Catalogue no. 75-001-XIE

PERSPECTIVES

ON LABOUR AND INCOME

MAY 2007
Vol. 8, No.5

Statistics Canada Statistique Canada

Canada

At Your Service...

How to obtain more information

Specific inquiries about this product and related statistics or services should be directed to: *Perspectives on Labour and Income*, 9 A-6 Jean Talon, 170 Tunney's Pasture Driveway, Statistics Canada, Ottawa, Ontario, K1A 0T6 (telephone: (613) 951-4628; e-mail: perspectives@statcan.ca).

For information on the wide range of data available from Statistics Canada, you can contact us by calling one of our toll-free numbers. You can also contact us by e-mail or by visiting our website at www.statcan.ca.

National inquiries line	**1 800 263-1136**
National telecommunications device for the hearing impaired	**1 800 363-7629**
Depository Services Program inquiries	**1 800 700-1033**
Fax line for Depository Services Program	**1 800 889-9734**
E-mail inquiries	**infostats@statcan.ca**
Website	**www.statcan.ca**

Information to access the product

This product, catalogue no. 75-001-XIE, is available for free in electronic format. To obtain a single issue, visit our website at www.stacan.ca and select Our Products and Services.

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner and in the official language of their choice. To this end, the agency has developed standards of service that its employees observe in serving its clients. To obtain a copy of these service standards, please contact Statistics Canada toll free at 1 800 263-1136. The service standards are also published on www.statca.ca. under About Statistics Canada > Providing services to Canadians.

Perspectives on Labour and Income
(Catalogue no. 75-001-XIE; aussi disponible en français: *L'emploi et le revenu en perspective*, nº 75-001-XIF au catalogue) is published monthly by authority of the Minister responsible for Statistics Canada. ©Minister of Industry 2007.
ISSN: 1492-496X.

Symbols

The following standard symbols are used in Statistics Canada publications:

.	not available for any reference period
..	not available for a specific reference period
...	not applicable
p	preliminary
r	revised
x	confidential
E	use with caution
F	too unreliable to be published

Highlights

In this issue

The busy lives of teens

- In 2005, school-attending teens aged 15 to 19 averaged a 50-hour workweek (school, paid work and housework), virtually the same as adults aged 20 to 64 doing the same activities.
- On any given day, 60% of teens spent 2.2 hours on homework. Teens were significantly more likely to do homework if both parents had a university education or if they lived in an intact two-parent family; they were significantly less likely to do so if they were boys with Canadian-born parent(s) or if they had a paid job with long hours (20 or more).
- Teen involvement in paid work has increased over the past 20 years. In 2005, one in five reported working an average of five hours on the day they were interviewed. Paid work was more common on weekends and among teens aged 18 and 19.
- Four in 10 teenagers did some housework daily, averaging about an hour. Influencing factors included family type, cultural background, and community size.
- Significantly more teens with little or no stress (related to time and unpaid and paid labour) reported being very happy and/or very satisfied with life than teens with high stress (72% versus 45%).

Fuelling the economy

- In 2006, the contribution to GDP of all sectors of the oil and gas industry exceeded $40 billion (1997 dollars), and direct employment totalled almost 300,000.
- In the upstream sector (exploration and extraction), production and investment have become driving forces in the economy. Between 1997 and 2005, investment increased almost 140% to $45.3 billion, and the value of oil and gas production increased over 245% to $108 billion.
- Jobs in the oil and gas industry are much less likely to be unionized than other jobs (12% versus 32%). They are also more likely to be full-time (88% versus 82%) and held by men (72% versus 53%).
- Employment in oil and gas extraction increased 43% between 1997 and 2006 (from about 55,000 to 79,000). Average hourly earnings in 2006 were $30.36.
- Downstream employment varied dramatically. Of the 117,000 workers, 63% worked at gas stations where hourly earnings were about $8.60. For the 14% in petroleum and coal products manufacturing, earnings were significantly higher at just over $28 an hour.

PERSPECTIVES

ON LABOUR AND INCOME

THE COMPREHENSIVE JOURNAL

on labour and income from Statistics Canada

. . . . . .

❑ **Yes, I want PERSPECTIVES ON LABOUR AND INCOME (Catalogue no. 75-001-XPE).**

Save by extending your subscription!
Save 20% by subscribing for 2 years! Only $100.80 (plus taxes)
Save 30% by subscribing for 3 years! Only $132.30 (plus taxes)

Subscribe to *Perspectives on Labour and Income* today!

ORDER FORM

MAIL
Statistics Canada
Finance Division
100 Tunney's Pasture
Driveway, 6th floor
Ottawa, Ontario
Canada K1A 0T6

PHONE
1 800 267-6677
Quote PF027090

FAX
1 877 287-436
613-951-0581

E-MAIL
Infostats@statcan.ca

Name

Company Department

Address City Province

( ) ( )
Postal Code Phone Fax

E-Mail address

METHOD OF PAYMENT *(Check only one)*

Charge to my: ☐ MasterCard ☐ VISA ☐ American Express

Card Number Expiry Date

Authorized Signature

Cardholder *(Please print)*

❑ Payment Enclosed $ _____

Authorized Signature

Catalogue No.	Title	Subscription	Price (CDN $)	Quantity	Total CDN $
75-001-XPE	Perspectives on Labour and Income	1 year	63.00		
		2 years	100.80		
		3 years	132.30		

No shipping charges for delivery in Canada. Outside Canada, please add shipping charges as indicated. Canadian clients add **either** 6% GST and applicable PST **or** HST (GST Registration No. R121491807). Clients outside Canada pay in Canadian dollars drawn on a Canadian bank **or** pay in equivalent US dollars, converted at the prevailing daily exchange rate, drawn on a US bank. Federal government departments must include with all orders their IS Organization Code _____ and IS Reference Code _____

Your personal information is protected by the *Privacy Act.* Statistics Canada will use your information only to complete this sales transaction, deliver your product(s), announce product updates and administer your account. From time to time, we may also offer you other Statistics Canada products and services or ask you to participate in our market research.

If you do not wish to be contacted again for promotional purposes❒ and/or market research❒, check as appropriate.

Subtotal	
Applicable GST (6%)	
Applicable PST	
Applicable HST (N.S., N.B., N.L.)	
Shipping charges U.S. CDN $24, other countries CDN $40	
Grand Total	

Statistics Canada Statistique Canada

Canada

The busy lives of teens

Katherine Marshall

High school students are future members of the core labour force. Many of them understand that to achieve success they must do well in school and pursue some form of postsecondary education.[1] Apart from schooling, teenagers can increase their human capital in other ways, such as working at a paid job, participating in volunteer activities, and even doing household chores, which can provide many useful basic skills. Early training and skills development, in and out of school, can open up opportunities and choices in terms of attending university or finding employment. It is well accepted that investment in personal human capital increases the chances of finding meaningful, productive and higher-earning employment (Keeley 2007).

Time invested in these various skill-enhancing activities can be beneficial in other ways as well. For example, youth earnings can provide some financial aid toward a postsecondary education, and participation in housework can help alleviate some of the household responsibilities of busy parents. On the other hand, an inordinate amount of time spent on unpaid and paid work activities could lead to unhealthy levels of stress and reduce well-being, negatively affecting education outcomes.

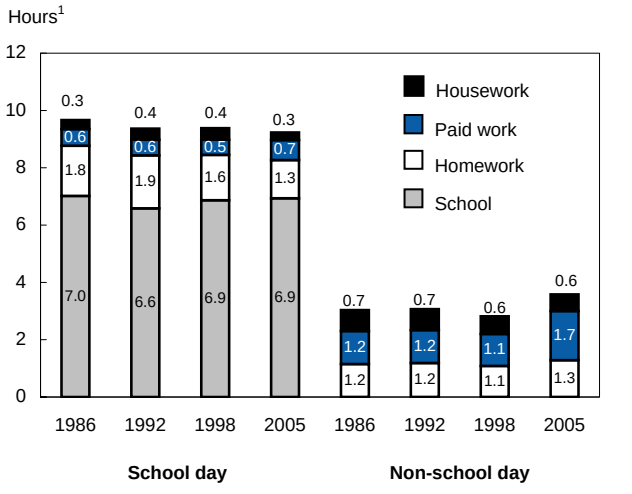
This article examines trends in the average number of daily hours teenagers spend on education-related activities, paid work and housework. It also examines in detail time differences by sex and other socioeconomic characteristics of teens in 2005, as well as looking at indicators of stress related to paid and unpaid workloads. The analysis is based on time-use data that allow a detailed examination of one 24-hour day (See *Data sources and definitions*). Some information is also provided on annual volunteer work (see *Volunteering*). Although the intrinsic value of the unpaid and paid work activities surveyed cannot be determined (for example, the quality of the schooling or part-time work experience), time spent on these activities can be viewed as a positive initiative in skill development.

Katherine Marshall is with the Labour and Household Surveys Analysis Division. She can be reached at 613-951-6890 or perspectives@statcan.ca.

Most teens put in long days

Over the past 20 years, a typical school day for a teenager aged 15 to 19 has averaged about 7 hours of school attendance, and another 2.5 hours of homework, paid work and housework (Chart A). Students also do about 3 hours of homework, paid work and housework per day on weekends and other non-school days. Mainly because of the increase in paid work since 1998, total productive work increased to 3.5 hours on weekends in 2005. Despite the stereotypical image of lounging, sleeping, nonchalant teenagers, many of them carry a heavy load. In fact, compared with nine other OECD countries with time-use sur-

Chart A Teenagers do much more than go to school



1 Average hours spent per day for the population aged 15 to 19.
Source: Statistics Canada, General Social Survey

veys, Canadian teens ranked first in terms of average hours spent on unpaid and paid labour during the school week (Table 1). Furthermore, averaged over the week (school and non-school days), teens did an average of 7.1 hours of unpaid and paid labour per day in 2005—virtually the same as the 7.2 hours adult Canadians aged 20 to 64 spent on the same activities. Only the distribution was different for adults, with an average of 8.3 hours of unpaid and paid work being done on weekdays, and 4.5 hours on weekends.

Generally, girls spend more time than boys on unpaid and paid work, particularly on weekends. For example, in 2005, boys put in an average of 9.1 hours on school days and 3.1 hours on weekends, while girls did 9.3 hours and 4.2 hours respectively. Averaged over the whole week, teenage girls did significantly more unpaid and paid work per day than boys—7.5 versus 6.7 hours.

Table 1 Time spent on unpaid and paid work on school days for those aged 15 to 19

	Total time	School related	Paid work	Domestic work[1]
		Hours:minutes		
Canada (1998)	9:45	8:31	:32	:43
Belgium (1999)	9:43	8:46	:13	:44
United States (2003)	9:10	7:53	:41	:36
Australia (1997)	9:08	8:01	:23	:44
Netherlands (2000)	8:55	7:34	:40	:41
United Kingdom (2000)	8:50	7:46	:22	:42
France (1998)	8:42	8:01	:09	:32
Norway (2000)	8:37	7:19	:17	1:01
Germany (2001/02)	8:29	7:23	:08	:58
Finland (1999/00)	8:16	7:11	:08	:57

1 Includes family care.
Source: Time use data collected by national statistical agencies (Zuzanek 2005).

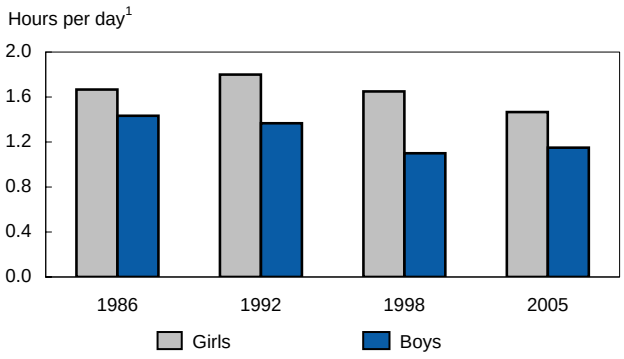
Homework takes time

The demands of high school curricula and university entrance requirements render homework essential for most students. Doing homework on a daily basis remained relatively stable over the four years examined, with roughly 70% of teenagers doing some each day on school days and 40% doing some on weekends. After school attendance, homework is the second most time-consuming, work-related activity for teens. Time spent on it has edged down on school days (1.3 hours in 2005) and up on non-school days (also to 1.3 hours), totalling about 9.2 hours per week. But as in other years, girls did more—10.3 hours compared with 8.1 hours for boys (Chart B). Interestingly, in almost all other industrialized countries, girls spend more time than boys doing homework (Zuzanek and Mannell 2005, 388).

Paid work increasing among teen girls

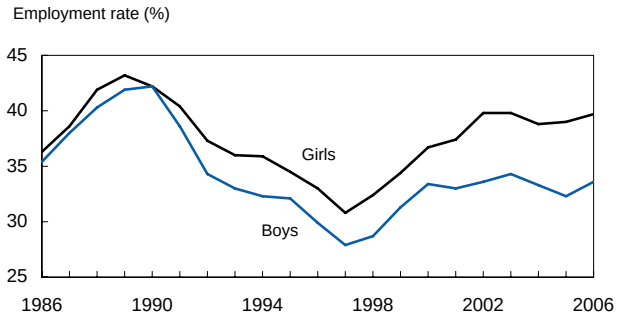
The average time spent working at a paid job in 2005 reached 0.7 hours on school days and 1.7 hours on non-school days. This represents about 7.6 hours per week, an increase of two hours from the previous three periods. The daily paid-work participation rate also edged up slightly, mainly because of higher weekend rates—28% reported working on a non-school day in 2005, compared with 20% in 1986. In 2005, girls for the first time had a higher daily employment rate than boys (23% versus 19%). These employment trends are similar to those found with the Labour Force Survey (LFS), which asks all respondents whether they did any work for pay during the reference week.[2] In 2006, 40% of girls and 34% of boys aged 15 to 19 who were attending school reported having a job sometime during the LFS reference week, with usual weekly hours of 13.6 and 14.5 respectively (Chart C). Both surveys show teenage girls now surpassing boys in terms of employment rates and a convergence of average hours worked.[3] These trends suggest that the difference

Chart B Total homework hours relatively stable, but boys still lag behind girls

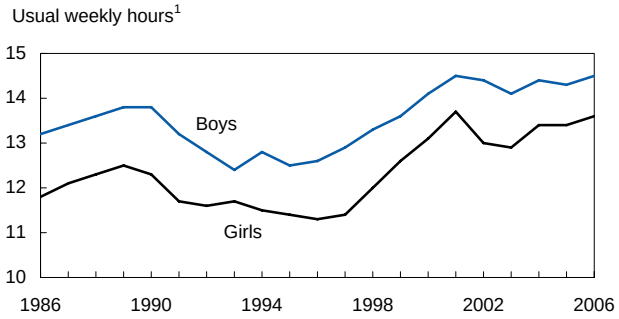


1 Averaged over seven days for the population aged 15 to 19.
Source: Statistics Canada, General Social Survey

Chart C Since the 1990s, school-attending teen girls have been more likely to be employed than boys...



...but boys with jobs work on average one hour more per week than girls



1 For those employed.
Source: Statistics Canada, Labour Force Survey

between women's and men's labour market activity may also continue to narrow as this younger generation enters the labour force on a permanent basis.

As with their parents, less housework but more equality

Overall, daily housework has trended downward. Daily participation in housework was 39% in 2005 compared with 43% in 1986, while the average time spent doing it dropped from 28 minutes to 23 (Table 2).[4] Although parents may not think that 23 minutes (averaged over 7 days) is much of a contribution relative to the 118 minutes they put in, it still represents 16% of total housework time.

Overall, adults have increased their daily participation in housework, but reduced the time spent on it. A significant decrease in the daily participation rate and in time spent by women has been more than offset by an increase in both for men (Marshall 2006). Interestingly, this convergence is being mirrored in

Table 2 Participation rate and average time spent on household chores, population aged 15 to 19

		Core housework					
	All housework	Total	Meal preparation	Meal clean-up	Indoor cleaning	Laundry	Non-core housework[1]
Daily participation rate (%)							
1986							
Both sexes	43	39	23	19	13	F	8[E]
Girls	53	52	30	27	18[E]	F	F
Boys	33*	28*	17*[E]	12*[E]	9*[E]	F	11[E]
2005							
Both sexes	39	35	26	3	9	F	9
Girls	43	39	27	4[E]	13	F	8[E]
Boys	36	30	26	F	F	F	11[E]
Average minutes per day (population)[2]							
1986							
Both sexes	28	21	9	5	7[E]	F	7[E]
Girls	34	30	13	8	9[E]	F	F
Boys	24[E]	13*[E]	5*[E]	2*[E]	F	F	F
2005							
Both sexes	23	17	7	1[E]	8[E]	F	7[E]
Girls	27	22	8[E]	1[E]	12[E]	F	F
Boys	20	11*[E]	6	F	F	F	9[E]

1 Includes such items as outdoor cleaning, mending or sewing, interior or exterior maintenance or repairs, gardening, pet and plant care, or household paperwork.
2 Time averaged over 7 days; numbers may not add due to rounding.
* Statistically significant difference with girls at the <.05 level.
Source: Statistics Canada, General Social Survey

Data sources and definitions

Since 1985, the **General Social Survey** (GSS) has annually interviewed Canadians aged 15 and over living in the 10 provinces on a wide range of social trends and social policy issues. Using a 24-hour diary instrument, the GSS has collected detailed information on time use in four different years with varying sample sizes—1986 (16,400), 1992 (9,800), 1998 (10,700) and 2005 (19,600). Individual activities are recorded sequentially for a 24-hour **diary day**. All activities are subsequently coded to a standard international classification. Each day of the week is sampled. Therefore, calculations are usually averaged over a 7-day period (see below). While the 1986 survey collected data during the months of November and December only, all remaining cycles covered a 12-month period.

Each month, the **Labour Force Survey** (LFS) collects information on labour market activity, covering a one-week reference period, from all persons 15 and older. The survey includes questions about the usual and actual weekly hours at main and secondary jobs. The LFS **employment rate** for a particular group (for example, girls aged 15 to 19) is the employed labour force in that group expressed as a percentage of their population. For comparison purposes, the annual LFS data used in this paper were customized to align with the target population (see below). (Student status in the LFS is based on school attendance during the survey reference week).

Target population: all teenagers aged 15 to 19 who were interviewed in September through June (the traditional school year). They also had to be single and never married, living at home with at least one parent, and report their main activity as attending school. Around 80% of teenagers living at home reported going to school as their main activity. Some comparisons are made with the adult population aged 20 to 64. Those over 64 are more likely to be retired and have quite different unpaid and paid work activity patterns.

School attendance refers to the total time spent in full-time or part-time classes, special lectures, meals at school, breaks between classes, and travel to and from school. Based on an international standard, a day was designated a **school day** if 60 minutes or more were spent attending school (Zuzanek and Mannell 2005).

Homework includes all study time related to course work.

Paid work includes time spent on all activities related to a job or business. The GSS data also include time spent travelling to and from the workplace, as well as unpaid work in a family, business or farm.

Core housework covers meal preparation, meal clean-up (for example, doing the dishes or clearing the table), indoor cleaning (for example, dusting or vacuuming), and laundry. Core activities are those that are most likely done on a daily basis and demand, on average, the most time. **Non-core housework** includes such items as outdoor cleaning, mending or sewing, interior or exterior maintenance and repair, gardening, pet and plant care, household paperwork, and unpacking groceries. **Total housework** comprises core and non-core activities.

A respondent is deemed to have **immigrant parents** if both their mother and father were born outside Canada. **Canadian-born parent(s)** means that at least one parent was born in Canada.

All the teenagers in this study lived in a **two-parent intact family** (never-divorced parents), a **two-parent blended family** (one parent and one step-parent), or a **one-parent family** (either mother or father).

Parental level of education is based on the highest level achieved. The derived categories are both parents having a university degree, both having a high school diploma or less, and a 'mix' of levels. A mix means that both parents could have a postsecondary certificate or diploma, or a combination of any of the levels noted here.

An **urban** area has a minimum population of 1,000 and a population density of at least 400 persons per square kilometre. **Rural** areas comprise all territory not deemed urban.

Positive well-being is being 'very happy' and/or feeling 'very satisfied' with 'life as a whole right now' (that is, reporting a 9 or 10 on a scale of 1 to 10).

Activity participation rate (time use) indicates the proportion of the population (or sub-population) that reported spending some time on a particular activity on diary day. The participation rate is a daily rate, and unless otherwise specified is an average over a seven-day week (average of the daily rates of Sunday through Saturday diary days).

Average time spent on specific activities (time use) of the population or sub-population refers to the total time all respondents reported spending on a given activity divided by the population and averaged over a seven-day week. The average time spent on activities for participants refers to the average time spent of only those who participated in that activity on diary day, but again over seven days.

the younger generation. Daily participation in housework in 1986 was significantly higher for girls than for boys (53% versus 33%), but by 2005 the rates had converged to 43% and 36% respectively. Although not significant in either year, the gap in time spent also narrowed over the period. And, even though the boundaries between traditional male and female housework tasks are still evident, some indication of a breakdown can be seen. For example, in 1986, on any given day, 30% of girls were likely to help with meal preparation at home, compared with only 17% of boys. By 2005, about one-quarter of both were doing some work in the kitchen each day.

Volunteering

The incidence of daily participation in volunteer work is too small for a detailed analysis. However, questions were also asked about volunteering in the past year. In 2005, more than half (54%) of all school-attending teenagers aged 15 to 19 did some unpaid volunteer work, significantly higher than the adult (20 to 64) rate (35%). Some 60% of both teen and adult volunteers put in at least five or more hours per month. These findings mirror those in national volunteer surveys (Hall et al. 2006).

Some provinces have begun to legislate mandatory community service as a requirement for high school graduation. Total requirements range from 40 hours in Ontario to 25 hours in the Northwest Territories and Nunavut (Volunteer Canada 2006). This is probably behind Ontario's significantly higher annual volunteer rate for teenagers (66%).

Volunteered[1] sometime in 2005

	Teens	Adults
	%	
Total	**54**	**35**
Boys/men (ref)	51	32
Girls/women	58	38*
British Columbia (ref)	48	37
Alberta	54	42*
Manitoba and Saskatchewan	47	43*
Ontario	66*	36
Quebec	40	26*
Nova Scotia	52	41
Other Atlantic	51	37

1 Did unpaid volunteer work for any organization.
* Significant difference with reference (ref) group at the <.05 level.
Source: Statistics Canada, General Social Survey

The next section focuses on 2005 data and examines the key factors associated with teenagers' daily participation in and time spent on the three key productive non-school activities: homework, paid work and housework. Included are results of Tobit regression models for each activity (see *Regression*).

Family characteristics and paid work linked to homework

Skills and knowledge acquisition from schooling is a teen's most important asset for ensuring a positive socio-economic outcome later in life. Strong cognitive skills enable children to do well in school and perform better on standardized tests, thus increasing the likelihood of attaining higher levels of education. Reading abilities and marks are most important and account for 34% of the gap in university attendance between lower- and higher-income families (Frenette 2007). The second most important influence is parental education (30%), followed by parental expectations (12%) and financial constraints (12%). But what determines the gap in marks? Commitment to homework, as examined here may shed some light on this issue, since logically, good study habits improve academic performance (Bianchi and Robinson 1997). Time spent on homework can also be an indicator not only of school effort, but also of dedication and a desire to do well.

On any given day, roughly 6 in 10 teenagers aged 15 to 19 did an average of 2 hours and 17 minutes of homework (Table 3). Averaged over the population, the time spent on homework was 1 hour and 19 minutes. Mainly because of the difference in participation rate (68% versus 39%), homework effort was significantly higher on school days (26 additional minutes). So in addition to seven hours of classes and related activities, most teens spent just under two hours doing homework on school days.[5] When controlling for other characteristics, older teens (18 and 19) also spent significantly more time per day on homework than their younger counterparts (15 to 17).

Participation in and time spent on homework was strongly influenced by both sex and cultural background. While over 7 in 10 boys with immigrant parents (both parents born outside Canada) did homework daily, and for an average of 2 hours and 37 minutes, only half of boys with Canadian-born parent(s) did so, and for just under 2 hours. The net

Regression

Tobit regression analysis is well suited to time-use data, which has a large number of non-participants in certain activities on any given day. The technique assesses all participants and non-participants by simultaneously considering both the likelihood of daily participation and the average duration of time spent. The model first treats the data as binary (0 or 1) based on whether the respondent participated in the activity on diary day (for example, homework) and then fits the positive values (minutes spent doing it) linearly. The marginal effect is another way to interpret the model coefficients and represents the impact of time spent at the mean value of each variable. The calculation is based on the probability of participating in an activity multiplied by the mean value of time spent. The analysis was run with Stata 9, which allows for the application of bootstrap weights. For other examples of Tobit analysis and time-use data, see Flood and Grasjo 1998 and Bianchi and Robinson 1997.

Table 3 Homework participation and time spent

	Population	Participation rate	Time per day (participants)	Time per day (population)	Tobit estimates[1] predicting minutes per day
	'000	%	Hours:minutes		
Total	**1,228**	**57**	**2:17**	**1:19**	**...**
Age					
15 to 17	676	57	1:58	1:07	-22**
18 to 19	552	58	2:41	1:33	ref
Boys	593	54	2:09	1:09	...
Girls	635	61	2:24	1:28	...
Immigrant parents					
Boy	132	71	2:37	1:52	20
Girl	128	74	1:56	1:25	4
Canadian-born parent(s)					
Boy	453	50	1:57	:58	-21**
Girl	494	58	2:35	1:30	ref
Two parents (intact family)	862	63	2:22	1:29	ref
Two parents (blended family)	132	49	2:00	:58	-20
One parent	235	43	2:04	:53	-31***
Education level of parents					
Both university	213	69	2:48	1:57	34**
Mixed	358	61	2:10	1:19	10
Both high school or less	384	51	2:15	1:09	ref
School day	773	68	1:57	1:20	26***
Non-school day	456	39	3:16	1:17	ref
Urban	979	59	2:21	1:23	13
Rural	250	51	1:58	1:01	ref
Not employed	770	57	2:21	1:20	ref
Usual weekly job hours					
1-9	106	59	2:50	1:40	19
10-19	173	70	2:17	1:35	12
20+	172	46	1:36	:45	-32 **

1 This is the marginal effect each variable has on the time spent doing daily homework.
* Regression results statistically significant at the <.10 level; ** <.05 level, *** <.01 level from the reference (ref) group.
Source: Statistics Canada, General Social Survey, 2005

result is an overall reduced effort on homework by boys compared with girls. Controlling for other factors shows that among teens with Canadian-born parent(s), boys did significantly less homework (21 minutes per day) than girls. However, no significant difference was found for boys or girls with immigrant parents.

Being in a two-parent intact family significantly increases both the chances of doing homework and of doing more of it. Over 6 in 10 teens from such families did homework on a daily basis, compared with less than half of those in two-parent blended and lone-parent families. Controlling for other factors shows that teens in one-parent families averaged 31 minutes less per day on homework than those in two-parent intact families. Children's activity patterns are different in one- and two-parent households. With only one adult to manage the household, less time is available to monitor activities and supervise homework (Bianchi and Robinson 1997, 335).

It appears that highly educated parents either encourage or enforce the issue of homework for their children more than parents with lower education levels. Seven in 10 teens whose parents both had university education did homework on a daily basis and spent close to three hours at it—significantly more than those whose parents had less education.[6]

Compared with students currently not employed, only those in jobs with long weekly hours (20 or more) did significantly less homework (32 minutes less per day). An ongoing debate rages about the pros and cons of having a job through high school. Although studies have found moderate employment hours to be linked with positive future earnings, occupational status and academic performance, and most show long hours (20 or more per week) to be detrimental to school performance (Ruhm 1997; Stinebrickner and Stinebrickner 2003; Zuzanek and Mannell 2005; Parent 2006).

Work for pay more common on weekends and among older teens

By the end of high school, most teenagers will have done some work for pay. Many start with informal work such as babysitting or yard work, and then move to more formal organizational settings, which offer more complex work (Mortimer et al. 1994).

Table 4 Paid work participation and time spent

	Population	Participation rate	Time per day (participants)	Time per day (population)	Tobit estimates[1] predicting minutes per day
	'000	%	Hours:minutes		
Total	**1,228**	**21**	**5:04**	**1:05**	**...**
Age					
15 to 17	676	14	4:33	:39	-47***
18 to 19	552	30	5:22	1:36	ref
Boys	593	19	5:03	:59	-16
Girls	635	23	5:04	1:10	ref
Immigrant parents					
Boy	132	F	F	F	...
Girl	128	F	F	F	...
Canadian-born parent(s)					
Boy	453	21	4:59	1:01[E]	...
Girl	494	25	5:05	1:18	...
Two parents (intact family)	862	22	5:11	1:08	ref
Two parents (blended family)	132	24[E]	4:08[E]	:59	7
One parent	235	18[E]	5:15	:56[E]	-9
Education level of parents					
Both university	213	16[E]	3:45	:36[E]	ref
Mixed	358	27	4:24	1:10	33*
Both high school or less	384	22	6:21	1:23	33
School day	773	17	4:00	:42	-37***
Non-school day	456	28	6:12	1:43	ref
Urban	979	21	5:03	1:05	7
Rural	250	21[E]	5:06	1:04[E]	ref

1 This is the marginal effect each variable has on the time spent doing daily paid work.
* Regression results statistically significant at the <.10 level; ** <.05 level, *** <.01 level from the reference (ref) group.
Source: Statistics Canada, General Social Survey, 2005

In 2005, one in five teenagers aged 15 to 19 worked at a paid job for five hours on diary day (Table 4). As expected, younger teens (15 to 17) were significantly less likely to report daily employment activity (14%) than those aged 18 or 19 (30%) and likely to spend less time at it (47 minutes less per day).[7] Teenagers did significantly more paid work on the days they did not attend school, with 28% working just over six hours. Teens with parents with lower levels of education did 33 more minutes per day of paid work than those with university-educated parents.

Housework is gender-neutral among teens with Canadian-born parents

Housework performed by children has been written about in terms of sex-role socialization—its role in teaching responsibility and life skills—and more lightly, in terms of the never-ending battle. The introduction of compulsory schooling in the late 1800s significantly reduced the amount of children's domestic labour. The more recent reduction in housework participation by teens may be partly due to our evolving service-oriented economy and changing attitudes toward housework standards and priorities (Marshall 2006). Still, 39% of teens put in about an hour of housework daily (Table 5). Because of reduced opportunity and time, students do significantly less housework on school days than on weekends and other non-school days (9 minutes less per day). While age does not make a difference, teenagers in urban settings participated less in housework than their rural counterparts and for fewer hours. Since housework includes outdoor chores, work on farms may be part of the reason behind this difference.

Cultural background and family formation also play a role. After controlling for other factors, no significant difference was seen between girls and boys of Canadian-born parents in the effort on housework. Both had a daily participation rate of 40% and spent about one hour at it. However, compared with girls of Canadian-born parents, girls of immigrant parents did significantly more housework (17 minutes per day), and boys of immigrant parents did significantly less (11 minutes).

Finally, teenagers in two-parent blended families were much more likely to help with housework than teens in other family types. Both girls and boys with step-parents helped out more—72% of girls did housework daily for 50 minutes, 43% of boys for 66 minutes.

Table 5 Housework participation and time spent

	Population	Participation rate	Time per day (participants)	Time per day (population)	Tobit estimates[1] predicting minutes per day
	'000	%	Hours:minutes		
Total	**1,228**	**39**	**:59**	**:23**	**...**
Age					
15 to 17	676	39	:51	:20	-2
18 to 19	552	40	1:08	:27	ref
Boys	593	36	:55	:20	...
Girls	635	43	1:02	:27	...
Immigrant parents					
Boy	132	24[E]	F	F	-11*
Girl	128	48	1:32[E]	:44[E]	17*
Canadian-born parent(s)					
Boy	453	40	:58	:23[E]	0
Girl	494	40	:52	:21	ref
Two parents (intact family)	862	38	1:01	:23	ref
Two parents (blended family)	132	56	:57[E]	:32[E]	15**
One parent	235	36	:53	:19	-1
Education level of parents					
Both university	213	38	:51[E]	:19[E]	ref
Mixed	358	41	:54	:22[E]	6
Both high school or less	384	40	1:06[E]	:26[E]	5
School day	773	37	:44	:16	-9**
Non-school day	456	43	1:21	:35	ref
Urban	979	38	:52	:20	-11*
Rural	250	46	1:21	:37[E]	ref

1 This is the marginal effect each variable has on the time spent doing daily housework.
* Regression results statistically significant at the <.10 level; ** <.05 level, *** <.01 level from the reference (ref) group.
Source: Statistics Canada, General Social Survey, 2005

Stress higher for girls, older teens and those who spend long hours at homework and paid work

Like adults, teenagers can feel somewhat burdened with their day-to-day unpaid and paid work responsibilities. Approximately 1 in 10 regularly felt very stressed with not having enough time in the day (Table 6). A similar proportion were quite or extremely stressed because of school, while 16% considered themselves workaholics. Almost 4 in 10 reported being under constant pressure to accomplish more than they could handle, and 6 in 10 tended to cut back on sleep when they needed more time.[8] One-quarter of teens reported not having any of these five stress indicators related to time and productive work, 36% mentioned one, 23% two, and 16% three or more—an average of 1.4 per teenager.

Stress-level rates have changed very little over time. Another constant has been that for each question, girls tend to report a higher level of stress than boys. In 2005, girls had significantly more stress indicators than boys (Table 6). Interestingly, adult women have also consistently reported higher work-family stress than men (Zukewich 2003; Marshall 2006). For example, in terms of feeling constant pressure to accomplish more than is manageable, women in each age group reported higher rates than men, and teenage girls aged 18 to 19 had the highest rate overall (Chart D).

Older teens also reported significantly more stress indicators than younger teens. This is understandable since the last year of high school (or first year of postsecondary schooling) is often more difficult than the first years of high school, and the need for good marks is crucial. Furthermore, 18 and 19 year-olds are on the cusp on adulthood, which brings increased independence and personal and financial responsibility. Two other factors that significantly increase stress in a teen's life included spending more than 2.5 hours per day on homework, and having 20 hours or more of paid work per week.

Girls report more stress, but self-rating of well-being equal to boys

Although most teens answered yes to at least one indicator, some stress may not necessarily be detrimental.[9] In fact, moderate levels of stress have been positively linked with performance, energy and health. On the other hand, too much long-term stress can have negative mental and physical health effects (Farmer and Ferraro 1997; Wein 2000).

Table 6 Indicators of personal stress related to time and unpaid and paid work

	Very stressed for lack of time	Very stressed from school	Is a workaholic	Constant pressure to do more than can handle	Cut back on sleep to gain more time	Stress indicators
			%			Number
Total	**11**	**12**	**16**	**39**	**64**	**1.4**
Girls	14	15	17	46	68	1.6*
Boys (ref)	8[E]	9	15	32	60	1.3
Age						
15 to 17 (ref)	7[E]	9[E]	14	36	58	1.2
18 to 19	16	17	18	44	71	1.7*
Homework on diary day[1]						
None (ref)	7[E]	7[E]	12[E]	40	63	1.3
Less than 1.5 hours	9[E]	8[E]	19[E]	34	63	1.3
1.5 to 2.5 hours	12[E]	15[E]	19[E]	36	65	1.5
Over 2.5 hours	24[E]	27[E]	17[E]	48	66	1.8*
Diary day a school day (ref)	8[E]	11	18	38	63	1.4
Non-school day	16[E]	15[E]	12[E]	41	66	1.5
Not employed	10[E]	11	14	38	60	1.4
Usual weekly hours						
1 to 9 (ref)	F	F	F	40[E]	58	1.2
10 to 19 hours	F	F	16[E]	38	77	1.6
20 hours or more	15[E]	18[E]	31[E]	42	71	1.8*

1 The reference day of the interview (see *Data sources and definitions*).
* Statistically significant difference (<.05 level) from reference (ref) group.
Source: Statistics Canada, General Social Survey, 2005

Roughly two-thirds of all girls and boys in 2005 reported being very happy and/or very satisfied with life overall[10] (Table 7). However, the higher the level of personal stress (defined as the total number of indicators), the lower the likelihood of having very high levels of happiness and/or satisfaction. Of those with three or more stress indicators, only 45% were very happy and/or very satisfied with life, compared with a 72% positive rating among teens with no stress indicators.

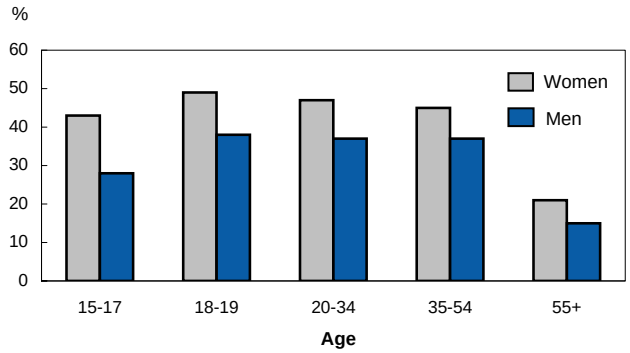
Table 7 Positive well-being by number of stress indicators related to time and unpaid and paid work

	Total	None	One	Two	Three or more
Currently feels very happy and/or very satisfied with life as a whole			%		
Both sexes	**64**	**72**	**73**	**57***	**45***
Girls	65	78	80	55*	40*[E]
Boys	63	68	66	60	52 [E]

* Statistically significant difference at the <.05 level from those with no stress indicators.
Source: Statistics Canada, General Social Survey, 2005

Higher levels of stress (three or more indicators) reduced the level of happiness and satisfaction for both girls and boys to 40% and 52% respectively (a significant drop for girls). When little or no stress was indicated, about 80% of girls reported being very happy and/or very satisfied, compared with only about two-thirds of boys. Therefore, although girls reported more stress, which seems to suppress feelings of well-being, their relatively high well-being when they had little or no stress equalized their overall rating of well-being to that of boys.[11]

Chart D Almost half of older teenage girls feel constant pressure to accomplish more than they can handle



Source: Statistics Canada, General Social Survey, 2005

Conclusion

The vast majority of 15 to 19 year-olds living at home with their parents attend school. In 2005, these teenagers did an average of 9.2 hours of school work, homework, paid work and housework on school days and 3.5 hours on weekends. This equates to a 50-hour workweek, the same time adults aged 20 to 64 spend on these activities. The time teens spend is arguably skill-enhancing and a positive investment in their long-term personal and economic well-being.

After school attendance, homework was the most time-consuming unpaid activity for teens, with 60% doing an average of 2 hours and 20 minutes every day. Family environment is a strong predictor of this activity. Teens were significantly more likely to do homework and more of it if both parents had a university education, if they lived in a two-parent intact family, and if their parents were foreign-born. Interestingly, boys with Canadian-born parents did significantly less homework than girls in similar families, and less than either girls or boys with immigrant parents. As well, teens with demanding paid jobs (20 hours or more per week) did significantly less homework than those not employed.

Age and type of day (school versus non-school) were strongly significant predictors of teens being involved in daily paid work. And indeed, paid work was the only productive activity that witnessed an increase over time. Although some studies have shown part-time student employment to be positively linked with personal responsibility, dependability and future productivity, an excess can interfere with school. Furthermore, this study shows that teenagers with long paid workweeks reported higher levels of personal stress.

Almost 4 in 10 teens did some housework daily, averaging about one hour. Although differences have narrowed over the past 20 years, in 2005, girls with immigrant parents did significantly more housework than boys in such families. Time spent on housework was also higher in rural areas and in two-parent blended families.

In sum, most teens have relatively high workloads, and not surprisingly, this comes with some feelings of stress. For example, 16% considered themselves workaholics, 39% felt under constant pressure to accomplish more than they could handle, and most (64%) cut back on sleep to get things done. Although self-ratings of well-being decreased as stress went up, most teens responded positively to questions about happiness and life satisfaction. Education and skill development are important activities for teenagers, but balance in life is also essential for ensuring a positive sense of well-being.

Perspectives

Notes

1 The vast majority of students graduate from high school and continue with some form of postsecondary education. According to the 1995 School Leavers Follow-up Survey, 80% of high school graduates did further schooling towards a certificate, diploma or university degree (Frank 1997).

2 Since the reference period in the LFS is one week as opposed to the one day in time-use surveys, the LFS employment rate will be higher since the chances of reporting some work hours are greater.

3 Averaged over the population (including those not employed), in 2005, girls worked longer weekly hours in both the GSS and the LFS. However, among those employed, the GSS shows both sexes working the same average number of hours per week while the LFS shows boys working one hour more.

4 These differences are not statistically significant.

5 Homework can be completed any time during a school day—for example, during the lunch hour.

6 Family income, although often correlated with level of education, would have been included separately as well; however, the majority of teen respondents were not able to answer the income question.

7 Half of teens aged 18 to 19 and one-quarter of those aged 15 to 17 reported having a job at some time in the past week. Among those with jobs, 45% of the older group and 27% of the younger group usually worked 20 hours or more per week.

8 Among adults aged 20 to 64, 24% reported being very stressed from lack of time and 12% very stressed from work, 28% considered themselves workaholics, 39% felt under constant pressure to do more than was manageable, and 52% cut back on sleep to gain more time. The average number of stress indicators was 1.5 for men and 1.6 for women, a statistically insignificant difference.

9 Among girls, 20% reported no stress indicators, 36% had one, 25% had two, and 19% had three or more. The equivalent distribution for boys was 29%, 36%, 21% and 14%.

10 More broadly, 97% of teenagers were very or somewhat happy, and 95% had a life satisfaction rating of at least 6 or higher out of 10. Although not discussed, 1986 data show similar levels.

11 Although the existence of time and work-related stress appears to affect girls and boys differently in terms of their sense of well-being, it must be kept in mind that stress in an adolescent's life comes from many different sources.

References

Bianchi, Suzanne M., and John Robinson. 1997. "What did you do today? Children's use of time, family composition, and the acquisition of social capital." *Journal of Marriage and the Family*. Vol. 59, no. 2. May. p. 332–344.

Farmer, Melissa M. and Kenneth F. Ferraro. 1997. "Distress and perceived health: Mechanisms of health decline." *Journal of Health and Social Behavior*. Vol. 38, no. 3. September. p. 298–311.

Flood, Lennart and Urban Gråsjö. 1998. *Regression Analysis and Time Use Data: A Comparison of Microeconometric Approaches with Data from the Swedish Time Use Survey (HUS)*. Working Papers in Economics no. 5. School of Economics and Commercial Law, Göteborg University, Sweden. 18 p.

Frank, Jeffrey. 1997. "After high school… ." *Perspectives on Labour and Income*. Vol. 9, no. 2. Summer. Statistics Canada Catalogue no. 75-001-XPE. p. 37–42. http://www.statcan.ca/english/studies/75-001/archive/e-pdf/e-9725.pdf (accessed May 2, 2007).

Frenette, Marc. 2007. *Why Are Youth from Lower-income Families Less Likely To Attend University? Evidence from Academic Abilities, Parental Influences and Financial Constraints*. Statistics Canada Catalogue no. 11F0019MIE no. 295. Ottawa. Analytical Studies Branch Research Paper Series. 38 p. http://www.statcan.ca/english/research/11F0019MIE/11F0019MIE2007295.htm (accessed May 2, 2007).

Hall, Michael, David Lasby, Glenn Gumulka, and Catherine Tryon. 2006. *Caring Canadians, Involved Canadians: Highlights from the 2004 Canada Survey of Giving, Volunteering and Participating*. Statistics Canada Catalogue no. 71-542-XIE. 99 p. http://www.statcan.ca/english/freepub/71-542-XIE/71-542-XIE2006001.pdf (accessed May 2, 2007).

Keeley, Brian. 2007. *Human Capital*: *How What You Know Shapes Your Life*. Organisation for Economic Co-operation and Development (OECD). OECD Insights Series. 148 p.

Marshall, Katherine. 2006. "Converging gender roles." *Perspectives on Labour and Income*. Vol. 7, no. 7. July. Statistics Canada Catalogue no. 75-001-XIE. http://www.statcan.ca/english/freepub/75-001-XIE/75-001-XIE2006107.htm (accessed April 27, 2007).

Mortimer, Jeylan T., Michael D. Finch, Katherine Dennehy, Chaimun Lee and Timothy Beebe. 1994. "Work experience in adolescence." *Journal of Vocational Education Research*. Vol. 19, no. 1. p. 39–70.

Parent, Daniel. 2006. "Work while in high school in Canada: Its labour market and educational attainment effects." *Canadian Journal of Economics*. Vol. 39, no. 4. November. p. 1125-1150.

Ruhm, Christopher J. 1997. "Is high school employment consumption or investment." *Journal of Labor Economics*. Vol. 15, no. 4. October. p. 735–776.

Stinebrickner, Ralph and Todd R. Stinebrickner. 2003. "Working during school and academic performance." *Journal of Labor Economics*. Vol. 21, no. 2. April. p. 473–491.

Volunteer Canada. 2006. *Volunteering and Mandatory Community Service: Choice, Incentive, Coercion, Obligation*. Ottawa. 17 p.

Wein, Harrison. 2000. "Stress and disease: New perspectives." National Institutes of Health, U.S. Department of Health and Human Services. 4 p.

Zukewich, Nancy. 2003. *Work, Parenthood and the Experience of Time Scarcity*. Statistics Canada Catalogue no. 89-584-XIE no. 1. 24 p. http://www.statcan.ca/english/research/89-584-MIE/89-584-MIE2003001.pdf (accessed April 27, 2007).

Zuzanek, Jiri and Roger Mannell. 2005. "Adolescent time use and well-being from a comparative perspective." *Society and Leisure*. Vol. 28, no. 2. Autumn. p. 379–423.

Fuelling the economy

Cara Williams

One of the hottest commodities today is a barrel of oil. While the price has fluctuated dramatically over the last several years, it has remained substantially higher than the December 2001 price of $15.95.[1] The reasons for the increase are multi-faceted. First, world demand is increasing, particularly in newly developed countries such as China and India. Indeed, demand rose more in 2004 than in any other year since 1976, mainly because of China, which is now the second biggest user of oil after the United States. On the supply side, geopolitical conflicts have destabilized oil supplies, leading to increased prices. Also, much of the oil is now more difficult to extract—wells are deeper, drilling occurs offshore, special technology is needed for the oil sands. This translates to higher production costs and higher prices for consumers (see *The downside*). Canada is currently the eighth-largest producer of crude oil at about 2.5 million barrels per day. Current world demand is approximately 84 million barrels per day (CAPP n.d. a), while production stands at about 86 million barrels (Government of Alberta, DOE n.d. a).

With the second largest proven oil reserves in the world (after Saudi Arabia), Canada is well positioned as one of the few countries outside OPEC with significant prospects for production growth (National Energy Board 2005). Indeed, increased demand coupled with price hikes have led to consistent growth in the energy sector. In particular, the oil sands, which hold an estimated 175 billion barrels of oil, have seen further development (CAPP n.d. b).

Natural gas is also important, both for export and domestic consumption. Currently, Canada is the second largest exporter of natural gas after Russia (Government of Alberta n.d.). As oil prices have increased, so too have natural gas prices (although not for all the same reasons). In general, the oil and gas industry in Canada is likely to continue to grow in terms of capital investment, revenue, jobs and wages.

Cara Williams is with the Labour and Household Surveys Analysis Division. She can be reached at 613-951-6972 or perspectives@statcan.ca.

The downside

Any economic boom has positive and negative implications. On the positive side, increased economic activity usually translates into increased capital investment, as well as employment and wage growth. However, negative implications also arise—particularly if economic growth occurs rapidly. For example, infrastructure may not be able to keep up with growth in the affected region, leading to housing shortages and overcrowding in schools and hospitals. Because of the housing shortage in Fort McMurray, Alberta, hundreds of temporary housing units have had to be established for workers drawn to the region. Additionally, a boom such as the current one in Alberta can result in labour shortages in all industries, driving up wages and subsequently prices across the board. However, wage increases in Alberta have not been able to attract the needed labour, and many businesses have had to reduce their hours as a result of staffing shortages (Bennett 2006).

The oil and gas sector also has significant environmental impact on water, air and land. Environment Canada estimated that the energy sector as a whole (production and processing of oil, natural gas and coal; petroleum refining; and transportation by pipeline) accounted for about 20% of Canada's total greenhouse gas emissions in 2004 (Environment Canada et al. 2006). While all oil and gas sectors are working towards decreasing their energy use and developing or adopting pollution abatement technologies, it is clear that as production increases it will become increasingly more important to find and develop methods of reducing emissions.

The oil and gas industry also uses a significant amount of water. It is used for conventional drilling, for oil sands surface mining, and for *in situ* oil sands production where the sands are too deep to mine. Water is also used in oil sands upgraders, and in refineries and petrochemical companies (for more specific usages, see www.waterforlife.gov.ab.ca). The upstream component of oil and gas accounts for about 7% of total water allocation in Alberta (about 37% of groundwater and about 6% of surface water). In response to concern over water usage, oil sands producers are now recycling up to 90% of the water they use (Centre for Energy n.d. b).

Three component sectors define oil and gas: upstream, midstream, and downstream (see *Component industries in oil and gas*). The article first looks at economic activity in each component sector and then analyzes employment (see *Data sources and definitions*). Only effects directly related to the oil and gas industry are examined. The substantial spin-off effects into other industries such as construction and services are not included.

Economic activity

Upstream

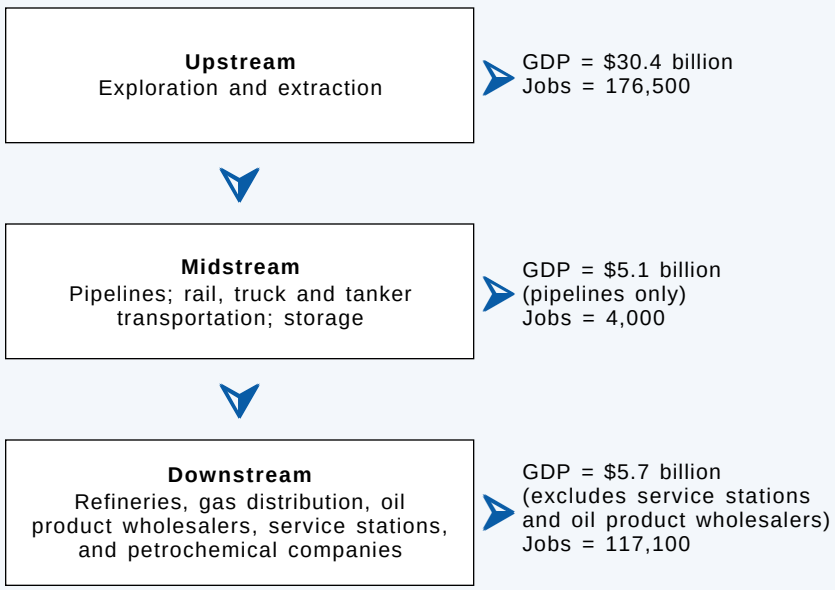
As the price of oil and gas increases, so too does exploration and extraction of both conventional and non-conventional sources (see *The basics of oil and gas*). In 2004, the number of oil and gas wells drilled stood at 24,874, up from 18,480 in 2000. Production from Canada's enormous supply of non-conventional energy has also grown rapidly. Indeed, 42% of all domestic oil output in 2004 came from oil sands, and most of the increase in natural gas production since 2004 has come from coal-based methane (Cross 2006).

Table 1 Production of crude oil

	Total	Conventional		Non-conventional	
	Cubic metres ('000)		%	Cubic metres ('000)	%
1997	112,670	82,066	73	30,604	27
1998	117,082	82,847	71	34,235	29
1999	111,028	78,090	70	32,938	30
2000	116,360	80,971	70	35,389	30
2001	118,165	79,822	68	38,343	32
2002	126,877	83,901	66	42,976	34
2003	134,748	84,690	63	50,058	37
2004	139,286	81,769	59	57,517	41
2005	136,177	78,918	58	57,258	42

Source: Statistics Canada, Manufacturing, Construction and Energy Division

Component industries in oil and gas

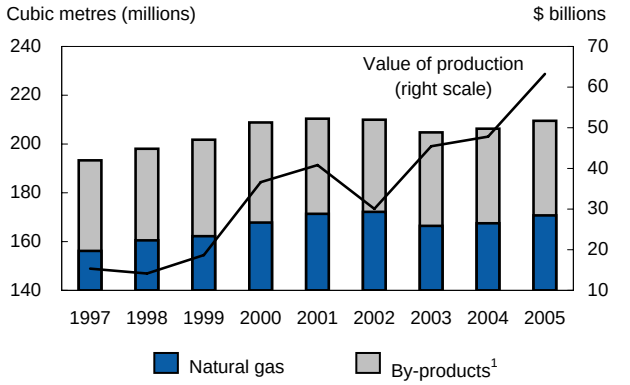


Sources: Statistics Canada, Income and Expenditure Accounts; Labour Force Survey, 2006

In terms of volume, crude oil production increased by 21% between 1997 and 2005. Over the same period, the value of production increased by 184% (Table 1). Total crude production in 2005 was 136,177,000 cubic metres with a value at $45.2 billion, up from 112,670,000 cubic metres and a value of $15.9 billion in 1997. Natural gas production (including by-products) increased by about 8% between 1997 and 2005 (from 193,320,000 to 209,534,000 cubic metres), but because of higher prices, the value of production increased by more than 312% (Chart A).

Since Canada's production of oil and natural gas surpasses domestic needs, much of it is sold on the world market. Not surprisingly then, crude oil and natural gas exports play an important role in international trade. In 2006 they

Chart A While natural gas production volume increased 8%, its value quadrupled



1 Includes pentane plus, propane, butane and ethane.
Source: Statistics Canada, Manufacturing, Construction and Energy Division

totalled $64.9 billion, up from $20 billion in 1997, with virtually all exports headed to the United States (Rowat 2006). Nevertheless, in central Canada, oil is imported for refining and consumption or re-export (950 Mb/d in 2004) (National Energy Board n.d.).

The extraction of oil and gas is complex and capital-intensive, particularly for non-conventional sources. When oil and gas prices are high, exploration and extraction of these reserves increase. Recent record prices have meant that capital expenditures for oil and gas extraction have grown substantially, far exceeding those in other industries. In 2005, capital investment in the oil and gas extraction industry (both conventional and non-conventional) was about $45.3 billion, more than double the $18.9 billion in 1997 (Chart B).

Because much of Canada's oil reserves are in non-conventional sources (for example, oil sands), much of the increase in capital expenditures went to this area. Indeed, capital expenditures for non-conventional crude oil increased a staggering 450% between 1997 and 2005, from $1.9 to $10.4 billion, illustrating the growing importance of this source. Given this enormous clout in the economy, it is not surprising that the upstream oil and gas sector contributed more than $30 billion (1997 dollars) to GDP in 2006, up from $25 billion in 1997, and is by far the largest of the three component sectors.

Data sources and definitions

This paper draws on several Statistics Canada sources.

Data for crude oil and natural gas production and capital investment in the oil and gas extraction industry are from the Manufacturing, Construction and Energy Division.

Pipeline data originate from the **Survey of Monthly Oil Transport** and **Monthly Oil Pipeline Statement**, which cover the activities of all pipelines in Canada receiving and delivering crude oils, liquefied petroleum gases (propane, butane and ethane), and refined petroleum products.

Information on the number of gas stations and sales is from the **Retail Store Survey** and **Retail Chain Survey**.

All employment figures (including average hourly earnings) are from the **Labour Force Survey** and based on the North American Industry Classification System (NAICS).

Upstream employment
Oil and gas extraction: NAICS 2111

Support activities for mining and oil and gas extraction: NAICS 2131

Midstream employment
Pipeline employment, which includes pipeline transportation of crude oil: NAICS 4861; pipeline transportation of natural gas: NAICS 4862; and other pipeline transportation: NAICS 4869.

Because it is impossible to separate out employment related to the oil and gas industry for rail, truck and tanker transportation or for storage of oil and gas products, these have not been included. Thus the figures may somewhat underestimate total midstream employment.

Downstream employment
Petroleum and coal products manufacturing (includes refineries and petroleum and coal products manufacturing): NAICS 3241

Natural gas distribution (utilities): NAICS 2212

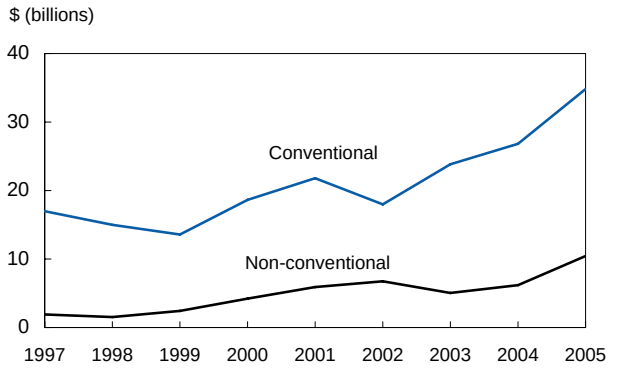
Petroleum product wholesaler distributors: NAICS 4121

Gasoline stations: NAICS 4471

Midstream

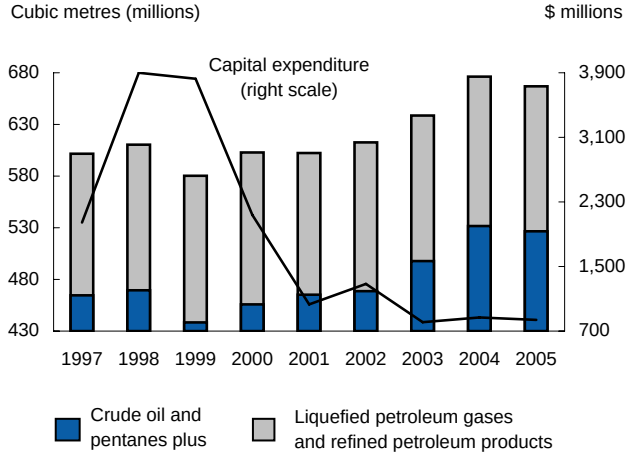
The midstream sector comprises pipelines; rail, truck and tanker transportation; and storage. Pipelines alone contributed about $5 billion to GDP in 2006[3] with approximately 95% of Canada's crude oil and natural gas transported by this method (Centre for Energy n.d. a). Given the size of the country, it is not surprising that Canada has the longest pipeline network in the world for crude oil. Originally constructed in 1950 to run from Edmonton to Superior, Wisconsin, the Enbridge system (originally called the Interprovincial Pipeline) has been expanded over the years, and now

Chart B Capital investment in extraction has increased sharply in recent years



Source: Statistics Canada, Manufacturing, Construction and Energy Division

Chart C After major expenditures in the late 1990s, Canadian-owned pipelines have recently been spending much less



Sources: Statistics Canada, Monthly Oil Pipeline Transport; Monthly Oil Pipeline Statement

runs from Norman Wells in the Northwest Territories, through Alberta, south to Oklahoma, and east to refineries in Chicago and central Canada. Today 700,000 km of different-sized oil and gas pipelines criss-cross Canada (Government of Alberta, DOE n.d. b). The Canadian-operated ones transported 667 million cubic metres of crude oil and other petroleum products across the country in 2005, up from 602 in 1997, with capital expenditures in 2005 of about $835 million (Chart C).

While pipeline movements of oil and gas are extensive, rail is another important distribution channel, with many shipments originating in Alberta and eastern Canada destined for customers in Canada, the U.S. and overseas. Of all petroleum products and hydrocarbon gases transported in 2004, 16.4 million tonnes were at some point carried by rail. Although Statistics Canada does not produce figures on freight revenues by type of commodity shipped, the 2005 annual report from CN rail noted that 16% (or $1,096 million) of total freight revenue was associated with petroleum and chemical shipments, illustrating the economic importance of the midstream sector.

Downstream

The downstream component is made up of refining and marketing, which includes refineries, gas distribution utilities, oil product wholesalers, service stations, and petrochemical companies. The GDP contribution of the downstream sector (not including the wholesale or retail petroleum industries) was about $5.7 billion in 2006 (1997 dollars).

Refineries process crude oil by sorting, splitting, reassembling and blending hydrocarbons. In 2006, 19 refineries were operating in Canada with a total refining capacity of about 330,000 cubic metres (about two million barrels) per day. Of the 19 refineries, 2 produced either asphalt or petrochemicals, while the others produced a range of petroleum products. Refinery utilization has been high over the last five years and is expected to remain at about 90% capacity (National Energy Board n.d.). Refineries in western Canada process only Canadian crude oil, while those in the rest of the country process both imported and domestic.

Petroleum product wholesalers (establishments primarily engaged in wholesaling crude oil, liquefied petroleum gases, heating oil, and other refined petroleum products) have seen pronounced sales growth over the past few years. Estimates of wholesale sales have increased from approximately $60 billion in 2001 to $87.5 billion in 2004.

The basics of oil and gas

Crude oil

Crude oil is a naturally occurring mixture of hydrocarbon compounds trapped in underground formations. Oil was produced as ancient vegetation and marine life died and settled on the bottom of streams, lakes, seas and oceans. Sediment covered this organic material, and subsequent heat and pressure changed it into oil. The vast majority of Canada's oil comes from the Western Canada Sedimentary Basin (WCSB) and offshore eastern Canada. The WCSB produces 88% of all oil in the country, the majority within Alberta. In eastern Canada, oil is found in and offshore Newfoundland and Labrador and off Nova Scotia.

Conventional crude oil comprises light, medium and heavy hydrocarbons. Light crude flows easily and when refined produces large amounts of transportation fuel such as gasoline, diesel and jet fuel. Heavy crude requires extra pumping or dilution to flow easily, producing primarily heating oil and a smaller amount of transportation fuel. Conventional crude oil is extracted by well drilling. It is called 'sweet' if it contains only small amounts of sulphur and 'sour' if the sulphur content is high. The average recovery rate for oil is about 30%—meaning that more than two-thirds of it stays in the ground and is not recovered because of cost or current technology (CAPP n.d. c).

Non-conventional crude oil differs from conventional in where it is found and how it is extracted. In Canada, the largest non-conventional source is the oil sands of Alberta (formerly called tar sands). The oil here is known as bitumen, and the sand and water in which it is found needs to be removed. Because bitumen is too thick to flow, it must be heated or diluted with lighter hydrocarbons. It takes about two tonnes of oil sand to produce one barrel of oil (Government of Alberta, DOE n.d. c).[2]

Currently, about 3,000 products are derived from crude oil. These include gasoline, ink, crayons, bubble gum, deodorant, dishwashing liquid, tires, ammonia, heart valves, eyeglasses, waxes, plastics, synthetic rubber, and asphalt.

Natural gas

This part of the country seems to have all hell for a basement and the only trapdoor appears to be in Medicine Hat.
—Rudyard Kipling on a visit to Alberta in 1907

In some parts of Canada, natural gas has been a source of energy since the 1800s, but it wasn't until the late 1950s and the completion of the TransCanada Pipeline that use of natural gas became widespread. Since then, demand has grown steadily, and today Canada is the third largest producer of natural gas in the world. Domestically, natural gas heats almost 50% of homes and is the main source of energy for 51% of the manufacturing sector (Canadian Gas Association n.d.).

Like crude oil, natural gas is a hydrocarbon-compound fossil fuel. Its main component is methane, but it also contains ethane, propane and butane. It is conventionally found in reservoirs several metres or kilometres below the earth's surface. Non-conventional sources include coal-bed methane, tight gas sands, gas shales, and gas hydrates, all of which are more difficult to extract (for more information see the Centre for Energy at www.centreforenergy.com).

Natural gas is largely found in Alberta, but British Columbia and Saskatchewan also have resources. Known resources of recoverable conventional natural gas are estimated to be about 58 trillion cubic feet. Another 500 trillion cubic feet are thought to be available from coal-bed methane. However, it is not known how much of this can be recovered (Energy Information Administration 2007).

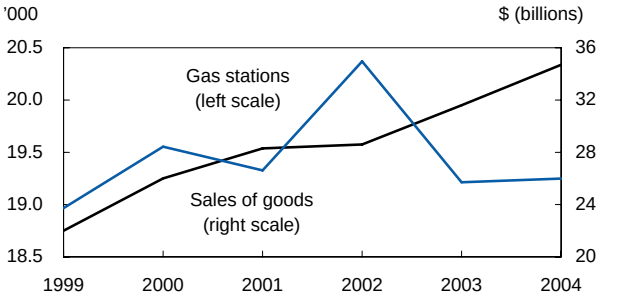
Natural gas is an energy source in several areas, providing fuel for furnaces, appliances, vehicles, electricity generation, steam-heat production, and co-generation of heat and electricity.

Another feature of the downstream oil and gas sector is the 19,200 gas stations found across the country. In 2004, their sales (gas and other products) totalled almost $35 billion (Chart D). When consumers pull into a gas station, the upstream and midstream sectors of oil and gas remain in the background.

Employment

Between 1997 and 2006, employment in Canada increased by about 20%. In the three oil and gas sector components, roughly 298,000 people were employed in 2006, an increase of about 22% over 1997 (Table 2).[4] Compared with other industries, jobs in all three components are much more likely to be held by men. In 2006, only 28% of jobs in the oil and gas industry were held by women, compared with 47% of jobs in

Chart D The number of gas stations has plateaued but sales have continued to increase



Sources: Statistics Canada, Retail Store Survey; Retail Chain Survey

other industries. Other differences include unionization status and hourly earnings. Although employees in oil and gas industries were less likely to be unionized (12% versus 32%), their hourly earnings were about 24% higher. These differences are even more pronounced for the individual components.

Upstream—full-time, male and well-paid

Between 1997 and 2006, employment in oil and gas extraction grew by about 43%—from 55,000 to about 79,000.[5] In support industries, the growth over this period was about 88%, reaching 98,000 in 2006 (Table 3). Relative to other industries, employment in oil and gas extraction held constant, ranking 18th in both 1997 and 2006. Not surprisingly, most employment was in Alberta with its vast oil and gas reserves. Indeed, approximately 75% of jobs in the industry were in this province.

Table 2 Labour force characteristics

	All industries		Oil and gas related		Non oil and gas	
	1997	2006	1997	2006	1997	2006
			'000			
Employed	13,706.0	16,484.3	244.7	297.6	13,461.3	16,186.8
Self-employed	2,349.4	2,498.0	28.6	34.9	2,321.4	2,463.1
			%			
Sex						
Men	54.5	52.9	74.6	71.8	54.1	52.6
Women	45.5	47.1	25.4	28.2	45.9	47.4
Age						
15 to 34	40.1	36.8	48.8	44.8	40.0	36.6
35 to 54	50.1	49.1	45.4	46.0	50.2	49.1
55 and over	9.7	14.1	5.8	9.3	9.8	14.2
Union coverage[1]						
Yes	33.7	31.7	13.8	12.3	34.1	32.0
No	66.3	68.3	86.2	87.7	65.9	68.0
Work schedule						
Full-time	80.9	82.0	85.5	88.3	80.8	81.8
Part-time	19.1	18.0	14.4	11.7	19.2	18.2
			$			
Average hourly earnings	12.92	16.73	14.80	20.64	12.88	16.66

1 Excludes self-employed
Source: Statistics Canada, Labour Force Survey

Table 3 Upstream employment

	Total		Extraction		Support industries	
	1997	2006	1997	2006	1997	2006
			'000			
Employed	107.1	176.5	55.2	78.7	51.9	97.8
Self-employed	14.6	21.6	3.6	F	11.0	20.2
			%			
Sex						
Men	81.0	76.7	75.4	67.5	87.1	84.0
Women	19.0	23.3	24.6	32.7	12.9	15.8
Age						
15 to 34	40.1	43.9	34.2	38.2	46.4	48.5
35 to 54	53.7	47.0	60.9	52.1	46.1	42.9
55 and over	6.2	9.1	4.9	9.7	7.5	8.6
Union coverage[1]						
Yes	7.9	9.7	7.9	9.2	8.1	10.2
No	92.1	90.3	92.1	90.8	91.9	89.8
Work schedule						
Full-time	94.9	95.8	96.0	97.2	93.6	94.6
Part-time	5.1	4.2	4.0	2.8	6.4	5.3
			$			
Average hourly earnings	17.24	24.21	20.47	30.36	13.79	19.26

1 Excludes self-employed
Source: Statistics Canada, Labour Force Survey

Workers in the oil and gas industry are much more likely to work full time. In 2006, about 97% of those in oil and gas extraction worked full time (95% in support industries) compared with about 82% in other industries. They were also much less likely to be unionized (9% versus 32%).

Their hourly earnings in 2006 were also substantially higher. While the average was $16.73 for the labour market as a whole, earnings were about 80% higher in oil and gas extraction ($30.36). The gap has not always been so large. In 1997, employees in oil and gas extraction earned only 58% more per hour than the average worker ($20.47 versus $12.92).

It is impossible to determine the exact employment figure for activities supporting oil and gas extraction since the mining industry is also included here. That said, in 2006, employment in the support activities for oil, gas and mining industries was almost 98,000, an increase of 88% since 1997. And while it is not possible to determine what percentage of the increase was a result of the oil and gas boom, it has clearly played an important role in employment growth.

Midstream—Pipeline workers: above average wages and predominately male

Because it is not possible to separate petroleum products from the transportation and storage of other commodities, this section deals only with the pipeline industries. In 2006, employment in pipeline industries was about 4,000, about 44% lower than the 1997 figure of just over 7,000 (Table 4). Just as for oil and gas extraction, workers in these industries are primarily male and have substantially higher average hourly earnings ($34.36 versus $16.73).

Table 4 Midstream employment

	1997	2006
	'000	
Employed	7.1	4.0
Self-employed	F	F
	%	
Sex		
Men	81.7	80.0
Women	F	F
Age		
15 to 34	40.9	F
35 to 54	52.1	65.0
55 and over	F	F
Union coverage[1]		
Yes	21.1	F
No	78.9	100.0
Work schedule		
Full-time	100.0	100.0
Part-time	F	F
	$	
Average hourly earnings	21.83	34.36

1 Excludes self-employed
Source: Statistics Canada, Labour Force Survey

Downstream—young, low-paid and non-unionized

While upstream and midstream employment in the oil and gas sector consists of full-time well-paid jobs, downstream employment varies widely. This is not surprising given the wide array of industrial components. Overall, the downstream sector in 2006 employed approximately 117,000 individuals in a variety of industries (Table 5).[6] Because employment is quite different in each one, they are examined individually.

Petroleum and coal products manufacturing includes refineries as well as asphalt paving, shingles, and other petroleum and coal manufacturing. Employment in this industry totalled about 16,400 in 2006, down from almost 21,000 in 1997. Much like oil and gas extraction, this field was predominately male, non-unionized, and full-time. Average hourly earnings, at $28.19, were much higher than the general working population, and higher than any other component in the downstream sector.

Employment in petroleum product wholesaling was virtually the same in 2006 and 1997, about 11,500. This industry was also predominately male (61%), and virtually all worked full time. Not surprisingly, hourly earnings were above average at $18.85. Employment in this industry was primarily in Alberta, Ontario and Quebec.

Employment in the distribution of natural gas rebounded somewhat in 2006 after declining steadily between 1997 and 2005. In 2005, it employed approximately 14,800 people, down from 20,600 in 1997, but the level rose to 15,300 in 2006. This industry is indicative of most oil and gas industries in that hourly earnings were substantially higher than the average ($27.12 versus $16.73), and almost all workers were full-time. Interestingly, it had the highest unionization rates of all oil and gas industries at about 45%.

Gasoline stations illustrate the varied employment in the downstream sector. Employment at gas stations was far higher than in any other industry in the midstream or downstream sectors. Not surprisingly, workers here had the lowest average earnings and were much younger. In 2006, some 74,000 individuals worked at gas stations across the country, down from almost 78,000 in 1997. Nearly 60% were under 35, compared with about 30% in the other downstream industries. Hourly earnings, at $8.61, were strikingly lower than in any other oil and gas industry, and 50% lower than the overall average. Because employment does not depend on where oil and gas are extracted, jobs are spread throughout the country in line with population distribution—26% in Ontario, 21% in Quebec, 16% in British Columbia, and 13% in Alberta.

Summary

With the discovery of oil at Leduc well no. 1 in Alberta in February 1947, Canada was transformed almost instantly from an oil-poor to an oil-rich nation. Recent development of non-conventional sources of oil and gas has further augmented the importance of this industry to the Canadian economy. By 2006, the contribution to GDP of all sectors of the oil and gas industry had exceeded $40 billion (1997 dollars), and direct employment totalled almost 300,000.

Table 5 Downstream employment

	Total		Manufacturing		Wholesale		Natural gas distribution		Gas stations	
	1997	2006	1997	2006	1997	2006	1997	2006	1997	2006
					'000					
Employed	130.5	117.1	20.9	16.4	11.3	11.6	20.6	15.3	77.7	73.9
Self-employed	13.9	13.4	F	F	1.8	F	F	F	11.8	11.9
					%					
Sex										
Men	69.0	64.1	82.3	87.2	70.8	61.2	59.2	71.2	67.6	57.9
Women	31.0	35.9	17.7	12.8	29.2	38.8	40.8	28.1	32.4	42.1
Age										
15 to 34	56.3	46.7	32.1	20.7	37.2	30.2	32.5	26.1	71.9	59.3
35 to 54	38.3	43.6	61.2	72.0	53.1	56.0	59.7	60.8	24.3	31.9
55 and over	5.4	9.6	F	F	F	13.8	7.8	13.1	3.7	8.8
Union coverage[1]										
Yes	18.0	15.8	31.4	31.7	F	F	50.5	45.4	5.2	4.8
No	82.0	84.2	68.6	68.3	91.6	87.8	49.5	54.6	94.8	95.2
Work schedule										
Full-time	77.2	76.8	94.7	99.4	94.7	92.2	94.7	95.4	65.3	65.4
Part-time	22.9	23.2	F	F	F	F	F	F	34.7	34.6
					$					
Average hourly earnings	12.42	14.78	22.03	28.19	14.18	18.85	20.78	27.12	7.38	8.61

1 Excludes self-employed
Source: Statistics Canada, Labour Force Survey

In the upstream sector, which comprises oil and gas extraction, investment and production have become driving forces in the economy. Indeed, between 1997 and 2005, investment in oil and gas extraction more than doubled from $18.9 billion to $45.3 billion, far exceeding any other industry. While production of natural gas levelled off in 2005, production of crude oil increased by 21% over the same period. Employment in this sector reached approximately 177,000 in 2006, and average hourly earnings were about 45% higher than in the labour market in general.

The midstream component of oil and gas is made up of transportation and storage. In Canada, 700,000 kilometres of pipelines carried approximately 700 million cubic metres of petroleum products in 2005 and contributed about $5.1 billion to GDP. Employment related to pipelines was relatively small in 2006 with only 4,000 people.

The downstream sector of oil and gas includes refineries, petroleum manufacturing and wholesale distribution, utilities, and gas stations and employs about 117,000. Currently the 19 refineries in Canada have the capacity to process 330,000 cubic metres of petroleum per day. For many consumers, the closest they get to the oil and gas industries is when they pull into one of over 19,000 gas stations in Canada.

Today Canada is recognized as an important player in terms of oil and natural gas. As global supplies dwindle, it becomes profitable to develop resources that are more difficult to extract—such as the oil sands. If geopolitical tensions remain high in other oil-producing areas of the world, Canada's role will become even more important.

Perspectives

Notes

1 This figure represents the per barrel refinery acquisition cost of imported crude oil.

2 A standard barrel of oil contains 159 litres. A barrel of oil when refined yields 72 litres of gasoline. Barrels are referred to as 'bbl' because in the past the only barrels guaranteed to contain 42 US gallons were blue barrels manufactured for Standard Oil. This has become the standard.

3 Unfortunately, it is possible to get GDP numbers only for pipelines. Information on transportation of crude oil products by rail, truck or tanker and on storage of petroleum products is not available.

4 This article looks at direct not indirect employment. For example, construction has increased substantially in Alberta, partly as a result of the boom in the oil and gas industry. This indirect employment is not included.

5 Employment figures are available only for oil and gas extraction as a whole; employment for the natural gas sector and the crude oil sector cannot be separated.

6 Unfortunately, it is not possible to separate out employment for petrochemical companies, so these are not included in employment counts for the downstream sector.

References

Bennett, Dean. 2006. "Red-hot Alta: Economy puts life on the boil; Albertans find quality of life beginning to evaporate." *New Brunswick Telegraph-Journal*. August 4. C3.

Canadian Association of Petroleum Producers (CAPP). n.d. a. "Energy prices." Web page. http://www.capp.ca/default.asp?V_DOC_ID=1142 (accessed April 17, 2007).

---. n.d. b. "Oil sands resources, production and projects." Web page. http://www.capp.ca/default.asp?V_DOC_ID=1162 (accessed April 17, 2007).

---. n.d. c. "Producing oil and natural gas." Web page. http://www.capp.ca/default.asp?V_DOC_ID=33 (accessed April 18, 2007).

Canadian Gas Association. n.d. "General overview: Other facts and figures." Web page. http://www.cga.ca/about/facts.htm (accessed April 17, 2007).

Centre for Energy™. n.d. a. "How is oil transported?" Web page. http://www.centreforenergy.com/silos/oil/generator.asp?xml=%2Fsilos%2Foil%2FoilOverview07XML%2Easp&menu=0,6&template=1,1 (accessed April 17, 2007).

---. n.d. b. "Water use." Web page. http://www.centreforenergy.com/silos/ong/ongEnvironmentusOilAndGasIndEnvWater01.asp?PostID= (accessed April 18, 2007).

Cross, P. 2006. "The year in review: The revenge of the old economy." *Canadian Economic Observer*. Vol. 19, no. 4. April. Statistics Canada Catalogue no. 11-010-XIB. http://www.statcan.ca/english/freepub/11-010-XIB/00406/featureTOC.htm (accessed April 13, 2007).

Energy Information Administration. 2007. "Natural gas." Country Analysis Briefs: Canada. Web page. http://www.eia.doe.gov/emeu/cabs/Canada/NaturalGas.html (accessed April 30, 2007).

Environment Canada, Statistics Canada and Health Canada. 2006. *Canadian Environmental Sustainability Indicators, 2005*. Statistics Canada Catalogue no. 16-251-XIE. http://www.statcan.ca/english/freepub/16-251-XIE/2005000/intro.htm (accessed April 17, 2007).

Government of Alberta. n.d. "Industry and Economy." Web page. http://www.gov.ab.ca/home/index.cfm?Page=1477 (accessed April 17, 2007).

Government of Alberta, Department of Energy (DOE). n.d. a. "Oil facts." Web page. http:/www.energy.gov.ab.ca/1960.asp (accessed April 17, 2007).

---. n.d. b. "Natural gas interesting facts." Web page. http://www.energy.gov.ab.ca/1956.asp (accessed April 18, 2007).

---. n.d. c. "Energy facts." Web page. http://www.energy.gov.ab.ca/1899.asp (accessed April 18, 2007).

National Energy Board. 2005. *Short-term Outlook for Canadian Crude Oil to 2006*. September. Calgary. 58 p.

---. n.d. "Energy pricing information for Canadian consumers. Crude oil and petroleum products." Web page. https://www.neb.gc.ca/energy/EnergyPricing/Industry/CO_e.htm. (accessed April 17, 2007).

Rowat, Miles Ryan. 2006. *Boom Times: Canada's Crude Petroleum Industry*. Statistics Canada Catalogue no. 11-621-MIE, no. 47. Analysis in Brief series. http://www.statcan.ca/english/research/11-621-MIE/11-621-MIE2006047.htm (accessed April 17, 2007).