

Jobs in an era of automation

Technology is all around us, from the smartphone in your pocket to the driverless vehicle you might soon come across on your way to work. Driven by increased digitization, artificial intelligence, advanced robotics and countless other innovations, technology has become more capable than ever before, and we're only scratching the surface of what is possible.

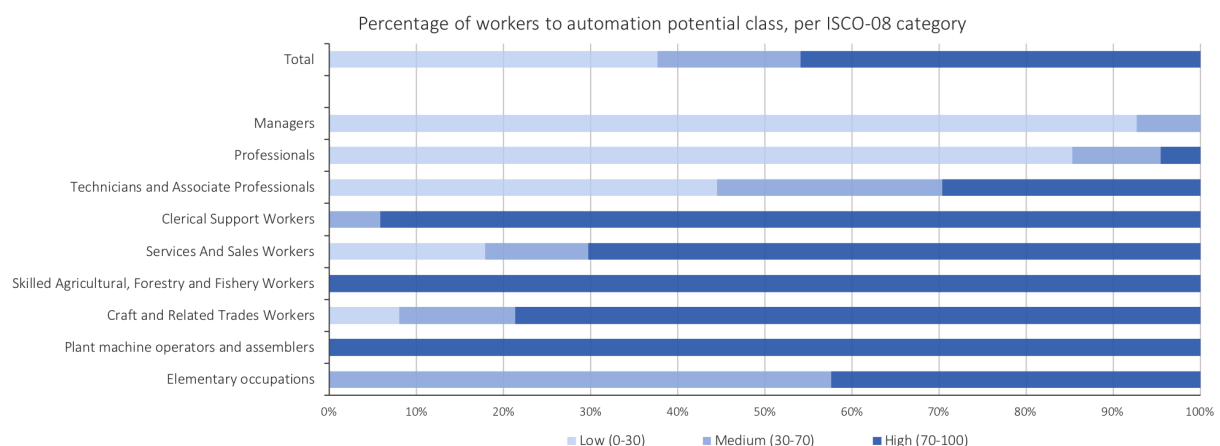
In the wake of rapid technological progress, the Fourth Industrial Revolution is bound to transform the world in which we live and work. While automation promises to generate tremendous value, it comes with challenges and questions about its impact on jobs, skills and the relevance of the human worker. This research explores these questions, discussing the potential for automation of occupations and industries in Belgium and the skills of the future.

Technical side note

We introduce the first model that quantifies the impact of modern technology on the Belgian labor market. It is based on a one-of-a-kind dataset of detailed profiles of all Belgian occupations, compiled specifically for the purpose of this thesis. Each occupation is scored on a set of variables (e.g. dexterity, creativity, etc.). Additionally, these profiles include information on wages, education, number of workers, etc. Using a bagged tree model, we quantified the potential for automation of Belgian occupations. Furthermore, we determined what features most significantly influence automation potential using advanced statistical methods.

Automation and the Belgian labor market

Many of the tasks that workers carry out today could be performed better and more cheaply by automation technologies. Just under half (47%) of all Belgian workers are employed in occupations with a high potential for automation.



Occupations that are routine, consist largely of basic cognitive skills or have a significant physical component, such as clerical support workers or plant machine operators, are most susceptible to automation. These 2 classes alone represent over 700.000 jobs that could potentially be automated, over 15% of the Belgian labor force. Perhaps more surprisingly, a

considerable share of service occupations, which experienced substantial job growth over the past decades, have a high automation potential.

Automation will have a lesser effect on jobs involving elaborate people skills and creativity, such as managers or graphic designers. They will likely see themselves complemented by technology. These findings are supported by a downward trend in employment in high-risk occupational groups (e.g. a 10% decrease in clerical workers since 2013), while the number of jobs in low-automation potential occupations increased by roughly 5% over the same period.

Overall, over 50% of jobs in Belgium in their present form could potentially be automated using current technology. The following table summarizes these results:

	# of occupations per category	# of workers	Share of workforce	Automation potential of occupations	Automation potential of workers	Potential jobs lost
Managers	28	380.296	8,3%	3,7 %	4,97 %	18.908
Professionals	90	1.089.460	24%	18,5 %	15,18 %	165.376
Technicians and associate professionals	82	623.253	13,7%	50,4%	46,61%	290.473
Clerical support workers	28	504.019	11,1%	88,3 %	91,45%	460.933
Services and sales workers	37	609.066	13,4%	66,1 %	68,33%	416.201
Skilled agricultural, forestry and fishery workers	13	57.774	1,2%	85,3 %	87,32%	50.448
Craft and related trades workers	64	485.924	10,7%	78,8 %	78,14%	379.706
Plant machine operators and assemblers	37	308.691	6,7%	92 %	92,85%	286.634
Elementary occupations	29	481.500	10,6%	82 %	64,61%	311.102
Total/average	408	4.539.983	100%	55,8%	52,4%	2.379.781

It's important to note that these findings are representative of occupations as they are currently defined. A changing task composition within existing occupations could affect these results, as occupations adapt to automation and workers focus on skills that machines cannot adequately provide.

Shifting skill requirements

As new automation technologies are introduced to the workplace, some occupations will decline, some will grow, but all will change to some extent. Workers will spend more time on those tasks that technology is not yet capable of, and demand for workforce skills will shift. Over 40% of skills required today are set to change substantially over the next 5 years.

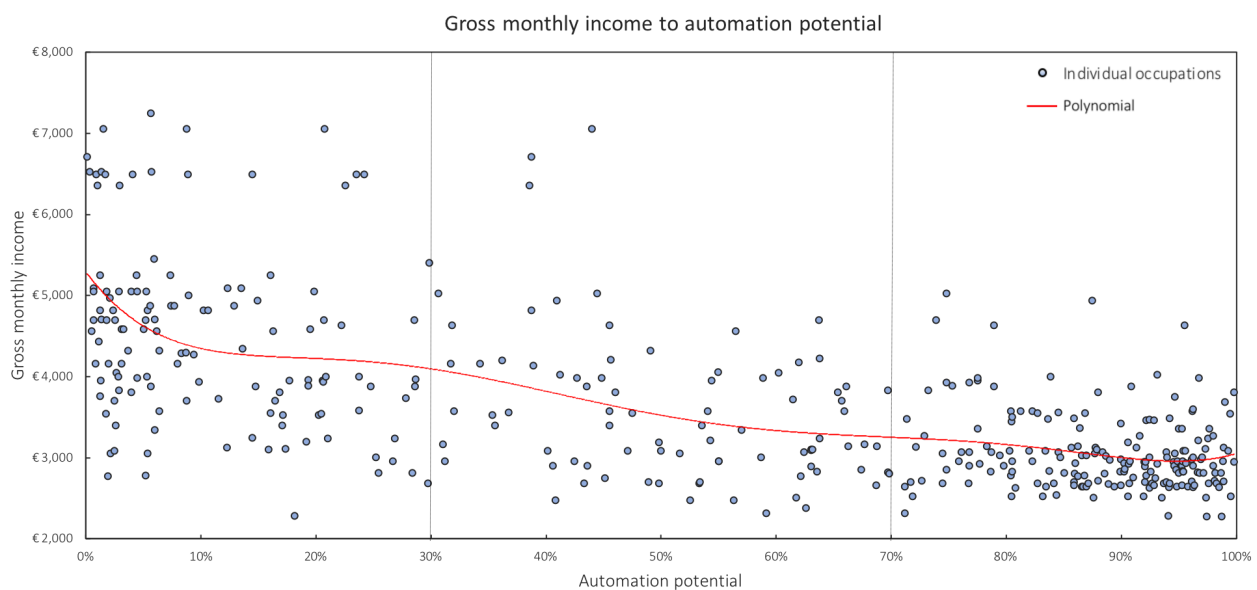
Our research shows that physical and manual-, along with basic cognitive and technical skills are associated with a high automation potential, as technology has largely matched or surpassed their human counterparts in this field. Demand for these skills will stagnate, and eventually decline.

It are the inherently human skills such as social- and emotional intelligence, creativity and communication that remain the hardest to automate. The single most significant factor to automation potential was found to be originality; *the ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem*. These types of skills, along with the advanced technical skills that complement automation technologies, will be the core of value offered by the workforce and will experience a strong growth in demand. Occupations leveraging these skills (e.g. managers, psychologists) generally have a low potential for automation and are likely to experience positive net occupational growth.

Ensuring that workers have the right skills and support to transition towards new jobs might prove to be the central challenge of Fourth Industrial Revolution. Workers will need to adapt continuously. Should they fail to do so, unemployment can be expected to increase, and we might fail to capture the full benefit of automation.

Income and education

The model provides evidence that wages and educational attainment have a strong negative correlation to potential for automation. The oncoming wave of automation will thus favor



highly skilled workers in currently high-wage positions, displacing workers on the other end of the distribution. This is in sharp contrast to the Computer Revolution of the 20th century, where automation most heavily impacted medium-income/skill jobs. The bias towards highly skilled workers suggests a discontinuity with this trend and an end to job polarization. More and more, companies will compete to attract and retain agile, highly skilled workers. Low-skill workers will experience stagnating or falling wages and employment opportunities, and will be forced to acquire the necessary skills to reallocate towards jobs that are less susceptible to automation.

So, what's the score?

While the technical potential for automation is considerable and will inevitably increase as technology advances, technological possibility is no guarantee for technological reality. The adoption of new technologies and the pace and extent to which these technologies will complement or replace human labor, depend on a variety of factors, such as the relative cost and benefits of automation and human labor, the availability of skills on the labor market and regulatory & social acceptance.

Nevertheless, the impact of the Fourth Industrial Revolution will be significant, and it will fundamentally alter the nature of work and the workplace itself. Both businesses and workers will have to adapt, if they are to thrive in a rapidly changing, technology-driven world.

Additional attachments

Resultaten ter illustratie, behoren niet tot het ingezonden artikel.

#	ISCO-08 Code	ISCO-08 Title EN	Number of workers	Automation potential	Potential jobs lost
1	8321	Motorcycle drivers	129	0,998	129
2	9331	Hand and pedal vehicle drivers	221	0,998	221
3	4321	Stock clerks	59.176	0,995	58888
4	3331	Clearing and forwarding agents	3.822	0,994	3800
5	4415	Filing and copying clerks	1.548	0,993	1537
6	4412	Mail carriers and sorting clerks	18.116	0,990	17940
7	9623	Meter readers and vending-machine collectors	1.362	0,989	1347
8	7511	Butchers, fishmongers and related food preparers	21.035	0,989	20799
9	4312	Statistical, finance and insurance clerks	40.150	0,988	39679
10	7513	Dairy-products makers	354	0,987	350
11	9621	Messengers, package deliverers and luggage porters	3.795	0,987	3744
12	7516	Tobacco preparers and tobacco products makers	272	0,985	268
13	7315	Glass makers, cutters, grinders and finishers	296	0,983	291
14	8212	Electrical and electronic equipment assemblers	6.354	0,982	6239
15	4311	Accounting and bookkeeping clerks	32.947	0,981	32316
16	4211	Bank tellers and related clerks	8.452	0,980	8284
17	3344	Medical secretaries	13.443	0,980	13173
18	9329	Manufacturing labourers not elsewhere classified	3.569	0,977	3486
19	8322	Car, taxi and van drivers	32.232	0,976	31456
20	8183	Packing, bottling and labelling machine operators	18.585	0,975	18129
21	4132	Data entry clerks	1.406	0,974	1370
22	5230	Cashiers and ticket clerks	29.951	0,974	29159
23	8122	Metal finishing, plating and coating machine	2.229	0,973	2169
24	8143	Paper products machine operators	1.739	0,971	1689
25	7231	Motor vehicle mechanics and repairers	30.271	0,971	29379
26	8141	Rubber products machine operators	2.834	0,969	2747
27	8181	Glass and ceramics plant operators	3.069	0,968	2970
28	3313	Accounting associate professionals	31.386	0,967	30357
29	7543	Product graders and testers (excluding foods and	9.123	0,967	8820
30	8112	Mineral and stone processing plant operators	519	0,966	502
31	4419	Clerical support workers not elsewhere classified	38.520	0,964	37121
32	4223	Telephone switchboard operators	2.955	0,963	2844
33	4222	Contact centre information clerks	8.413	0,962	8096
34	4313	Payroll clerks	7.487	0,962	7205
35	9411	Fast food preparers	9.865	0,962	9492
36	8171	Pulp and papermaking plant operators	2.861	0,962	2752
37	6330	Subsistence mixed crop and livestock farmers	6.393	0,961	6146
38	9213	Mixed crop and livestock farm labourers	2.287	0,961	2199
39	6130	Mixed crop and animal producers	7.012	0,958	6715
40	7224	Metal polishers, wheel grinders and tool sharpeners	1.541	0,956	1474
41	4411	Library clerks	3.548	0,956	3391
42	3135	Metal production process controllers	1.222	0,955	1167
43	7122	Floor layers and tile setters	7.685	0,954	7331
44	8154	Bleaching, dyeing and fabric cleaning machine	1.383	0,954	1319
45	7532	Garment and related pattern-makers and cutters	1.195	0,954	1140
46	4226	Receptionists (general)	21.752	0,953	20738
47	8189	Stationary plant and machine operators not	694	0,953	661

48	5245	Service station attendants	1.723	0,953	1642
49	7544	Fumigators and other pest and weed controllers	515	0,953	491
50	9129	Other cleaning workers	1.307	0,953	1245
51	8311	Locomotive engine drivers	5.824	0,952	5545
52	3315	Valuers and loss assessors	2.107	0,950	2002
53	7512	Bakers, pastry-cooks and confectionery makers	14.444	0,950	13720
54	8331	Bus and tram drivers	19.962	0,949	18939
55	7212	Welders and flamecutters	21.395	0,948	20285
56	8342	Earthmoving and related plant operators	9.003	0,948	8534
57	7211	Metal moulders and coremakers	515	0,947	488
58	6210	Forestry and related workers	1.865	0,946	1765
59	8121	Metal processing plant operators	11.198	0,946	10593
60	8343	Crane, hoist and related plant operators	11.312	0,945	10692
61	4227	Survey and market research interviewers	1.194	0,942	1125
62	3411	Legal and related associate professionals	12.786	0,942	12045
63	8157	Laundry machine operators	2.501	0,941	2354
64	4225	Enquiry clerks	2.811	0,941	2645
65	7515	Food and beverage tasters and graders	2.938	0,940	2761
66	8142	Plastic products machine operators	7.096	0,939	6665
67	8160	Food and related products machine operators	27.384	0,939	25711
68	8344	Lifting truck operators	21.139	0,937	19804
69	5249	Sales workers not elsewhere classified	332	0,935	310
70	7521	Wood treaters	46	0,932	43
71	3252	Medical records and health information technicians	99	0,931	92
72	7125	Glaziers	1.232	0,929	1145
73	8153	Sewing machine operators	1.693	0,929	1572
74	5120	Cooks	30.595	0,929	28408
75	7323	Print finishing and binding workers	586	0,927	543
76	9216	Fishery and aquaculture labourers	136	0,925	126
77	3342	Legal secretaries	3.727	0,925	3446
78	7223	Metal working machine tool setters and operators	13.733	0,925	12698
79	9313	Building construction labourers	4.438	0,924	4102
80	8156	Shoemaking and related machine operators	408	0,922	376
81	7221	Blacksmiths, hammersmiths and forging press	2.095	0,922	1931
82	8111	Miners and quarriers	706	0,921	650
83	7123	Plasterers	5.295	0,921	4874
84	4110	General office clerks	159.367	0,920	146678
85	8114	Cement, stone and other mineral products machine	3.059	0,920	2814
86	8131	Chemical products plant and machine operators	15.953	0,920	14669
87	7214	Structural-metal preparers and erectors	2.410	0,916	2208
88	5246	Food service counter attendants	5.012	0,913	4576
89	3213	Pharmaceutical technicians and assistants	7.992	0,910	7276
90	3343	Administrative and executive secretaries	38.335	0,909	34836
91	4221	Travel consultants and clerks	4.866	0,907	4416
92	7322	Printers	8.238	0,907	7473
93	8341	Mobile farm and forestry plant operators	1.728	0,906	1566
94	7316	Sign writers, decorative painters, engravers and	134	0,906	121
95	7523	Woodworking-machine tool setters and operators	2.006	0,906	1817
96	8151	Fibre preparing, spinning and winding machine	1.456	0,903	1315

97	4212	Bookmakers, croupiers and related gaming workers	883	0,903	797
98	8332	Heavy truck and lorry drivers	64.925	0,902	58580
99	9629	Elementary workers not elsewhere classified	1.727	0,900	1554
100	6320	Subsistence livestock farmers	277	0,900	249
101	9212	Livestock farm labourers	2.761	0,900	2484
102	4416	Personnel clerks	13.768	0,899	12379
103	9412	Kitchen helpers	30.707	0,894	27446
104	8172	Wood processing plant operators	1.677	0,890	1493
105	7233	Agricultural and industrial machinery mechanics and	35.285	0,889	31364
106	7533	Sewing, embroidery and related workers	2.551	0,887	2262
107	4131	Typists and word processing operators	425	0,886	376
108	7412	Electrical mechanics and fitters	19.577	0,884	17298
109	7124	Insulation workers	2.255	0,880	1984
110	7132	Spray painters and varnishers	4.603	0,880	4050
111	4413	Coding, proof-reading and related clerks	2.355	0,879	2070
112	3352	Government tax and excise officials	8.698	0,878	7634
113	6113	Gardeners, horticultural and nursery growers	20.988	0,877	18408
114	7126	Plumbers and pipe fitters	31.518	0,876	27598
115	5244	Contact centre salespersons	1.058	0,875	926
116	3321	Insurance representatives	17.182	0,871	14971
117	6310	Subsistence crop farmers	5.822	0,870	5064
118	9211	Crop farm labourers	4.604	0,870	4005
119	2411	Accountants	49.812	0,869	43270
120	7522	Cabinet-makers and related workers	5.979	0,868	5188
121	8211	Mechanical machinery assemblers	13.467	0,867	11676
122	5223	Shop sales assistants	150.225	0,866	130080
123	9334	Shelf fillers	18.512	0,866	16026
124	7311	Precision-instrument makers and repairers	2.911	0,864	2514
125	4414	Scribes and related workers	124	0,862	107
126	5162	Companions and valets	4.167	0,862	3592
127	6223	Deep-sea fishery workers	288	0,860	248
128	9622	Odd job persons	20.517	0,859	17633
129	5131	Waiters	36.420	0,859	31286
130	7112	Bricklayers and related workers	29.438	0,859	25277
131	8152	Weaving and knitting machine operators	3.287	0,859	2822
132	4229	Client information workers not elsewhere classified	5.263	0,856	4507
133	7422	Information and communications technology	10.157	0,850	8636
134	8113	Well drillers and borers and related workers	155	0,847	131
135	7131	Painters and related workers	13.432	0,845	11357
136	5212	Street food salespersons	1.416	0,845	1197
137	5112	Transport conductors	3.832	0,844	3232
138	4120	Secretaries (general)	36.320	0,841	30548
139	3251	Dental assistants and therapists	2.802	0,839	2350
140	7313	Jewellery and precious-metal workers	2.493	0,838	2088
141	5414	Security guards	23.897	0,836	19981
142	9214	Garden and horticultural labourers	16.453	0,834	13727
143	9312	Civil engineering labourers	7.586	0,834	6327
144	3324	Trade brokers	497	0,832	413
145	3134	Petroleum and natural gas refining plant operators	538	0,827	445

146	8132	Photographic products machine operators	944	0,827	781
147	9611	Garbage and recycling collectors	14.012	0,822	11524
148	9612	Refuse sorters	2.305	0,822	1896
149	7531	Tailors, dressmakers, furriers and hatters	750	0,820	615
150	3354	Government licensing officials	4.525	0,813	3677
151	7222	Toolmakers and related workers	2.935	0,808	2371
152	6111	Field crop and vegetable growers	4.938	0,805	3977
153	6112	Tree and shrub crop growers	1.087	0,805	875
154	6114	Mixed crop growers	330	0,805	266
155	7114	Concrete placers, concrete finishers and related	6.194	0,805	4985
156	5142	Beauticians and related workers	10.059	0,804	8091
157	7318	Handicraft workers in textile, leather and related	739	0,804	594
158	7536	Shoemakers and related workers	422	0,804	339
159	8219	Assemblers not elsewhere classified	5.674	0,803	4556
160	5111	Travel attendants and travel stewards	5.482	0,798	4374
161	7213	Sheet-metal workers	9.539	0,794	7576
162	3133	Chemical processing plant controllers	3.245	0,789	2561
163	3132	Incinerator and water treatment plant operators	1.562	0,789	1233
164	7234	Bicycle and related repairers	2.091	0,787	1646
165	7514	Fruit, vegetable and related preservers	1.093	0,786	859
166	3333	Employment agents and contractors	13.530	0,783	10598
167	7215	Riggers and cable splicers	1.672	0,777	1299
168	5211	Stall and market salespersons	3.289	0,775	2549
169	5243	Door to door salespersons	1.046	0,775	811
170	9520	Street vendors (excluding food)	483	0,775	374
171	6121	Livestock and dairy producers	7.301	0,768	5605
172	6122	Poultry producers	926	0,768	711
173	6129	Animal producers not elsewhere classified	547	0,768	420
174	8350	Ships' deck crews and related workers	1.625	0,767	1247
175	9311	Mining and quarrying labourers	195	0,761	148
176	7115	Carpenters and joiners	41.595	0,759	31550
177	3312	Credit and loans officers	7.822	0,753	5893
178	5153	Building caretakers	7.298	0,748	5459
179	9123	Window cleaners	2.428	0,748	1816
180	3257	Environmental and occupational health inspectors	4.877	0,748	3647
181	7314	Potters and related workers	218	0,745	162
182	4224	Hotel receptionists	3.037	0,745	2261
183	3240	Veterinary technicians and assistants	831	0,739	614
184	3359	Regulatory government associate professionals not	2.057	0,732	1506
185	5141	Hairdressers	27.083	0,729	19743
186	7421	Electronics mechanics and servicers	6.251	0,726	4540
187	7113	Stonemasons, stone cutters, splitters and carvers	2.096	0,721	1512
188	5321	Health care assistants	70.411	0,719	50590
189	8312	Railway brake, signal and switch operators	3.887	0,717	2786
190	7312	Musical instrument makers and tuners	296	0,714	211
191	9333	Freight handlers	54.933	0,712	39106
192	5312	Teachers' aides	14.786	0,712	10522
193	3433	Gallery, museum and library technicians	333	0,698	233
194	5132	Bartenders	7.773	0,697	5418

195	9321	Hand packers	13.272	0,697	9249
196	5329	Personal care workers in health services not	510	0,688	351
197	5113	Travel guides	1.716	0,687	1179
198	7119	Building frame and related trades workers not	3.704	0,677	2507
199	7121	Roofers	15.871	0,674	10695
200	3112	Civil engineering technicians	4.420	0,663	2930
201	3314	Statistical, mathematical and related associates	544	0,661	359
202	2651	Visual artists	3.875	0,659	2555
203	2431	Advertising and marketing professionals	14.066	0,657	9241
204	3435	Other artistic and cultural associate professionals	3.463	0,653	2263
205	5164	Pet groomers and animal care workers	3.782	0,638	2412
206	3254	Dispensing opticians	2.220	0,637	1415
207	3111	Chemical and physical science technicians	6.682	0,637	4259
208	5242	Sales demonstrators	680	0,635	432
209	3118	Draughtspersons	11.989	0,631	7569
210	7317	Handicraft workers in wood, basketry and related	152	0,631	96
211	7319	Handicraft workers not elsewhere classified	106	0,631	67
212	7535	Pelt dressers, tanners and fellmongers	106	0,631	67
213	9215	Forestry labourers	654	0,626	409
214	9112	Cleaners and helpers in offices, hotels and other	130.984	0,624	81763
215	9121	Hand launderers and pressers	6.609	0,621	4107
216	3255	Physiotherapy technicians and assistants	1.099	0,620	681
217	7534	Upholsterers and related workers	530	0,618	327
218	3113	Electrical engineering technicians	4.895	0,615	3009
219	2641	Authors and related writers	1.868	0,602	1125
220	4322	Production clerks	3.498	0,592	2069
221	9122	Vehicle cleaners	3.549	0,589	2089
222	7411	Building and related electricians	37.449	0,587	21980
223	2412	Financial and investment advisers	12.590	0,570	7177
224	3256	Medical assistants	2.511	0,565	1418
225	5322	Home-based personal care workers	33.902	0,563	19088
226	2354	Other music teachers	2.169	0,550	1193
227	5165	Driving instructors	2.496	0,550	1372
228	2514	Applications programmers	6.782	0,549	3725
229	3131	Power production plant operators	1.548	0,544	842
230	2655	Actors	1.373	0,543	745
231	3311	Securities and finance dealers and brokers	889	0,540	480
232	5163	Undertakers and embalmers	2.828	0,535	1514
233	5419	Protective services workers not elsewhere classified	3.178	0,534	1696
234	3322	Commercial sales representatives	30.987	0,533	16518
235	2656	Announcers on radio, television and other media	58	0,525	30
236	3117	Mining and metallurgical technicians	928	0,516	479
237	3142	Agricultural technicians	784	0,500	392
238	3353	Government social benefits officials	2.706	0,498	1348
239	3139	Process control technicians not elsewhere classified	1.728	0,498	860
240	3141	Life science technicians (excluding medical)	3.389	0,491	1663
241	5413	Prison guards	7.599	0,489	3714
242	3212	Medical and pathology laboratory technicians	8.809	0,475	4182
243	2642	Journalists	8.974	0,471	4228

244	3521	Broadcasting and audio-visual technicians	6.366	0,460	2928
245	2619	Legal professionals not elsewhere classified	19.486	0,456	8892
246	3114	Electronics engineering technicians	5.786	0,455	2634
247	3155	Air traffic safety electronics technicians	173	0,455	79
248	3522	Telecommunications engineering technicians	1.411	0,455	642
249	4323	Transport clerks	24.874	0,451	11222
250	5151	Cleaning and housekeeping supervisors in offices,	7.177	0,448	3218
251	3151	Ships' engineers	444	0,445	197
252	2413	Financial analysts	8.509	0,440	3741
253	7232	Aircraft engine mechanics and repairers	1.605	0,436	699
254	3512	Information and communications technology user	6.685	0,435	2911
255	3513	Computer network and systems technicians	1.926	0,433	834
256	3423	Fitness and recreation instructors and program	2.731	0,427	1165
257	4214	Debt-collectors and related workers	764	0,424	324
258	3211	Medical imaging and therapeutic equipment	3.556	0,412	1466
259	3334	Real estate agents and property managers	14.265	0,409	5841
260	2433	Technical and medical sales professionals (excluding	14.663	0,408	5983
261	7127	Air conditioning and refrigeration mechanics	4.302	0,406	1745
262	5169	Personal services workers not elsewhere classified	317	0,401	127
263	2513	Web and multimedia developers	6.626	0,389	2578
264	3115	Mechanical engineering technicians	12.268	0,387	4752
265	2355	Other arts teachers	1.971	0,387	763
266	2353	Other language teachers	1.570	0,386	605
267	3259	Health associate professionals not elsewhere	2.075	0,368	763
268	2230	Traditional and complementary medicine	381	0,362	138
269	9111	Domestic cleaners and helpers	122.229	0,356	43458
270	3511	Information and communications technology	4.465	0,353	1576
271	3153	Aircraft pilots and related associate professionals	2.361	0,343	809
272	3214	Medical and dental prosthetic technicians	4.007	0,320	1282
273	2612	Judges	3.545	0,318	1127
274	1412	Restaurant managers	27.761	0,317	8805
275	7541	Underwater divers	133	0,312	41
276	3119	Physical and engineering science technicians not	6.660	0,310	2065
277	2120	Mathematicians, actuaries and statisticians	1.677	0,306	514
278	2112	Meteorologists	205	0,299	61
279	7321	Pre-press technicians	1.476	0,297	439
280	2521	Database designers and administrators	5.669	0,287	1625
281	3154	Air traffic controllers	2.280	0,286	652
282	2165	Cartographers and surveyors	3.507	0,285	1000
283	7413	Electrical line installers and repairers	3.307	0,284	938
284	2522	Systems administrators	3.697	0,278	1029
285	3152	Ships' deck officers and pilots	2.844	0,268	763
286	5311	Child care workers	46.304	0,267	12349
287	7542	Shotfirers and blasters	136	0,254	35
288	3431	Photographers	5.148	0,252	1299
289	2434	Information and communications technology sales	4.562	0,248	1129
290	2267	Optometrists and ophthalmic opticians	118	0,242	29
291	3339	Business services agents not elsewhere classified	2.640	0,238	627
292	2512	Software developers	30.179	0,237	7155

293	2152	Electronics engineers	7.320	0,235	1721
294	2153	Telecommunications engineers	2.371	0,225	534
295	3221	Nursing associate professionals	45.036	0,222	10011
296	3143	Forestry technicians	228	0,210	48
297	3323	Buyers	9.699	0,208	2021
298	2266	Audiologists and speech therapists	9.860	0,207	2044
299	2631	Economists	2.091	0,207	433
300	2622	Librarians and related information professionals	4.485	0,206	924
301	3422	Sports coaches, instructors and officials	5.642	0,206	1161
302	3116	Chemical engineering technicians	10.699	0,205	2189
303	3514	Web technicians	2.425	0,202	490
304	2113	Chemists	2.579	0,199	512
305	2519	Software and applications developers and analysts	1.959	0,195	382
306	2262	Pharmacists	15.463	0,193	2991
307	2653	Dancers and choreographers	379	0,193	73
308	2529	Database and network professionals not elsewhere	2.334	0,191	447
309	3421	Athletes and sports players	957	0,181	173
310	5412	Police officers	12.477	0,177	2206
311	3258	Ambulance workers	1.507	0,173	261
312	5411	Fire-fighters	7.138	0,171	1220
313	3123	Construction supervisors	38.909	0,170	6633
314	5222	Shop supervisors	11.863	0,168	1995
315	2250	Veterinarians	7.790	0,164	1279
316	3412	Social work associate professionals	41.112	0,163	6687
317	3222	Midwifery associate professionals	334	0,160	54
318	3230	Traditional and complementary medicine associate	148	0,160	24
319	3432	Interior designers and decorators	5.314	0,159	843
320	3355	Police inspectors and detectives	22.954	0,149	3415
321	3122	Manufacturing supervisors	28.691	0,147	4224
322	2511	Systems analysts	38.345	0,144	5540
323	2633	Philosophers, historians and political scientists	1.796	0,144	259
324	2643	Translators, interpreters and other linguists	8.947	0,136	1215
325	2146	Mining engineers, metallurgists and related	50	0,135	7
326	2342	Early childhood educators	36.733	0,129	4727
327	2359	Teaching professionals not elsewhere classified	9.636	0,123	1184
328	3341	Office supervisors	31.248	0,122	3821
329	2166	Graphic and multimedia designers	12.156	0,115	1398
330	2310	University and higher education teachers	23.688	0,106	2511
331	2652	Musicians, singers and composers	5.106	0,102	521
332	2654	Film, stage and related directors and producers	6.433	0,098	630
333	2422	Policy administration professionals	24.097	0,094	2260
334	2432	Public relations professionals	8.087	0,089	721
335	2222	Midwifery professionals	5.828	0,089	517
336	2133	Environmental protection professionals	4.899	0,088	429
337	2145	Chemical engineers	3.934	0,088	344
338	2114	Geologists and geophysicists	1.035	0,087	90
339	1212	Human resource managers	23.265	0,083	1933
340	2141	Industrial and production engineers	15.201	0,080	1208
341	2523	Computer network professionals	7.362	0,077	565

342	1342	Health services managers	5.070	0,074	373
343	2149	Engineering professionals not elsewhere classified	3.275	0,073	240
344	2163	Product and garment designers	4.930	0,063	313
345	3253	Community health workers	147	0,063	9
346	2264	Physiotherapists	23.608	0,061	1443
347	1411	Hotel managers	3.662	0,060	218
348	2111	Physicists and astronomers	2.308	0,060	137
349	2632	Sociologists, anthropologists and related	3.022	0,059	178
350	1211	Finance managers	17.004	0,057	971
351	3351	Customs and border inspectors	3.639	0,057	206
352	2151	Electrical engineers	5.544	0,056	311
353	2144	Mechanical engineers	6.210	0,056	347
354	2634	Psychologists	18.843	0,053	1005
355	2143	Environmental engineers	1.173	0,053	62
356	1341	Child care services managers	2.989	0,053	158
357	2164	Town and traffic planners	3.093	0,052	162
358	1323	Construction managers	19.363	0,052	1006
359	7111	House builders	33.603	0,052	1745
360	2611	Lawyers	17.945	0,050	896
361	1330	Information and communications technology service	17.021	0,048	812
362	1420	Retail and wholesale trade managers	24.810	0,044	1098
363	5221	Shop keepers	31.244	0,044	1383
364	2341	Primary school teachers	63.435	0,044	2771
365	2320	Vocational education teachers	33.884	0,040	1362
366	2211	Generalist medical practitioners	16.167	0,039	635
367	2263	Environmental and occupational health and hygiene	9.541	0,039	373
368	2621	Archivists and curators	1.463	0,036	53
369	2423	Personnel and careers professionals	10.467	0,032	340
370	1431	Sports, recreation and cultural centre managers	5.775	0,031	178
371	2330	Secondary education teachers	95.697	0,031	2951
372	2221	Nursing professionals	86.132	0,029	2504
373	1311	Agricultural and forestry production managers	1.124	0,029	32
374	2142	Civil engineers	14.323	0,028	408
375	2421	Management and organization analysts	23.501	0,028	653
376	2131	Biologists, botanists, zoologists and related	8.023	0,027	213
377	1343	Aged care services managers	3.073	0,026	79
378	2265	Dieticians and nutritionists	3.434	0,025	86
379	2161	Building architects	19.092	0,025	472
380	3434	Chefs	6.912	0,025	170
381	2132	Farming, forestry and fisheries advisers	3.353	0,024	79
382	2635	Social work and counselling professionals	48.836	0,021	1048
383	2162	Landscape architects	1.836	0,021	38
384	1120	Managing directors and chief executives	65.901	0,020	1298
385	2352	Special needs teachers	24.115	0,019	464
386	1346	Financial and insurance services branch managers	10.575	0,018	190
387	1221	Sales and marketing managers	50.476	0,018	889
388	3332	Conference and event planners	6.552	0,017	112
389	1222	Advertising and public relations managers	11.745	0,017	194
390	2212	Specialist medical practitioners	21.442	0,015	320

391	1223	Research and development managers	5.762	0,014	78
392	2269	Health professionals not elsewhere classified	13.399	0,013	181
393	2261	Dentists	4.556	0,013	58
394	1213	Policy and planning managers	9.414	0,012	114
395	1322	Mining managers	162	0,012	2
396	1349	Professional services managers not elsewhere	4.928	0,012	60
397	1439	Services managers not elsewhere classified	3.042	0,012	37
398	2351	Education methods specialists	6.886	0,011	75
399	1219	Business services and administration managers not	9.048	0,010	90
400	1112	Senior government officials	9.148	0,009	79
401	1321	Manufacturing managers	10.969	0,008	88
402	1345	Education managers	13.592	0,006	87
403	2356	Information technology trainers	1.956	0,006	12
404	2424	Training and staff development professionals	7.649	0,006	48
405	2636	Religious professionals	2.426	0,005	11
406	1344	Social welfare managers	3.288	0,003	11
407	1114	Senior officials of special-interest organizations	1.186	0,002	3
408	1324	Supply, distribution and related managers	20.143	0,001	23