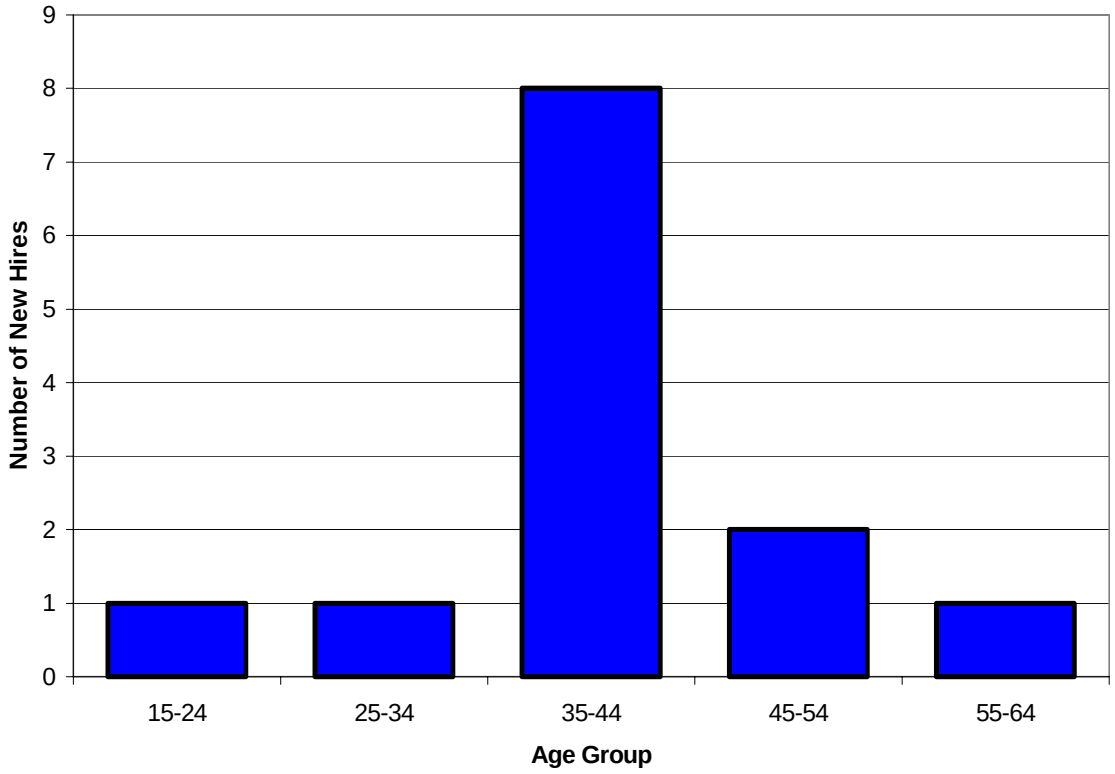
One possible explanation for the occupational differences in the relationship between "lost time" and age is that workers in the Process Operator category may receive more training.

Organizational Movement

Recruitment

Company A hired only 13 new workers between 1996 and 1999, with the majority (6) hired in 1998. Most of the new hires (10 of 13) were classified as *temporary* workers (versus *regular*). Six out of ten of the new hires (61.5 percent) were between the ages of 35-44 (Chart 3-11) and the median age was 39.8 years.

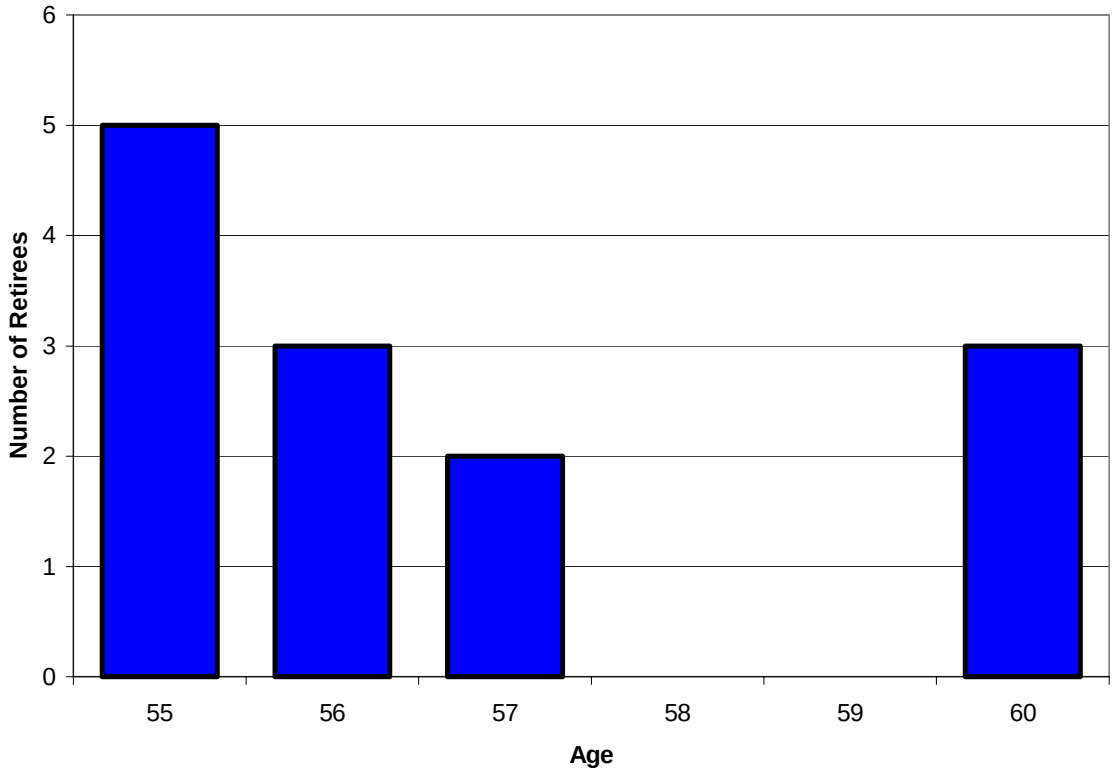
Chart 3-11
New Hires by Age, Company A
1996 to 1999



Retirement

All thirteen workers who retired between 1996 and 1999 were between the ages of 55 and 60 (Chart 3-12). The median age of retirement was 56 (mean = 56.7). Eleven of the workers left in 1998 when it appears an early retirement incentive was available. The retirement bulge of 1998 was partially managed by the hiring drive referred to above.

Chart 3-12
Retired Workers by Age, Company A
1996 to 1999



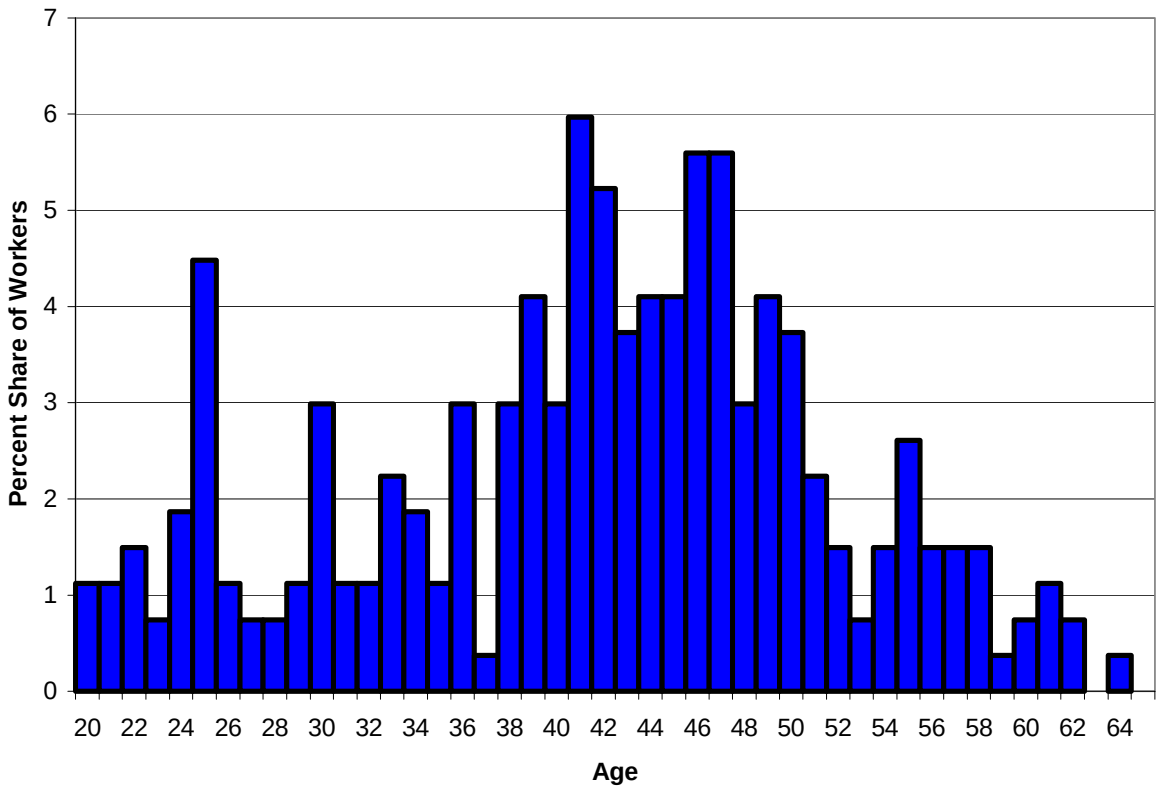
Company B

Company B is in the soap and cleaning compounds segment of the chemical industry. Data were provided on 268 production workers on a current basis only. The database was not comprehensive in that data on retirement, resignation, and hours worked and "lost time" by age were not provided. However, Company B was able to provide data on a gender basis.

Age Profiles

The majority (61.2 percent) of the production work force at Company B is 40 years or older (see Chart 3-13). On average workers are in their early forties (the mean age is 41.6 and the median age is 42.6).

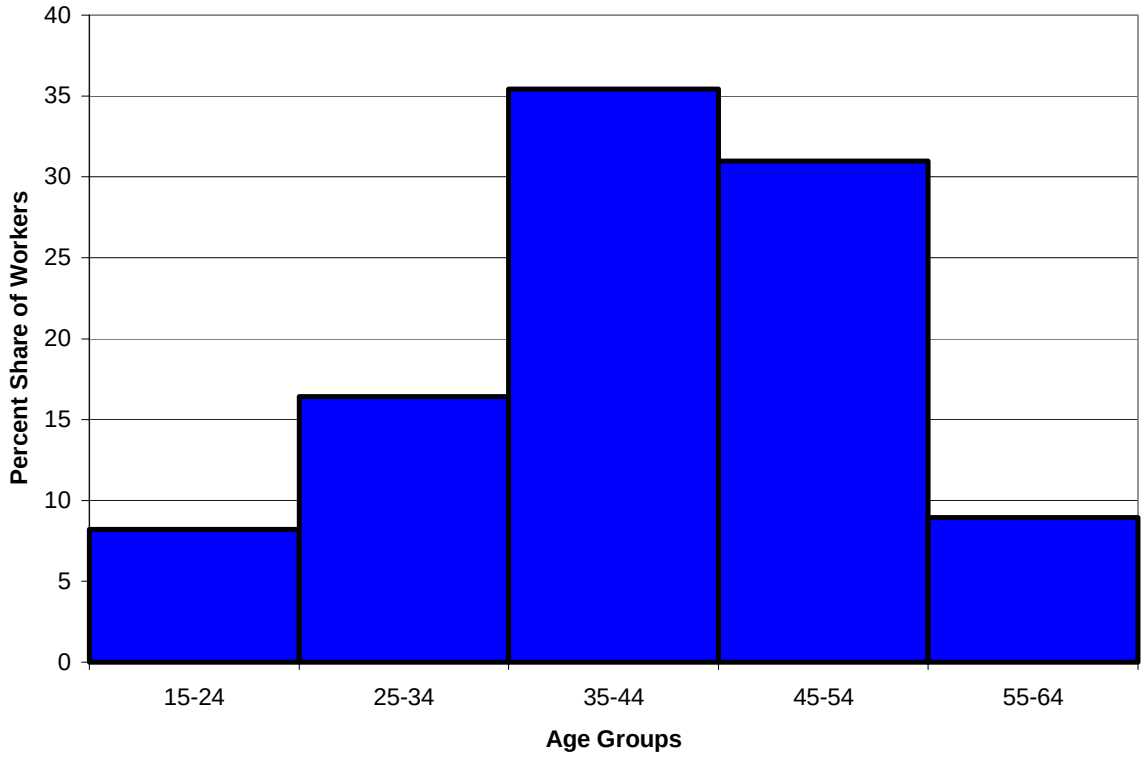
Chart 3-13
Age Distribution (single years) of Company B Work Force, 2000



The single largest group of workers, comprising 35.4 percent of the company's work force, ranges in age from 35 to 44 years (see Chart 3-14). Just less than 31 percent of workers at Company B are in the 45 - 54 group. Together the two age groups, which overlap substantially with the "boomer" cohort in Ontario's labour force, constitute about two-thirds of the company's work force (in 2000 67.5 percent of the workers are between the ages of 33 and 53).

Chart 3-14 also illustrates that the youngest (15 - 24 years) and oldest (55 - 64 years) groups of workers occupy roughly the same share of Company B work force.

Chart 3-14
Age Distribution (ten-year age groups) of Company B Work Force, 2000



The age profile of the Company B work force needs to be placed in the broader context of Ontario's labour force. This comparison is depicted in charts 3-15, 3-16, and 3-17.

Chart 3-15 shows the company's work force in comparison to Ontario's labour force. Three major differences are evident:

- Boomers (i.e., essentially workers between the ages of 35 and 54) occupy a larger share of the work force at Company B than is the case in the labour force. The boomer share at Company B is about two-thirds compared to one-half in the labour force.

- The share of workers under 35 is greater in the labour force (40.4 percent) than at Company B (24.6 percent).

- The share of "older workers" (i.e., 55 and older) is about the same.

Chart 3-15
Age Distribution of Company B Work Force (2000)
Versus Ontario Labour Force (1999)

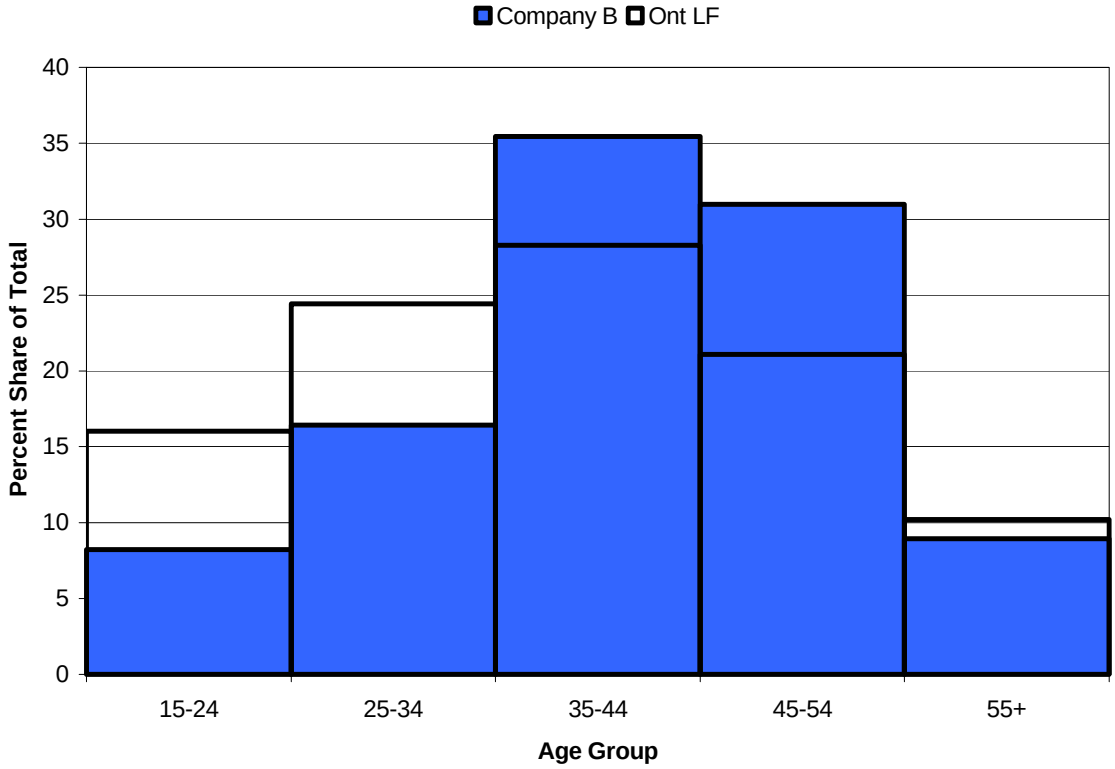


Chart 3-16 compares the work force at Company B to the full-time employment component of Ontario's labour force; Chart 3-17 to the manufacturing sector labour force. Although the specific age group shares vary somewhat, the trends identified in the comparison of Company B and the overall labour force remain evident:

- Boomers represent 54.1 percent of full-time employment and 53.1 percent of manufacturing employment (compared to 66.4 percent at Company B).
- The share of workers under 35 employed full-time (35.9 percent) and employed in manufacturing (37.1 percent) exceeds the share at Company B (24.6 percent).
- The share of 55+ workers is approximately the same among Company B, the full-time labour force, and the manufacturing labour force.

Chart 3-16
Age Distribution of Company B Work Force (2000)
Versus Ontario Full-Time Employment (1999)

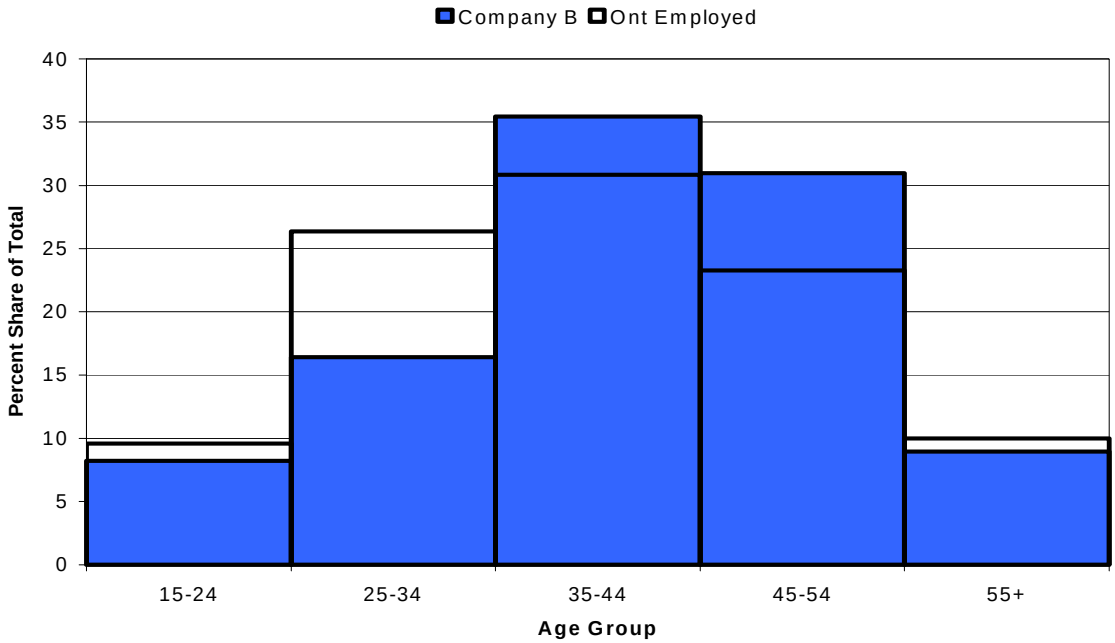
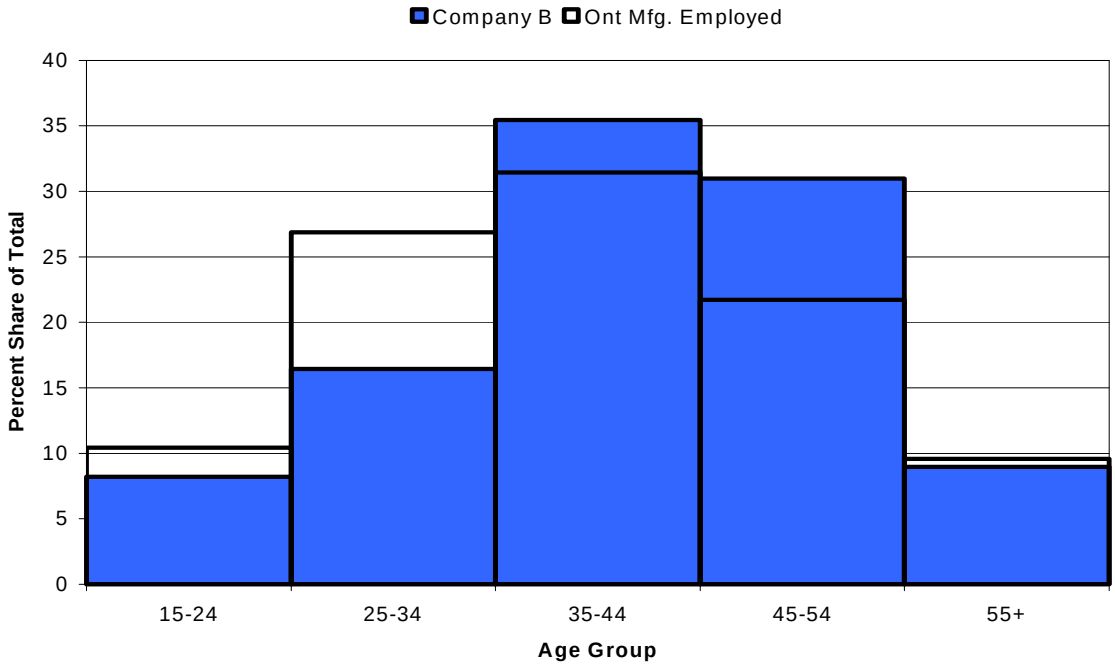


Chart 3-17
Age Distribution of Company B Work Force (2000)
Versus Ontario Manufacturing Employment (1999)



Age and Gender Profiles

Compared to Ontario's labour force, participation by females in Company B's work force is quite low (46.7 percent versus 6.7 percent, respectively). This "gender gap" remains when comparisons are made to the full-time component of the labour force (41.1 percent level of female participation) and the manufacturing labour force (29.8 percent level of female participation).

In terms of age male and female workers at Company B are fairly similar. The median age of female workers is 42.6 (42.7 for males) and the mean age is 41.9 (41.6 for males). Chart 3-18 illustrates that the age distribution is reasonably the same, although the female boomer cohort is relatively larger (77.8 percent of female workers are boomers) than the male boomer cohort (65.6 percent of male workers). The dominance of female boomers at Company B is in sharp contrast to female boomer representation in the manufacturing sector labour force (53.6 percent of female manufacturing workers are boomers) and full-time labour force (54.7 percent).

Chart 3-18
Age Distribution by Gender
Company B Work Force (2000) versus Ontario Labour Force (1999)

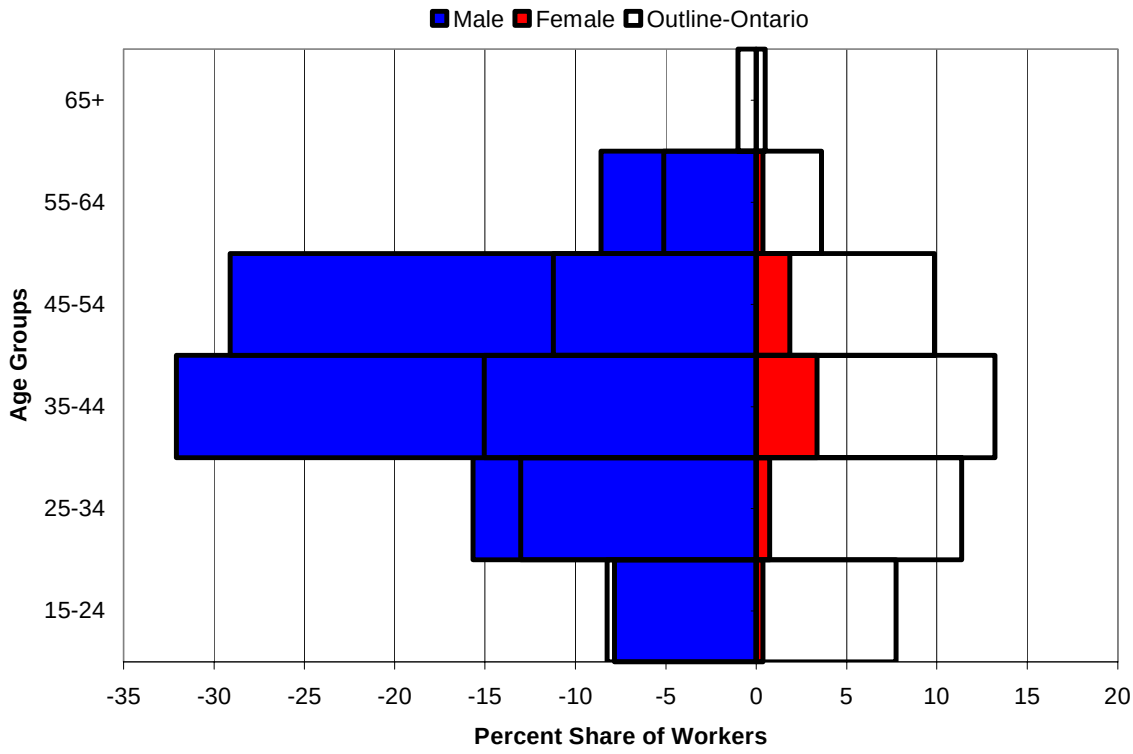


Chart 3-18 also reiterates the disparate age profiles of Company B and the Ontario labour force, most notably the over-representation of boomers in the company's work force.

Occupational Profiles

The analysis of the work force at Company B focuses on four occupational categories - Process Operator, Skilled Trades, Semi-skilled workers, and Manual workers. Table 3-4 presents data derived from the analysis of these occupational categories. A number of observations can be made:

- The oldest workers are in the Skilled Trades occupational category. This observation holds when different indicators of age are used. Workers in the Skilled Trades have the highest average age (46.4), the highest average age at entry to the Company B work force (33.1), and the largest share of workers in the 55+ age group (19.6 percent). This category has the second largest share of 45+ workers (56.9 percent).

- Semi-skilled workers are the second oldest category in terms of average age, average entry age, and share of 55+ workers. It has the largest share of 45+ workers (58.8 percent).

- Process Operator is the next oldest category. The average age of workers in this category is almost the same as the company average. These workers also have the youngest average entry age (27.3) and a substantially lower share of 45+ (37.6 percent) and 55+ (6.3 percent) workers than the Skilled Trades and Semi-skilled categories. Compared to the Skilled Trades, the Process Operator category has a larger share of workers under 35 (9.8 percent versus 22.7 percent, respectively).

- Manual worker is the youngest category with an average age of 31.1 and three-quarters of its workers under the age of 35. Only 8.3 percent of the workers in this category are 45 or older.

- The dominance of boomers is evident in all categories except Manual. Roughly two-thirds of workers in the Process Operator (71.1 percent), Skilled Trades (70.6 percent), and Semi-skilled (64.7 percent) categories are boomers compared to one in four workers (25.0 percent) in the Manual category.

- The average age at entry to the Company B work force ranges from 27.3 (Process Operator) to 33.1 (Skilled Trades). This suggests that the company recruits relatively "mature" labour force participants for its production operations. Even the youngest category (Manual) has an average entry age of 31.1 (the second highest among the four categories).

Table 3-4
Comparison of Occupation Categories
Company B Work Force, 2000

Characteristic	Process Operator	Skilled Trades	Semi-Skilled	Manual
Age Groups (% share of category):				
15-24	9.1	0.0	0.0	25.0
25-34	13.6	9.8	17.6	50.0
35-44	39.8	33.3	23.5	16.7
45-54	31.3	37.3	41.2	8.3
55-64	6.3	19.6	17.6	0.0
65+	0.0	0.0	0.0	0.0
Number of Workers	176	51	17	24
Average Age	41.4	46.4	45.0	31.1
Average Years of Service	14.0	13.4	17.5	0.2
Average Age at Entry	27.3	33.1	29.3	31.1
% Share Aged 45+	37.6	56.9	58.8	8.3

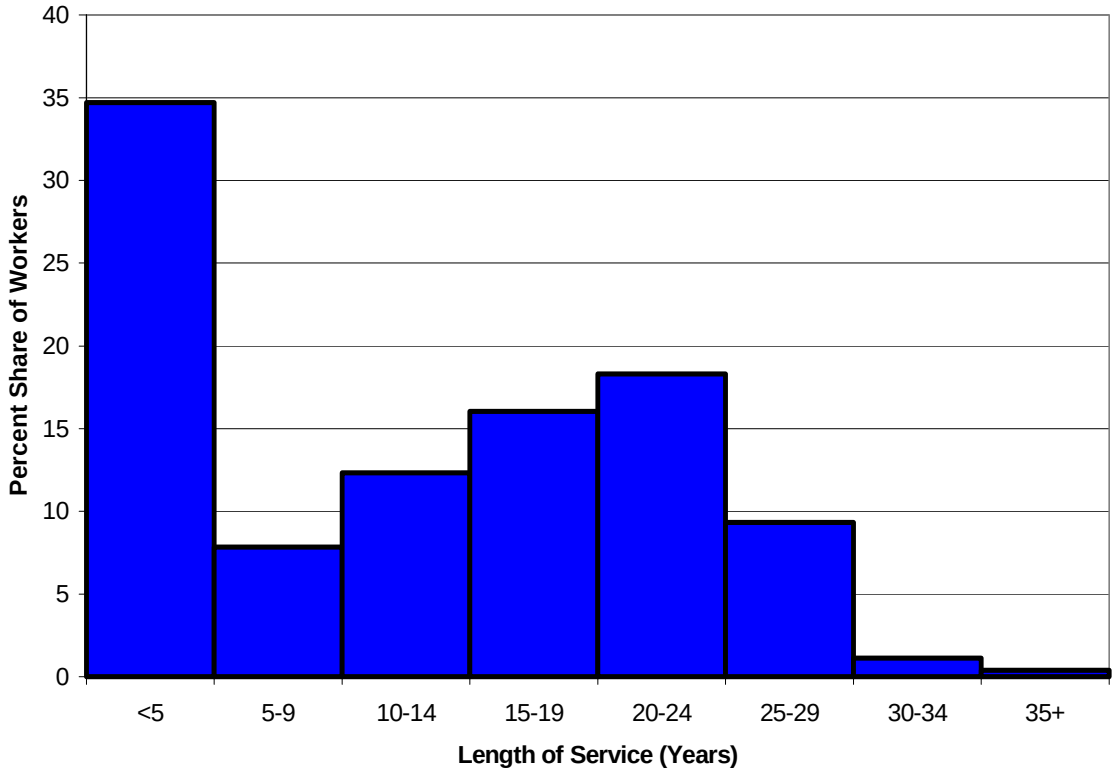
Length of Service

Chart 3-19 illustrates data on length of service for all production workers at Company B. Almost 35 percent of the work force has less than five years of service; 43 percent, less than ten years. This trend reflects the number of people hired since 1990 (see section on "Recruitment" below). However, large segments of the work force have either 10 - 19 years of service (28.4 percent of workers) or 20 - 29 years of service (27.6 percent).

The median length of service at Company B for all workers is 14.6 years (the mean is 12.8 years). Although male and female workers have a comparable median length of service (14.6 years for males and 14.2 for females), the mean length of service is higher for males (13.0 versus 11.2 years).

From an occupational perspective, service length ranges from 0.2 (Manual) to 17.5 (Semi-skilled) years. Although workers in the Process Operator category are significantly younger than those in the Skilled Trades category (average ages of 41.4 and 46.4, respectively), they have a slightly higher average length of service (14.0 versus 13.4 years).

Chart 3-19
Years of Service (five-year groups)
Company B Work Force, 2000



Recruitment

Company B hired 115 workers during the 1990 - 2000 period (see Chart 3-20), a group that represents 42.9 percent of the current work force. Although this is an average of about ten workers a year, over three-quarters (76.5 percent) of the new hires have been made since 1997. Hiring in 1998 alone accounted for almost 27 percent of the ten-year total.

The vast majority of new hires (almost 95 percent) have been male, a trend consistent with the gender composition of the company's work force.

Chart 3-21 demonstrates that about two of every three new workers hired was either in the 25-34 age group (41.7 percent) or the 35-44 age group (27.8 percent). However, one in four (24.3 percent) were in the 15 - 24 age group. Few 45+ workers were hired (6.1 percent of all hires). The mean age of all new hires was fairly high at 31.5 (the median age was 30.0).

In terms of occupational categories six of ten new hires were Process Operators; less than 3 percent of new hires were Semi-skilled workers. Semi-skilled workers (20.9 percent) and Skilled Trades (16.5 percent) accounted for roughly similar shares.

Chart 3-20
Annual Number of New Hires
Company B, 1990 - 2000

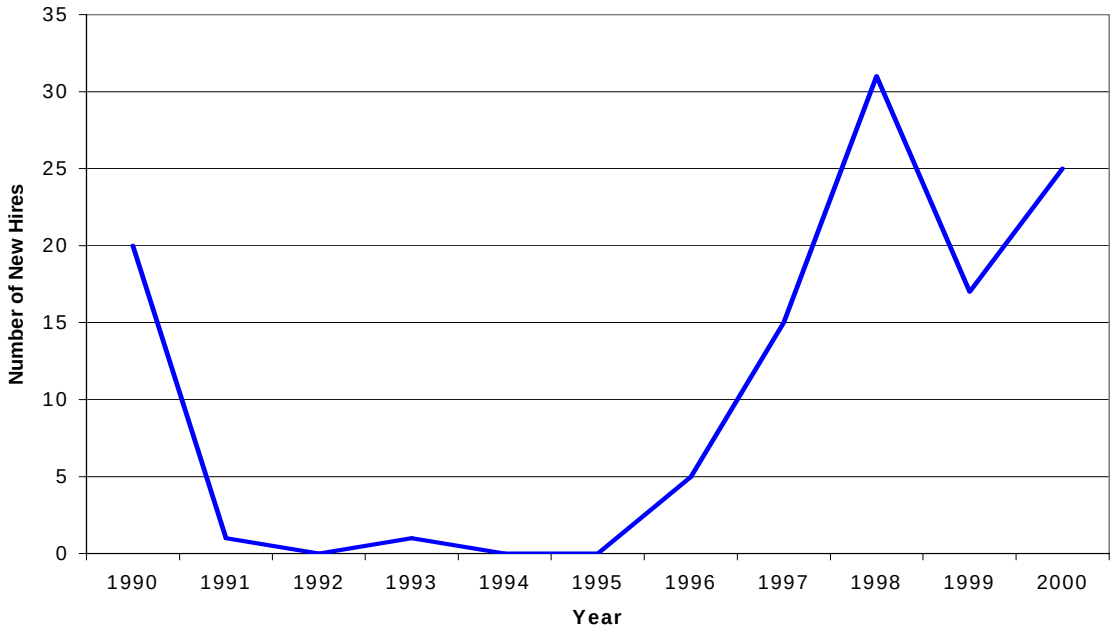
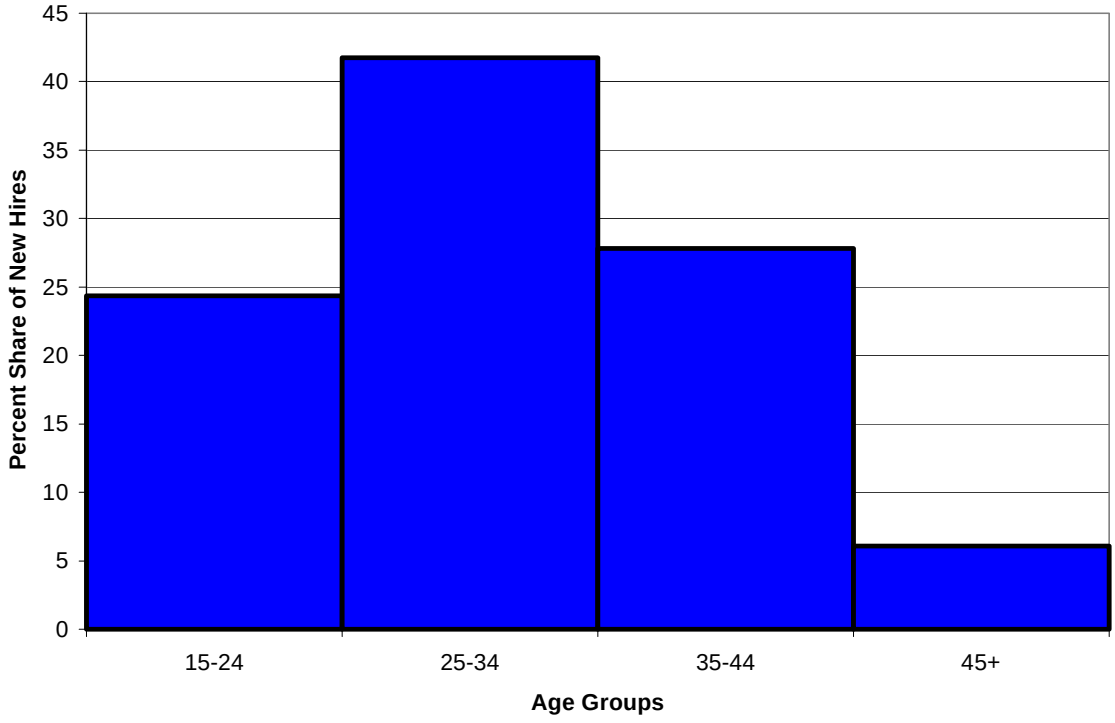


Chart 3-21
New Hires by Age at Entry
Company B, 1990 - 2000



Comparative Analysis

The extent to which a comparative analysis of the companies' respective work forces can be conducted is limited by the available data. The data common to both cases are age, service, occupational category, and recruitment.

Age

Both companies have work forces that are considerably older than the Ontario labour force and the overall work force in Ontario's manufacturing industry. Company A's work force is much older than that of Company B. The median age for workers in the selected occupational categories at Company A is 49.3 compared to 42.6 at Company B. In addition, Company A has a larger percentage of workers who are 45 and older (77 percent versus 40 percent).

The age difference between the companies shows up in both the Process Operator and Skilled Trades occupational categories. The share of Process Operators who are 45 or older at Company A is almost twice as large as the share at Company B (74 percent versus 38 percent). About 85 percent of the workers in Skilled Trades at Company A are 45 or older compared to 57 percent at Company B. Both companies have significant shares of Skilled Trades workers in the 55 or older age group. At Company A approximately one in three workers in the Skilled Trades are 55 or older; at Company B, one in five.

Service

The age differentials translate into service differentials. Overall, 83.2 percent of the production workers at Company A have 20 or more years of service compared to a 29.1 percent share at Company B. In the Process Operator category 86.3 percent of Company A's workers have 20 or more years of service. The share for Company B is 33.5 percent. In the Skilled Trades category Company B has fewer (21.6%) workers with 20 or more years of experience than Company A does (75.8 percent).

Recruitment

Company B has recruited more actively than Company A during the past three years or so. There is a substantial difference in the median age of new hires by the two companies: about 30 at Company B and 40 at Company A. The thrust of Company B's recruitment has been to replenish the Process Operator category. Company has primarily recruited temporary workers.

Part 4: Observations and Recommendations

Observations

- Output, employment, and productivity in the Canadian chemical and chemical products industry have increased substantially since 1994. The current employment level exceeds the previous high attained in the late 1980s.

- Ontario is the anchor of the chemical and chemical products industry in Canada accounting for the major shares of output and employment.

- Future demand for the industry's products will be strong and is driven by both economic and demographic factors. However, the level of demand will vary across the industry's segments.

- To meet the projected demand the industry will need to continue to expand its work force until about 2011. This projection regarding labour force supply assumes that the recent high level of productivity growth can be sustained. If productivity growth slows down, the period of work force expansion will extend beyond 2011.

- Ontario's labour force is aging. During the next ten years labour force growth will be greatest among workers 45 and older. Workers in their thirties will be in less plentiful supply.

- Ontario's labour force is becoming more diverse in terms of gender and ethnicity. Participation rates for women in the prime working years between 25 and 54 will continue to increase. Immigrants, particularly from Asia and Africa, will represent an increasingly larger share of labour force growth.

- The production work forces of the companies examined in this report are aging. In the key occupational categories of Process Operator and Skilled Trades both companies have work forces that are considerably older than Ontario's labour force as well as the overall work force in Ontario's manufacturing industry.

- The age (and gender) profile of the companies has significant implications for recruitment and the use of technology to increase output and productivity. Recent recruitment efforts have targeted workers in their thirties, the labour market cohort that declines absolutely during the next ten years. Other studies have shown that older workers tend to be less inclined either to keep pace with the latest technology or to take training.

Recommendations

1. The results of this report are both significant and suggestive. Expanding the demographic analysis of company work forces at the production level would strengthen the validity of our findings. A sample of 25 companies representing all industry segments would provide a more solid basis to identify human resources planning issues across the industry.

2. Industry leaders should assess the usefulness of including both other production occupations (e.g., semi-skilled workers) and non-production occupations (e.g., administrative support) in the expanded analysis.

3. The data provided by Company A should be the template for future research. The template should also include data on gender and resignation (i.e., age, gender, occupation, and service).

4. An expanded study would provide a framework for demographically-based projections of labour supply at both the company and industry level. A larger sample of workers would allow for the formulation of realistic assumptions about attrition factors such as resignation and retirement. Demographically-based supply projections could be married with industry-level demand projections.