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# A Demographically Augmented Shift-Share Employment Analysis: An Application to Canadian Employment Patterns

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**Abstract.** In this paper we illustrate how the traditional shift-share model may be readily expanded to analyse disaggregate data on various age-sex cohorts of the labour market. Further we show that such results can be misleading unless age-sex-specific labour-force changes are explicitly considered. We then analyze the performance of the Canadian regional labour markets as an example of the proposed procedure.

## 1. Introduction

Traditional analysis of regional employment changes has recognized the importance of accounting for both differences in industrial structure and locational advantages (disadvantages) that may be present in the region. Frequently, shift-share analysis has been used to separate these effects, for example O'Leary (2003) and Esteban (2000), in studying regional convergence in Europe.

More recently, several studies have looked more closely at regional inequality in terms of gender [Peinado and Cairo Cespedes (2004) and Hunt (2004)] and/or age group [Stenberg and Wikstrom (2004), MacDonald and Weisbach (2004) and Kletzer and Fairlie (2003)]. These studies have typically ignored, or down-played, the effects of the industrial structure. In this study, we suggest a relatively simple extension to the standard shift-share model which allows for direct consideration of the industrial mix and the age-sex composition of regional employment change as well as for the regional locational advantages.

The study is organized as follows. In section 2, we describe the theoretical form of the standard shift-share model and discuss some of the common criticisms of its use in policy analysis. In section 3, we suggest modifications to allow for the extension of the analysis for various age-sex cohorts. Part of this extension recognizes the importance of accounting for age-sex-specific changes in the labour force when assessing regional labour-market impacts. In section 4,

we present an example of the use of the labour-force adjusted, age-sex-specific, shift-share model by analysing changes in Canadian labour markets from 1986 to 1995. In the final section, we summarize our findings of the paper and suggest some policy implications of the analysis.

## 2. Criticisms of Shift-Share Models

The conventional shift-share model has been used to assess regional development as measured on the basis of such variables as income, employment, value added, or a variety of others, by separating growth into three components: (1) the national-growth component, which points to growth that would have occurred in the event that all industries in the study region displayed the same rate of growth as the reference economy average; (2) the industry-mix component, which measures the effect of the existing industrial structure on regional growth by capturing the growth that would have occurred if the growth displayed by the existing regional industries matched that exhibited by the same industries in the reference economy; and (3) the competitive or differential-shift component, which attributes regional growth to the dynamism or attractiveness of the region and is measured residually. The application of the shift-share model, and, in particular, the relevance of the competitive-shift component have received undue attention in the literature.

The application of the conventional shift-share analysis normally involves assessing the industrial performance of a region in relation to the reference economy, where the national economy is often used as the reference economy. The analysis is frequently conducted on the basis of employment, which offers the most readily available data over all age groups, according to the following specification:

$$N^r = E_i^r g^n \quad (1)$$

$$I^r = E_i^r (g_i^n - g^n) \quad (2)$$

$$C^r = E_i^r (g_i^r - g_i^n) \quad (3)$$

where the national-growth component,  $N^r$ , is given by regional employment in the  $i$ th industry,  $E_i^r$ , times the overall rate of employment change in the reference economy, the nation,  $g^n$ . The national-growth component, therefore, represents the growth in employment that would have resulted if the region had experienced the same growth as the reference economy. The industrial-mix component,  $I^r$ , is given by regional employment in the  $i$ th industry,  $E_i^r$ , times the national (reference economy) rate of employment change in the  $i$ th industry,  $g_i^n$ , less the overall rate of employment change in the nation,  $g^n$ . Thus, the industry-mix effect represents the employment growth that would have resulted had each regional industry displayed a growth rate consistent with that experienced by the corresponding industry in the reference economy. The industry-mix effect is often viewed as a measure of the strength of the industrial composition in the region. The competitive component,  $C^r$ , is given by regional employment in the  $i$ th industry,  $E_i^r$ , times the regional rate of employment change in the  $i$ th industry,  $g_i^r$ , less the national rate of employment change in the  $i$ th industry,  $g_i^n$ . This component is often interpreted as indicative of the location advantages/disadvantages possessed by the particular industry in the region.

Richardson (1978) is perhaps most representative of the shift-share critics. The main criticisms of shift-share concern five central themes:

- (1) lack of theoretical content
- (2) aggregation problems
- (3) weighting bias
- (4) instability of competitive effect
- (5) interdependence of the industry mix and competitive effects.

While some studies such as Chalmers and Beck-

helm (1976) have attempted to create a theoretical basis for the shift-share model using location theory, Fothergill and Gudgin (1979) argued that while technically it is true that the theoretical basis is questionable, the use of the shift-share model allows the researcher to test hypotheses in a more meaningful way. Indeed, Andrikopoulos, Brox and Carvalho (1990) showed that forecasts based on the shift-share model are more accurate than those based on analysis of aggregate employment changes. Further, Ireland and Moomaw (1981) and Andrikopoulos, Brox and Carvalho (1987) used shift-share models to forecast investment decisions on a regional basis, and Rigby and Anderson (1993) used an extended version of the shift-share model to explain changes in Canadian labour productivity.

Aggregation problems have been commonly presented as a flaw in shift-share models, however, most empirical studies, such as Ashby (1968), Fothergill and Gudgin (1979), and Esteban (2000), have concluded that shift-share models are no more sensitive to the level of disaggregation than are other models commonly applied to regional analysis.

Richardson (1978) argued that factors such as business cycles, demographic shifts and similar events cause a potential weighting bias owing to the choice of the base year. McDonough and Sihag (1991) showed that such effects are minimal in the short run and can be accounted for by using the so-called 'dynamic shift-share model' in longer-term analysis. Fothergill and Gudgin (1979), based on an empirical application to eleven British regions, also showed that the effect of weighting is small.

Brown (1969) suggested that the instability of the competitive effect rendered the shift-share model next to useless for both forecasting and policy analysis. This claim was discounted by Danson, Lever and Malcolm (1980) for British urban areas, and shown to be a minor issue for prediction by Ireland and Moomaw (1981) for Oklahoma, and for Ontario and Quebec by Andrikopoulos, Brox and Carvalho (1990).

The interdependence of components or its absence has become a standard measure of the validity of shift-share analysis, as noted, for example, by Arcelus (1984) and Houston (1967). The desirability of component independence has been seen as so prominent that a variety of alternative shift-share models have been suggested to reduce the correlation between the industry-mix and competitive effects. Loveridge and Selting (1998) examined a number of these alternative shift-share models including those by Esteban-Marquillas (1972), Bishop and Simpson (1972) and Arcelus (1984). They showed that the Esteban-Marquillas models do not solve the very problem they

purport to eliminate, as one form of interdependence replaces another. This point has been further stressed by Kiel (1992). If the importance of avoiding interdependence is momentarily suspended, Esteban-Marquillas and Arcelus models are more complex. Nevertheless, they suffer from a lack of what Loveridge and Selting (1998) termed “the zero national deviation property”, i.e., the industry-mix and competitive effects summing to zero. Given their empirical results and the need for practitioner acceptance and use, Loveridge and Selting concluded that “the classic model and its close relatives are the overall winners” (1998, p.55)

### 3. Demographically-enhanced Shift-Share

In this study, the standard shift-share analysis is extended beyond its conventional application of assessing regional industrial performance to account for the impact of regional economic growth or decline on particular age-sex cohorts. To accommodate the effect of regional economic performance on particular age-sex cohorts, the conventional shift-share model is modified according to the following specification:

$$N_a^r = E_{ia}^r g^n \quad (4)$$

$$I_a^r = E_{ia}^r (g_i^n - g^n) \quad (5)$$

$$C_a^r = E_{ia}^r (g_{ia}^r - g_i^n) \quad (6)$$

where the national-growth component,  $N_a^r$ , is given by regional employment in the  $i$ th industry for a particular age-sex cohort,  $E_{ia}^r$ , times the overall rate of employment change in the reference economy, the nation,  $g^n$ ; the industrial-mix component,  $I_a^r$ , is given by regional employment in the  $i$ th industry for the particular age-sex cohort,  $E_{ia}^r$ , times the national rate of employment change in the  $i$ th industry,  $g_i^n$ , less the overall rate of employment change in the nation,  $g^n$ ; and the competitive component,  $C_a^r$ , is given by regional employment in the  $i$ th industry for the particular age-sex cohort,  $E_{ia}^r$ , times the regional rate of employment change in the  $i$ th industry for the particular age-sex cohort,  $g_{ia}^r$ , less the national rate of employment change in the  $i$ th industry,  $g_i^n$ .

Finally, since labour-force changes for specific age-sex cohorts may reflect factors other than labour-

market conditions,<sup>1</sup> the competitive component adjusted for regional labour-force growth of the particular age-sex cohort,  $C_{ia}^r$ , is calculated by applying the same shift-share modelling procedure to the disaggregated regional labour-force data, and then subtracting the competitive share component for the age-sex regional labour force,  $L_a^r$ , from that obtained for the employment data described above:

$$C_{ia}^r = C_a^r - L_a^r = E_{ia}^r [(g_{ia}^r - g_i^n)] - L_{ia}^r [(g_{ia}^r - g_i^n)] \quad (7)$$

where,  $L_{ia}^r$  is the competitive-share component of regional labour force in the  $i$ th industry for the particular age-sex cohort;  $g_{ia}^r$  is the regional rate of labour-force change in the  $i$ th industry for the particular age-sex cohort; and  $g_i^n$  is the national rate of labour-force change in the  $i$ th industry.

Thus, our disaggregated version of the model designates each specific age-sex cohort in each region as a separate sub-region of its own, analysed in relation to aggregate economic performance. An alternative would be to treat the national performance of specific age-sex cohorts as the reference economy and conduct shift-share analysis independently for each age-sex component. Our approach allows us to compare the performance of specific age-sex cohorts to the overall level of economic performance, while the alternative approach would provide a more direct measure of the relative status of a particular age-sex cohort compared to the same cohort nationally. Accordingly, the national-growth component gives the employment change that would have occurred if the employment for the particular age-sex cohort in each region had matched the reference economy, that is, the national overall average for all age-sex cohorts.

The industrial-mix component gives the employment growth that would have occurred for the particular age-sex cohort for a given industry in each region, if the industry employment growth had been at the relevant national average for that industry. The industrial mix is interpreted as a measure of the structural strength (weakness) of the industrial base in each region. The competitive-share component is interpreted as the locational advantages (disadvantages) of each age-sex employment cohort for each industry, measured by the actual employment growth for each age-sex cohort in the relevant regional industry minus the national average growth for the corresponding industry. The labour-force adjusted competitive com-

<sup>1</sup> Increased participation in post-secondary education for the young and early retirement decisions by older workers are examples of the effects which we have in mind here.

ponent measures regional employment growth for a given industry at the age-sex cohort level relative to the change in the regional labour-force participation for that age-sex cohort for a given industry. This component is interpreted as the net demand impact for the specific age-sex cohort after adjustment for age-sex-specific supply of labour.

#### 4. An Application

The modified version of the shift-share model discussed above has been applied to each of five Canadian regions including the Atlantic Region (Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick), Quebec, Ontario, the Prairie Region (Manitoba, Saskatchewan, and Alberta), and British Columbia, separately for males and females, divided into three age groups: young workers (aged 15-24), adult workers (aged 25-54), and older workers (aged 55+). The raw data utilized in the computations are drawn from Statistics Canada's Labour Force Survey and have been retrieved from CANSIM II, table 282007.<sup>2</sup> Based on annual averages by one-, two-, and three-digit standard industrial codes, multi-dimensional tables for the period extending from 1986 to 1995 have been constructed according to region, industry, gender and age group for both total employment and total labour force.

Tables 1, 2, and 3 present the shift-share components, in numbers of employees, by gender for younger workers, adult workers and older workers, respectively. For comparison purposes, Table 4 presents the traditional shift-share measures, again presented on the basis of numbers of employees, for the same industries and regions. It is readily apparent that although the same basic pattern is found for both the traditional competitive shares and the age-sex-specific version, there is considerable variation in the details. For example, in the Atlantic region, the competitive share is positive in four of the nine industrial sectors in the traditional shift-share model (Table 4), but negative for every industry in the case of younger workers for both males and females (Table 1). In the same region, adult female workers (Table 2) are found to have a positive competitive share for every sector. Similar variability may be noted for most age-sex cohorts.

Aggregating across various cohorts allows one to consider the differential performance of various categories of workers. For example, in Table 5, we present

the competitive share by age category, produced by aggregating across regions and sex cohorts. Here it is obvious that adult workers have fared better than the younger or older age groups. Similarly, in Table 6, we present the competitive share by gender. In this case it is clear that female workers have gained at the expense of male workers in almost every industry.

Finally, in Table 7, we present the results of adjusting the competitive shares for each age-sex cohort by the differential labour-force effect. This is particularly important when considering the relative performance of the disaggregate cohorts as labour-force participation rates show considerable variation over different age-sex groups. For example, while the competitive share is negative for every cohort for young Atlantic workers (Table 1), the corresponding results in Table 7 show five positive results for young Atlantic males and three positive effects for young Atlantic females.

#### 5. Summary and Conclusions

This study has three main purposes: (1) to illustrate how the traditional shift-share model may be readily expanded to analyse disaggregate data on various age-sex cohorts of the labour market; (2) to show that such results can be misleading unless age-sex-specific labour-force changes are explicitly considered; (3) to analyze the performance of the Canadian regional labour markets as an example of the proposed procedure.

The results of this study clearly indicate that adult workers have fared better than either young or older workers, in terms of relative employment growth over the period considered. When labour-force changes are taken into account, these conclusions are modified to some extent. In that case, the relative performance of the adult workers is seen to be less favourable, with improved performance for the younger workers and relatively little change noted for the older workers. These results would tend to suggest that the recent trend towards early retirement for older workers has, to some extent, reduced the employment problem facing younger cohorts. When the sex cohorts are considered, it appears that, in most age groups, females have fared slightly better than corresponding male groups.

Regionally, we note that accounting for labour-force adjustment has tended to make the relative position of the adult workers worse and that for younger workers better in most regions. The same adjustment, however, has had a more ambiguous effect on the position of older workers.

<sup>2</sup> CANSIM II is Statistics Canada's computerized database.

**Table 1.** Shift-Share Components for Youth Workers (Ages 15 - 24) for the Period 1986-1995

National Growth										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	758	158	2268	493	3463	1259	3843	848	739	431
Other Primary	992	100	833	92	828	144	2227	565	1262	116
Manufacturing	2073	971	10260	5701	18161	9539	4214	1935	2827	965
Construction	1282	110	2754	356	6259	624	3287	418	1387	235
TCOU	856	374	2286	1234	4063	1562	2948	1250	1508	726
Trade	3865	3574	12582	9631	21373	18669	10598	8141	5399	4332
"Fin. Insur, & R.Est."	203	703	1282	3731	1429	4963	857	2562	337	1416
Service	3019	6553	12711	19272	20367	33487	8807	16547	5563	10663
Public Admin	891	845	1558	2420	2882	3814	1684	2107	688	56

  

Industrial Mix										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	-1249	-261	-3736	-812	-5706	-2074	-6331	-1397	-1218	-710
Other Primary	-959	-97	-805	-88	-800	-139	-2152	-546	-1220	-112
Manufacturing	-2069	-969	-10241	-5690	-18127	-9522	-4206	-1932	-2822	-964
Construction	318	27	683	88	1553	155	816	104	344	58
TCOU	-150	-66	-401	-216	-713	-274	-517	-219	-265	-127
Trade	-1305	-1207	-4249	-3253	-7218	-6305	-3579	-2749	-1823	-1463
"Fin. Insur, & R.Est."	109	378	690	2006	769	2669	461	1378	181	761
Service	3485	7564	14673	22247	23511	38655	10166	19102	6421	12309
Public Admin	-946	-897	-1654	-2569	-3060	-4049	-1787	-2238	-730	-595

  

Competitive Share										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	-2233	-112	-3977	1359	-7139	-158	-1340	1245	-1569	-568
Other Primary	-1779	-193	-1388	107	-2404	-332	-3412	-1447	-1293	55
Manufacturing	-4760	-2998	-21591	-18317	-55578	-38583	-6294	-4917	-420	-2434
Construction	-4655	-179	-8742	-1728	-23286	-825	-7745	-1030	4132	678
TCOU	-2974	-795	-6192	-3778	-10575	-2090	-11856	-5573	-4657	-1745
Trade	-3204	-3808	-21513	-4011	-50861	-24662	-21473	-11435	-829	10308
"Fin. Insur, & R.Est."	-17	-3118	-6298	-21163	-2206	-19630	-3243	-13013	-583	-4276
Service	-1134	-15687	-33999	-58684	-35209	-91267	-13274	-39345	1091	-23499
Public Admin	-1352	-2669	-924	-9893	-7028	-16868	-7918	-8997	-2449	414

**Table 2.** Shift-Share Components for Adult Workers (Ages 25 - 54) for the Period 1986-1995

National Growth										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	1251	467	5236	2496	5942	3916	12722	5632	1835	1383
Other Primary	4821	254	4662	293	5732	618	8665	2250	5293	656
Manufacturing	8121	2883	43415	16297	81648	32186	13699	4882	14322	3473
Construction	4853	397	12285	1909	22169	2942	11010	1345	7094	929
TCOU	6919	1468	21370	5580	27620	9434	15955	4176	9953	3221
Trade	7862	6033	28302	17747	35870	31161	20050	14078	12741	9341
"Fin. Insur. & R.Est."	1533	2236	7345	9918	11657	17286	4735	7161	3646	5332
Service	9696	18268	40344	59200	50355	86005	23996	41679	17312	27666
Public Admin	5839	2999	15199	8648	20115	12706	11124	6913	6135	3859
Industrial Mix										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	-2061	-770	-8627	-4111	-9790	-6452	-20960	-9279	-3024	-2279
Other Primary	-4659	-245	-4505	-283	-5539	-597	-8374	-2174	-5115	-634
Manufacturing	-8106	-2878	-43335	-16266	-81496	-32126	-13674	-4873	-14296	-3466
Construction	1205	98	3049	474	5503	730	2733	334	1761	231
TCOU	-1214	-258	-3748	-979	-4844	-1655	-2798	-732	-1746	-565
Trade	-2655	-2037	-9559	-5994	-12114	-10524	-6771	-4754	-4303	-3155
"Fin. Insur. & R.Est."	824	1202	3950	5333	6269	9296	2546	3851	1961	2867
Service	11192	21088	46571	68337	58127	99280	27700	48113	19984	31936
Public Admin	-6199	-3184	-16137	-9182	-21357	-13490	-11811	-7339	-6514	-4097
Competitive Share										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	-59	1238	-2675	1424	6224	-2503	-878	4034	-1422	-1912
Other Primary	2778	1781	-1075	1166	-3351	-1270	6970	3358	1855	817
Manufacturing	8331	1142	51976	38428	4504	17153	24873	8741	18252	14148
Construction	-3069	1033	917	29	931	122	9768	161	30827	4583
TCOU	-438	3131	-10320	10692	21680	18738	5665	8661	12150	7392
Trade	2457	6456	10601	23412	53995	15353	-2658	10248	18176	29404
"Fin. Insur. & R.Est."	531	3765	3030	12436	21704	34538	-5900	685	6263	6861
Service	-464	18440	-24002	25347	70473	134264	-45	37226	36335	72209
Public Admin	262	9755	-4408	22399	6566	28135	-9539	7097	6784	15359

**Table 3.** Shift-Share Components for Older Workers (Ages 55+) for the Period 1986-1995

National Growth										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	657	104	1715	490	3250	1123	6690	1833	841	379
Other Primary	756	6	643	28	803	69	776	92	750	149
Manufacturing	1239	241	6999	1421	13492	3870	1863	364	2170	366
Construction	563	44	1713	184	3849	381	1432	153	1125	145
TCOU	1192	181	3166	377	4850	918	2025	415	1749	394
Trade	1203	756	4716	2978	7524	5374	3088	2400	2158	1629
"Fin. Insur, & R.Est."	271	147	1416	650	2971	1995	1081	526	958	686
Service	1630	2173	6800	6479	11058	13557	4375	5361	3263	3125
Public Admin	1111	286	1872	462	4271	1627	1712	885	886	405

  

Industrial Mix										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	-1082	-171	-2825	-807	-5355	-1851	-11022	-3020	-1385	-625
Other Primary	-730	-6	-621	-27	-776	-67	-750	-88	-725	-144
Manufacturing	-1237	-241	-6986	-1419	-13467	-3862	-1859	-364	-2166	-365
Construction	140	11	425	46	955	95	356	38	279	36
TCOU	-209	-32	-555	-66	-851	-161	-355	-73	-307	-69
Trade	-406	-255	-1593	-1006	-2541	-1815	-1043	-810	-150	-550
"Fin. Insur, & R.Est."	146	79	762	349	1598	1073	581	283	515	369
Service	1881	2508	7850	7479	12765	15650	5051	6188	3766	3607
Public Admin	-1180	-304	-1988	-490	-4535	-1727	-1817	-939	-940	-430

  

Competitive Share										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	-1123	265	-3177	428	-1394	1090	8676	7810	-1216	-338
Other Primary	-633	134	242	147	-1075	209	-104	-12	470	-321
Manufacturing	-2769	-171	-12156	3143	-18550	-25	-864	414	-1279	601
Construction	142	-63	-646	-743	-1991	526	-1011	-7	1785	87
TCOU	-2648	-240	-4724	-1218	-9624	-2152	-3218	-426	-2680	-187
Trade	-1573	-199	-4266	-6937	-12863	-4141	-4242	-3630	2185	-290
"Fin. Insur, & R.Est."	383	196	-1077	-1485	-3723	-2078	-2880	355	-460	403
Service	-2048	-3934	-16334	-4211	-8865	-19951	-4639	-6186	1602	5790
Public Admin	-2931	-256	-1558	1549	-11465	-2298	-4594	-1660	-1324	-189



**Table 4.** Traditional Shift-Share Components for the Period 1986-1995

National Growth					
Industry/Region	Atlantic	Quebec	Ontario	Prairie	B.C.
Agriculture	3395	12698	18953	31568	5608
Other Primary	6929	6551	8194	14575	8226
Manufacturing	15528	84093	158896	26957	24123
Construction	7249	19201	36224	17645	10915
TCOU	10990	34013	48447	26769	17551
Trade	23293	75956	119971	58355	35600
"Fin. Insur, & R.Est."	5093	24342	40301	16922	12375
Service	41339	144806	214829	100765	62592
Public Admin	11971	30159	45415	24425	12029
Industrial Mix					
Industry/Region	Atlantic	Quebec	Ontario	Prairie	B.C.
Agriculture	-5594	-20918	-31228	-52009	-9241
Other Primary	-6696	-6329	-7918	-14084	-7951
Manufacturing	-15500	-83937	-158600	-26908	-24079
Construction	1799	4765	8991	4381	2709
TCOU	-1929	-5965	-8498	-4694	-3079
Trade	-7865	-25654	-40517	-19706	-11444
"Fin. Insur, & R.Est."	2738	13090	21674	9100	6654
Service	47718	167157	247988	116320	78023
Public Admin	-12710	-32020	-48218	-25931	-13306
Competitive Share					
Industry/Region	Atlantic	Quebec	Ontario	Prairie	B.C.
Agriculture	-2024	-6618	-3880	19547	-7025
Other Primary	2088	-801	-8223	5353	1583
Manufacturing	-1225	41483	-91079	21953	28868
Construction	-6791	-10913	-24523	136	42091
TCOU	-3964	-15540	15977	-6747	10274
Trade	129	-2714	-23179	-33190	58954
"Fin. Insur, & R.Est."	1740	-14557	28605	-23996	8208
Service	-4827	-111883	49445	-26263	93528
Public Admin	2809	7165	-2958	-25611	18595

**Table 5.** The Competitive Share by Age Category for the Period 1986-1995

Industry/Age Cohort	Youth	Adult	Elder
Agriculture	-14492	3471	11021
Other Primary	-12086	13029	-943
Manufacturing	-155892	187548	-31656
Construction	-43381	45302	-1921
TCOU	-50234	77351	-27117
Trade	-131488	167444	-35956
"Fin. Insur, & R.Est."	-73547	83913	-10366
Service	-311007	369783	-58776
Public Admin	-57684	82410	-24726

**Table 6.** The Competitive Share by Gender for the Period 1986-1995

Industry/Gender	Male	Female
Agriculture	-13302	13302
Other Primary	-4199	4199
Manufacturing	-16325	16325
Construction	-2643	2643
TCOU	-30411	30411
Trade	-36068	36068
"Fin. Insur, & R.Est."	5524	-5524
Service	-30512	30512
Public Admin	-41878	41878

While results are found to be significant in terms of actual changes, our work has little to say concerning desired changes. For example, much of the relative decline in youth and older workers is the result of changes in participation rates rather than changes in employment opportunities. Whether such changes in participation rates are desirable, representing investment in human capital by youths, or increased consumption of leisure by older individuals, or the results of undesired discouraged-worker effects, we cannot say.

The industry-mix effects are clear and not overly surprising, with agriculture, other primary, manufacturing, utilities, and public administration exhibiting weakness in the period and with construction, the finance, real estate and insurance, and service sectors showing growth.

Such results, especially when extended to more disaggregate data, provide the basis for labour train-

ing policies. Further, when considering the competitive share effects, especially when disaggregated for specific age-sex cohort impacts, we note some major differences across the various regions. This implies that labour-market policies might be best addressed at a relatively localized and disaggregated level.

The simple extension to the traditional shift-share model suggested by this paper could easily be applied to forecasting following the same procedure as used by Ireland and Moomaw (1981) for Oklahoma, and by Andrikopoulos, Brox and Carvalho (1990) for the Canadian provinces of Ontario and Quebec. Also, as suggested by Loveridge and Selting (1998), the effects of policy changes on specific age-sex cohorts could be analysed by looking at the age-sex specific competitive-share components in regions following a particular policy, e.g., changing the regulations concerning mandatory retirement or changing youth minimum wage laws, relative to similar effects in other regions.

**Table 7.** Labour Force Adjusted Competitive Shares

Youth (Ages 15-24)										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	-601	201	1753	2588	1334	2612	7421	3099	-805	-120
Other Primary	357	6	717	335	-379	-15	1665	-211	11	176
Manufacturing	-296	-1076	4332	-4103	-11045	-17596	3313	-685	2502	-1430
Construction	-1895	39	-1785	-842	-7973	549	-250	-116	5566	922
TCOU	-1132	-54	-417	-702	-633	1346	-5134	-2840	-3099	-989
Trade	5118	-3117	1278	2003	1432	1649	2690	6366	4750	14813
"Fin. Insur. & R.Est."	421	-1726	-3058	-11861	1291	-8711	-1290	-7410	-235	-2804
Service	5367	-2713	-1883	-53879	14622	-17597	6806	-3161	6839	-12410
Public Admin	567	-996	3013	-3859	23	-8478	-4080	-4389	-1738	997

  

Adults (Ages 25-54)										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	-101	503	-3268	-2170	1866	-8665	-30872	7902	-3563	-5425
Other Primary	2617	1382	-1603	745	-7554	-2242	908	4903	-4320	-850
Manufacturing	8060	-3394	47056	14961	-55371	-33586	25147	12094	1543	5327
Construction	-3231	409	-475	-2720	-15326	-4507	-3083	1084	22551	2223
TCOU	-669	821	-12742	2657	1425	3895	17707	11529	538	-789
Trade	2431	-3035	7393	-2143	27690	-33674	-54072	199915	3311	5678
"Fin. Insur. & R.Est."	480	247	2198	-1845	13155	7342	14510	5602	2010	-6681
Service	-787	-10302	-28574	-59900	33546	-1050	59713	65846	16137	1937
Public Admin	67	5036	-6131	9946	-8185	8145	4493	11844	-373	5557

  

Older Workers (Ages 55+)										
Industry/Region	Atlantic:		Quebec:		Ontario:		Prairie:		B.C.:	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Agriculture	-72	320	-570	444	3026	1734	14964	7969	-779	-725
Other Primary	576	137	1219	148	16	248	625	-4	860	-473
Manufacturing	-787	-42	-1517	3190	-201	2194	887	446	-151	228
Construction	1042	-40	1958	-737	3243	744	335	6	2370	-61
TCOU	-740	-143	88	-1205	-3028	-1626	-1314	-390	-1771	-589
Trade	352	204	2902	-6838	-2630	-1060	-1339	-3422	3307	-1952
"Fin. Insur. & R.Est."	816	274	1076	-1463	318	-934	-1864	401	38	-297
Service	559	-2775	-5997	-3995	6175	-12178	-526	-5721	3299	2602
Public Admin	-1153	-103	1288	1564	-5656	-1365	-2985	-1583	-863	-603

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