



Mapping Australian workforce change

October 2018: Analytical summary

Executive Summary: Changing tasks & Changing jobs (I/II)

Overall context and findings

This report seeks to understand **change within the Australian labour market** and the workers who are most affected.

- Advances in technology, globalisation and business processes are changing the way we work. The report focusses on two types of change: (1) **change in tasks** which involve workers changing the way they do their jobs; and (2) **change in jobs** which involve workers moving involuntarily from one job to another or ceasing to be employed.
- We find a modest but interesting negative relationship between these two types of change, i.e. parts of the labour market which experience **faster change in tasks are less likely to experience higher rates of job loss**.
- The potential implication of this finding is that **by adapting jobs to new technologies and new processes**, businesses and workers may be able to **increase job security**.

Change in tasks

The tasks within Australian jobs are changing as advances in technology, globalisation and business processes create new tasks for humans and cause other tasks to be able to be performed by increasingly capable machines.

- These ‘task-level’ changes have, over time, caused us to spend **less time on routine and manual tasks** (which are now being performed by machines) and **more time on interpersonal, creative and decision-making tasks**.
- On average, Australian jobs have experienced a **9.3% change in tasks** over the last 5 years. This change is a combination of **new tasks in our jobs** (0.9% contribution to the total task change) and a **reallocation of workers’ time across existing tasks** (8.4%).
- **Higher skill occupations** (10.9%), **middle aged workers** (9.5%) and **urban workers** (9.4%) are also experiencing greater task change

Note: The base data used to assess task change comes from the task information contained in the O*NET Program, which is the United States’ primary source of occupational information. The US occupations have been aligned as far as possible to Australian ones, and the task change is assumed to be consistent.

Executive Summary: Changing tasks & Changing jobs (II/II)

Change in jobs

Changes in the labour market may also cause some Australian workers to move jobs. This report focusses on **involuntarily job change** which results from retrenchment, redundancy, dismissal and business failure:

- Each year, there are about **330,000 involuntary transitions** (out of 2.1m total transitions). The percentage of the labour force experiencing involuntary transitions **has declined over last two decades but been stable over last 5 years**
- On average, Australian workers have had a **10% incidence** of experiencing an involuntary transition over a five year period
- Industry characteristics play a significant role in determining the incidence of involuntary transition with **construction** (23%), **mining** (19%) and **utilities** (17%) industries having significantly higher incidence of involuntary transition while **education** (5%), **healthcare** (5%) and **public administration** (5%) having lower incidence
- **Regionally based workers** (12%), **low-skilled workers** (13%), **males** (14%) and **younger workers** (13%) also have had lower incidence of involuntary transition. When you put all factors together, the incidence rises to >20%

Labour market change involves changing 'jobs' & changing 'tasks'



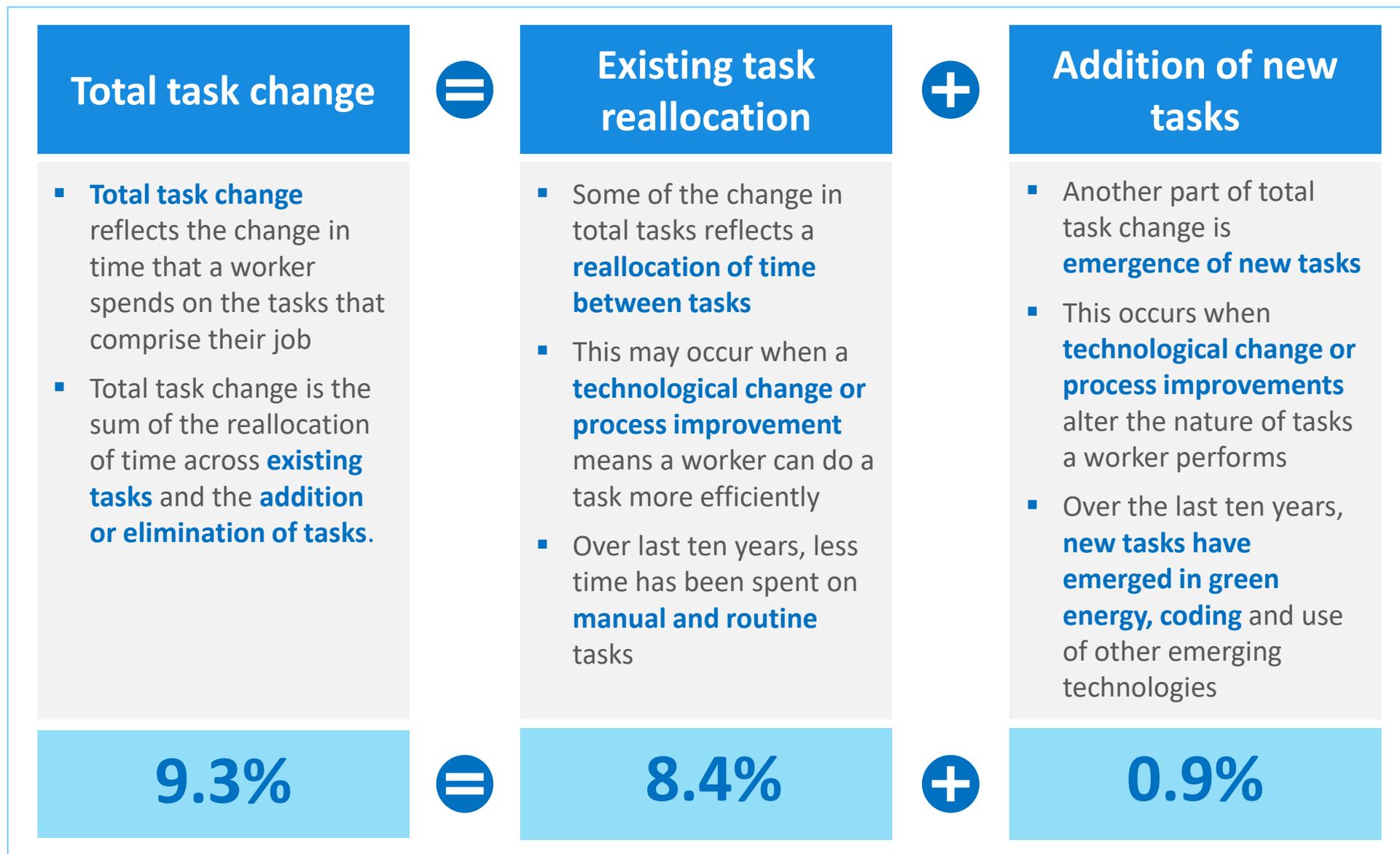
Agenda

- **How are ‘tasks’ changing within Australian jobs & which workers are most affected?**
- How are ‘jobs’ changing & who is at risk of job loss?
- What is the relationship between ‘task’ change and ‘job’ change?
- Appendix

Key findings on task change within jobs

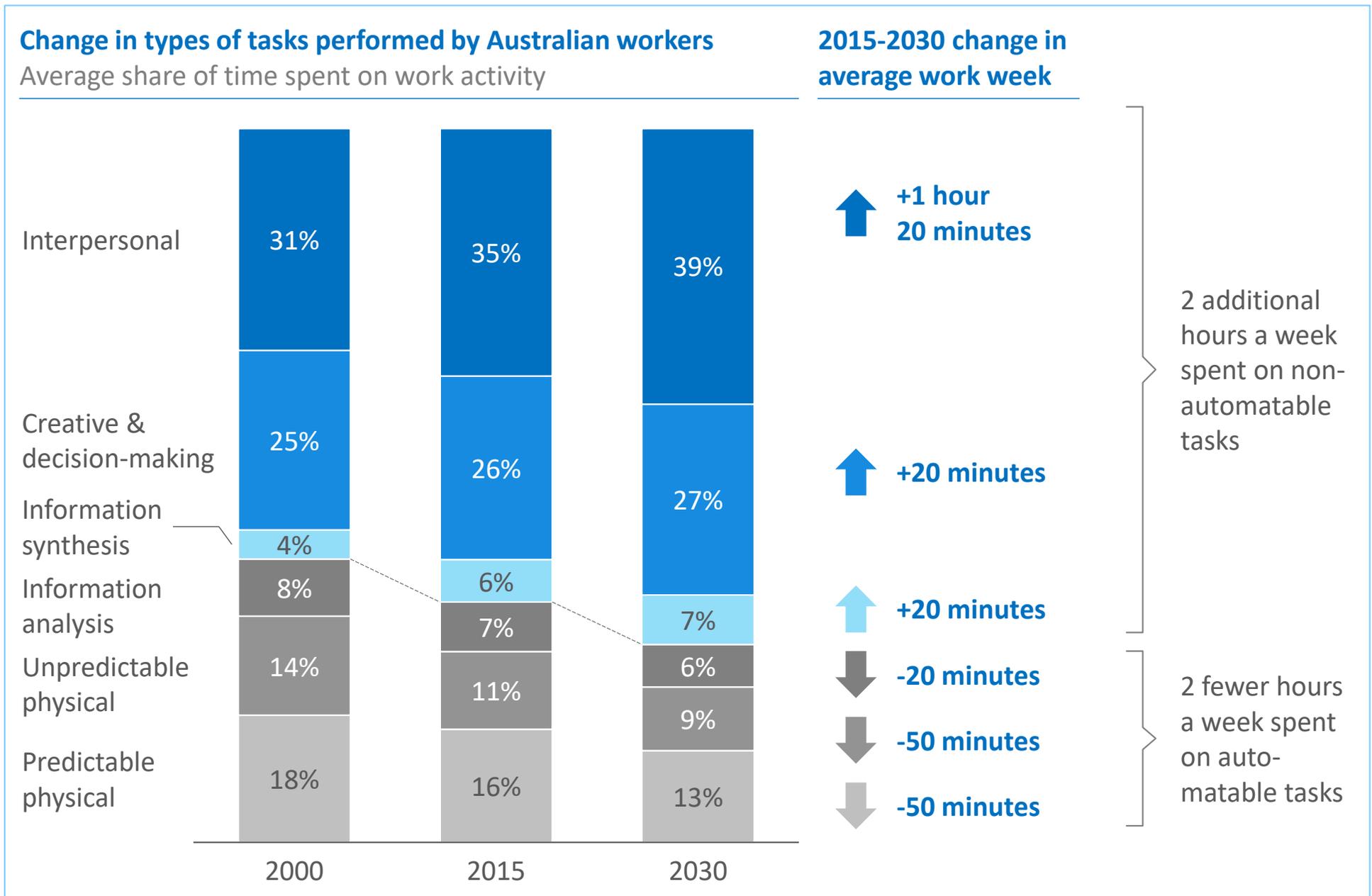
- Advances in **technology, globalisation and business process improvement** are changing the way we work. Some of this change results in workers losing jobs and gaining new jobs, but the broadest impact of the change is on how we do existing jobs, i.e. it changes the tasks within each of our jobs
- These ‘task-level’ changes within our jobs have, over time, caused us to spend **less time on routine and manual tasks** (which are being performed by machines) and **more time on interpersonal, creative and decision-making tasks**
- On average, Australian jobs have experienced a **9.3% change in tasks** over the last 5 years. This change is a combination of **new tasks in our jobs** (0.9% contribution to the total task change) and a **reallocation of workers’ time across existing tasks** (8.4%)
- **Lower skill jobs** (8.0%) have experienced slower growth in new tasks and slower change in existing tasks than **higher skilled jobs** (10.9%)
- **Males** (9.9%), **middle aged workers** (9.5%) and **urban workers** (9.4%) are experiencing somewhat greater task change than the average

Task change involves reallocation of time between existing tasks and the addition of new tasks



Note: The base data used to assess task change comes from the task information contained in the O*NET Program, which is the United States' primary source of occupational information. The US occupations have been aligned as far as possible to Australian ones, and the task change is assumed to be consistent.

Automatable tasks are being performed by machines; leaving workers to focus on interpersonal, creative and decision-making tasks

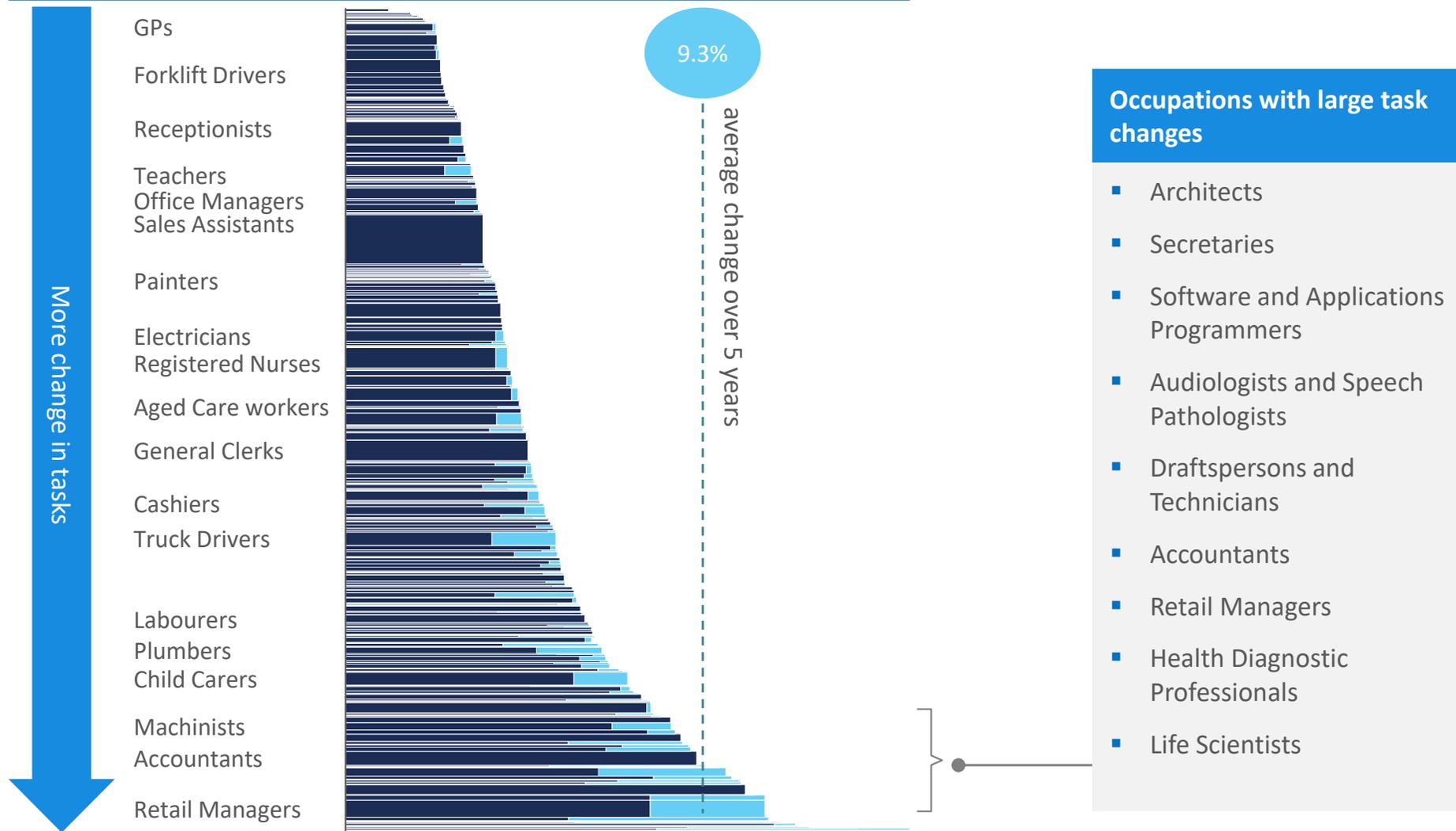


On average, occupations have changed tasks by around 9.3% over 5 years

Task change by occupation

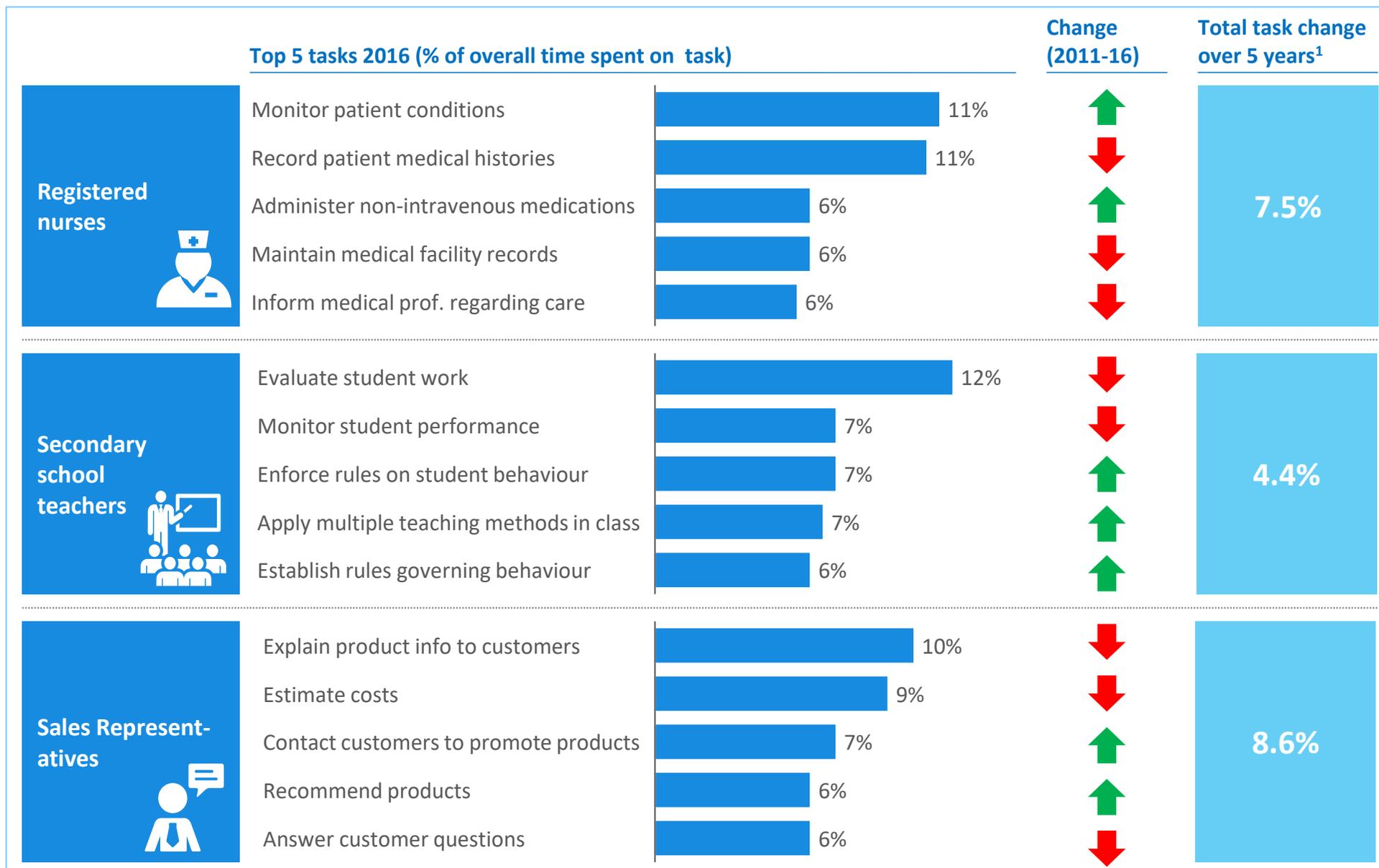
% change in tasks over 5 years, width of bar is # of workers in 2016

Existing tasks: change in time allocation
New tasks: change in time allocation



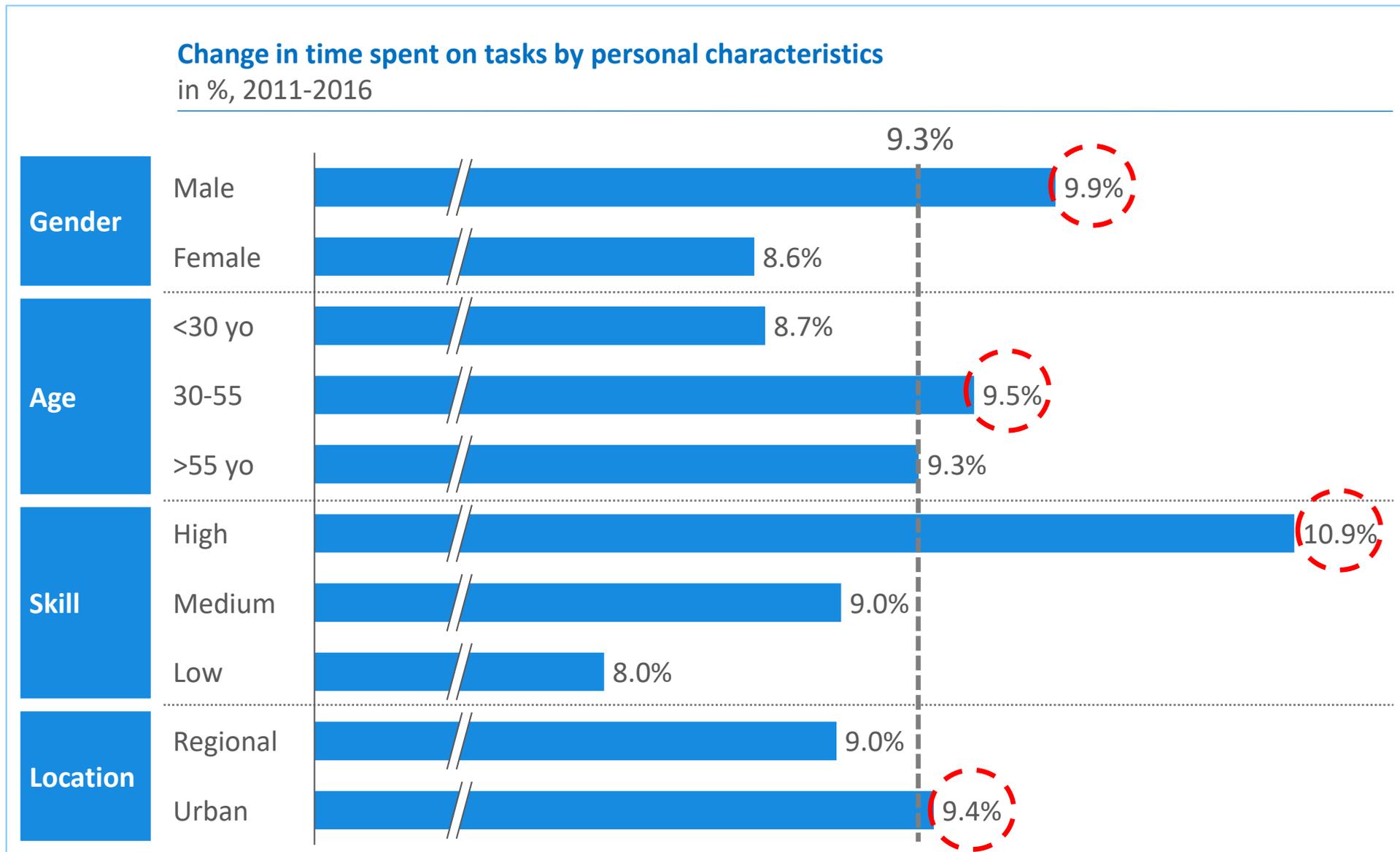
1 Based on ANZSCO occupations at the 4-digit level

Tasks are changing within our occupations



1. Total task change over all tasks not just top 5 tasks. SOURCE: O*Net, ABS Census, AlphaBeta analysis

High skilled, middle-aged, urban, male workers have experienced more task change in their jobs than other workers



NOTE: Urban: ASGS Remoteness Area (RA) 'Major City', Regional: ASGS RAs: 'Inner Regional', 'Outer Regional', 'Remote Australia', 'Very Remote Australia'. High skill: ANZSCO skill levels 1 and 2, Medium skill: ANZSCO skill level 3, Low skill: ANZSCO skill levels 4 and 5

Agenda

- How are 'tasks' changing within Australian jobs & which workers are most affected?
- **How are 'jobs' changing & who is at risk of job loss?**
- What is the relationship between 'task' change and 'job' change?
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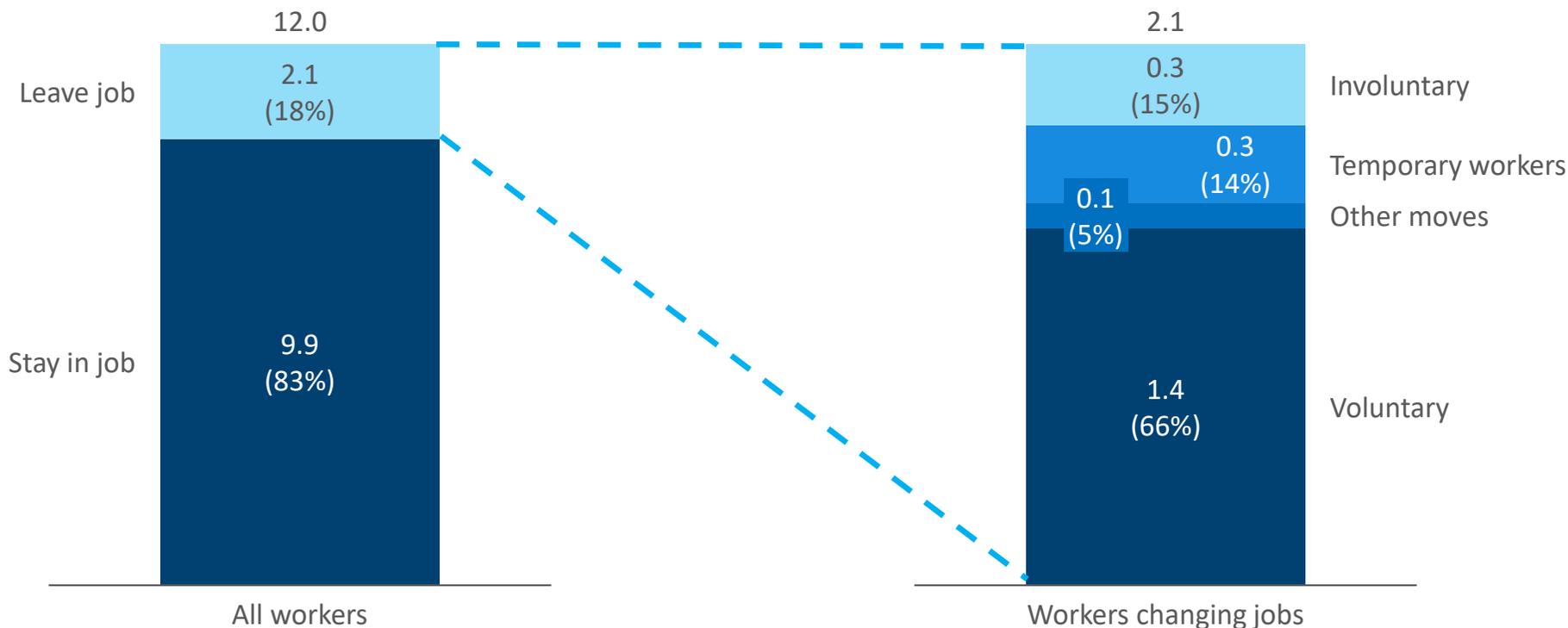
Key findings on involuntary job change

- Each year, there are about **330,000 Australians who lose their jobs involuntarily** (out of 2.1m total transitions)
- The percentage of workers experiencing involuntary transition has **declined over the last two decades but has been relatively steady over the last 5 years**
- On average, Australian workers have had a **10% incidence** of experiencing an involuntary transition over the last five years
- Industry characteristics play a significant role in determining the incidence of involuntary transition with **construction** (23%), **mining** (19%) and **utilities** (17%) industries having had significantly higher incidence of involuntary transition while **education** (5%), **healthcare** (5%) and **public administration** (5%) having had lower incidence
- **Regionally based workers** (12%), **low-skilled workers** (13%), **males** (14%), **younger workers** (13%) and workers at **small companies** (11%) also have had higher incidence of involuntary transition
- When you put multiple factors together, the incidence of involuntary transition has been much higher e.g. **male, low skilled, mining workers under the age of 30 have an incidence of involuntary transition of 24%**

Of the 2.1 million Australian workers who moved jobs last year, 330,000 were separated from their role involuntarily

2.1 million of 12 million Australian workers moved jobs last year

330,000 of these workers were involuntarily separated from their role



Focus of this study

Involuntary transition

Includes workers who were **laid off, retrenched**, made **redundant, dismissed**, or whose **business closed down** for economic reasons

Other reasons for moving jobs

Voluntary moves
Temporary workers
Other moves

Voluntarily moves includes those who left for another job, to return to studies, for family reasons, or due to unsatisfactory work arrangements

Employment came to an end because it was a fixed-term role, temporary or seasonal role

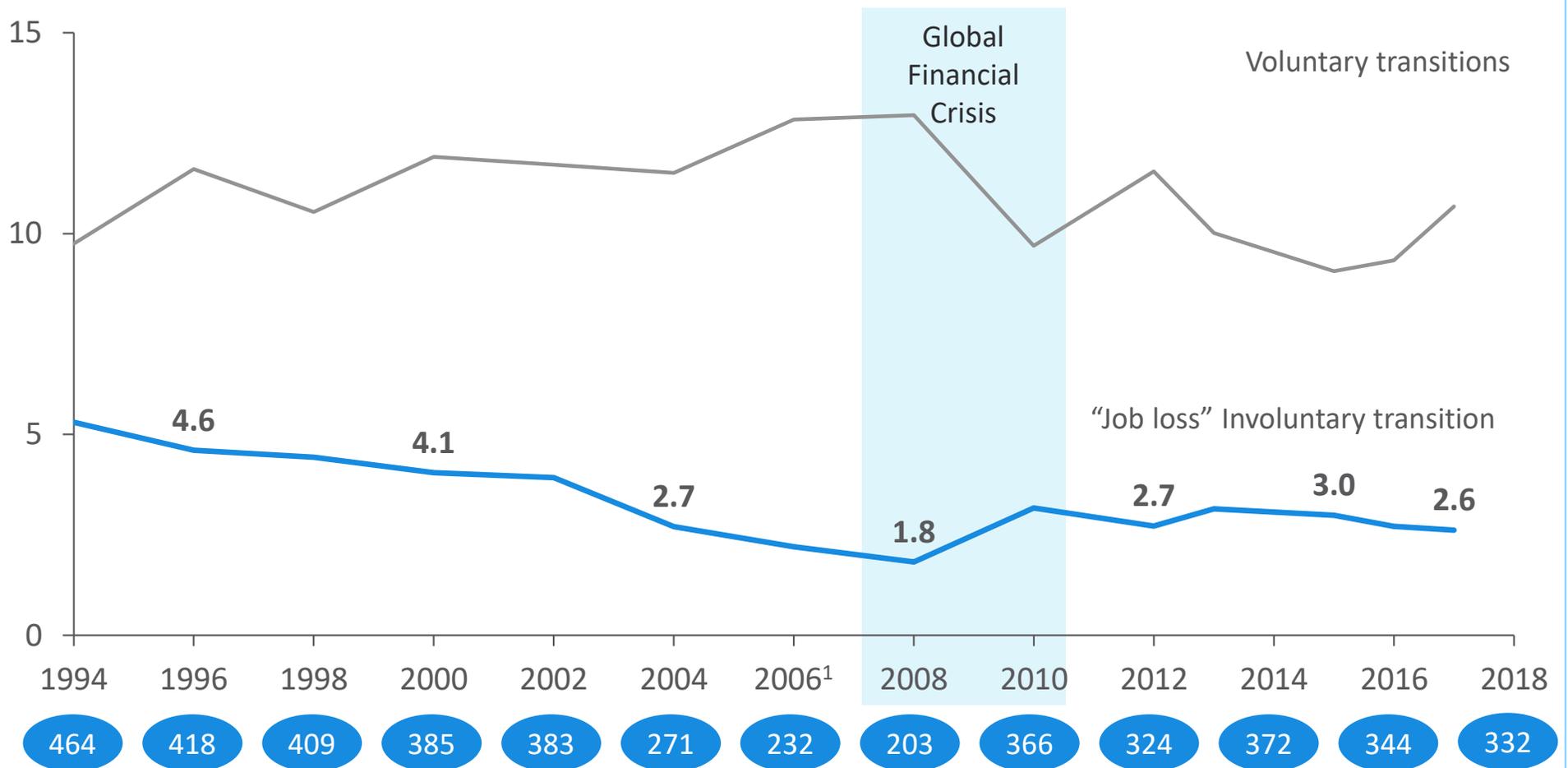
Other moves includes those who left due to illness or other reasons

The percentage of labour force experiencing involuntary transition has actually declined over the last two decades from over 4.6% to 2.6%

Job changes in Australia

Transitions as % of labour force, 1994 – 2017,
 # in bubble is absolute # workers ('000s) experiencing involuntary transition

— Involuntary job changes
 — Voluntary job changes



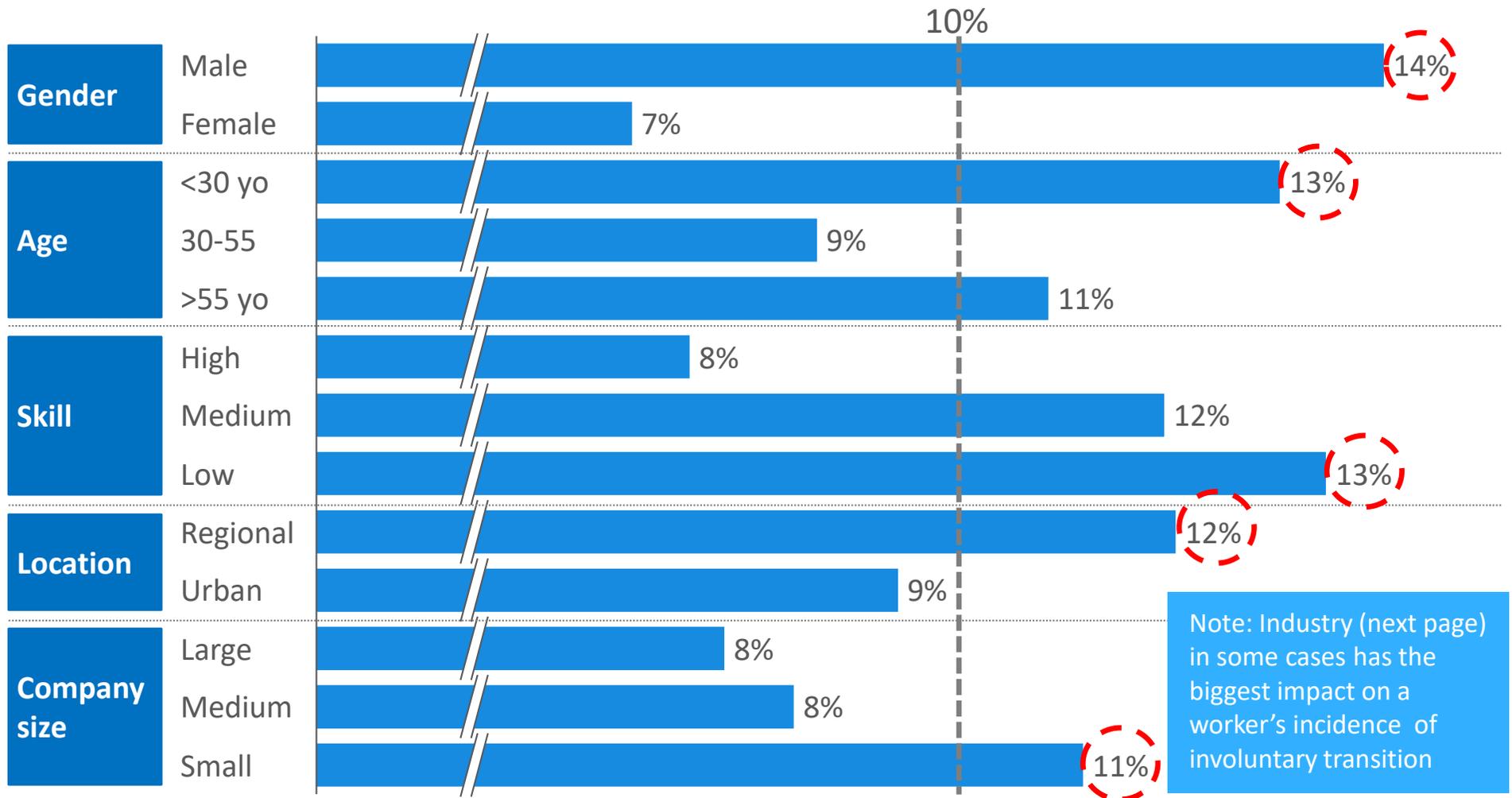
NOTE: The scope of the Labour Mobility survey was expanded in February 2006 to include all people aged 15 years and over. This change resulted in an extra 73,300 people coming within the scope of the survey

SOURCE: ABS 6209, 6226; AlphaBeta analysis

On average, workers had a 10% incidence of involuntary transitions in the past five years; incidence was higher for some groups

Incidence of involuntary transition by personal characteristics

Average incidence of experiencing involuntarily transition in past five years



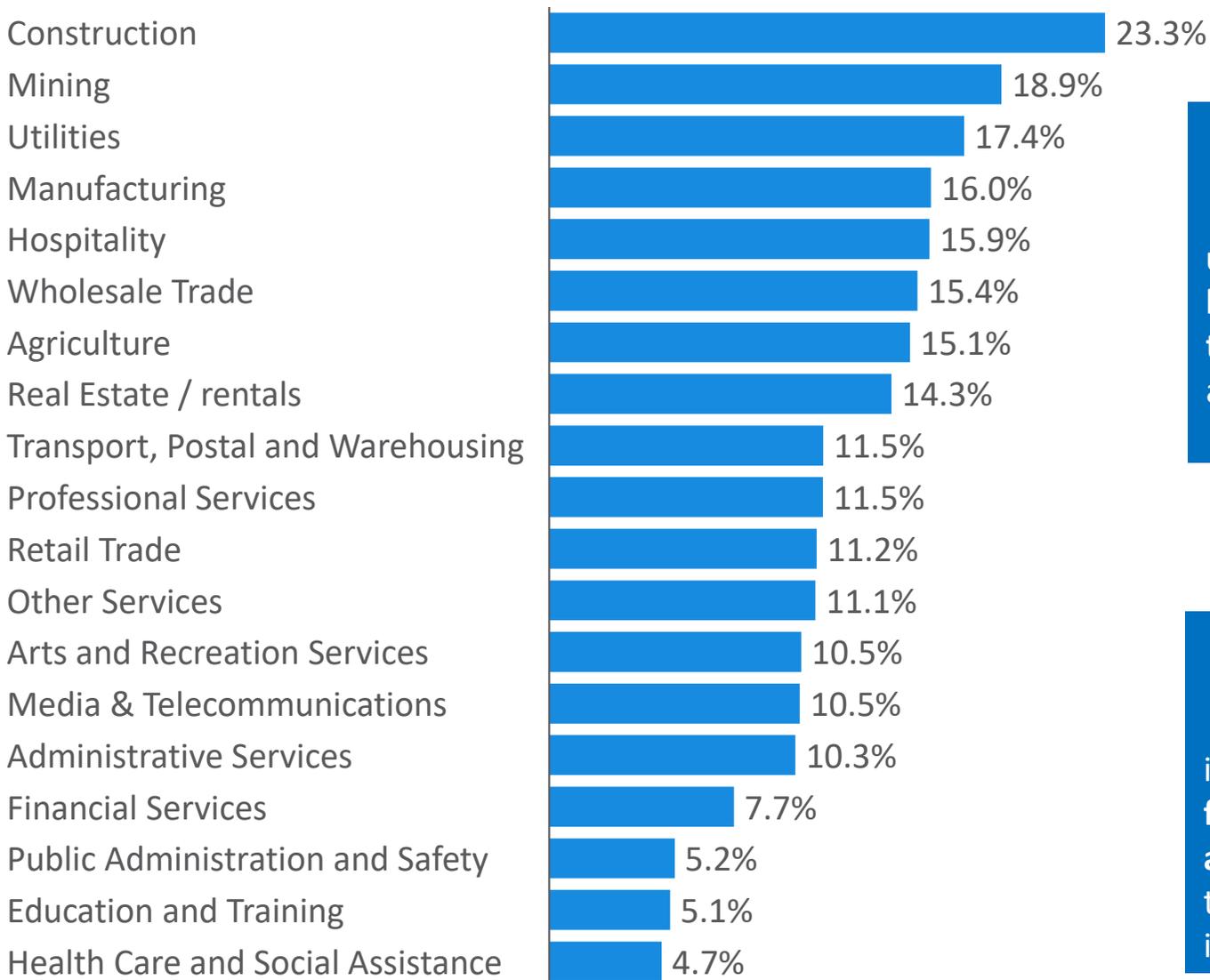
NOTE: Large company: >500 workers, medium company: 100-500 workers, small company: <100 workers; Urban: ASGS Remoteness Area (RA) 'Major City', Regional: ASGS RAs: 'Inner Regional', 'Outer Regional', 'Remote Australia', 'Very Remote Australia'. High skill: ANZSCO skill levels 1 and 2, Medium skill: ANZSCO skill level 3, Low skill: ANZSCO skill levels 4 and 5

SOURCE: Logistic regression performed using 2015/16 HILDA data (n=10,000). Model statistically significant at p < 0.001 (using likelihood-ratio test).

The incidence of involuntary transition has varied significantly across industries

Involuntary transition incidence by industry

% incidence experiencing involuntary transition in past five years



Industries including **construction, mining, utilities, manufacturing, hospitality** and **wholesale trade** are among the highest areas of involuntary transition



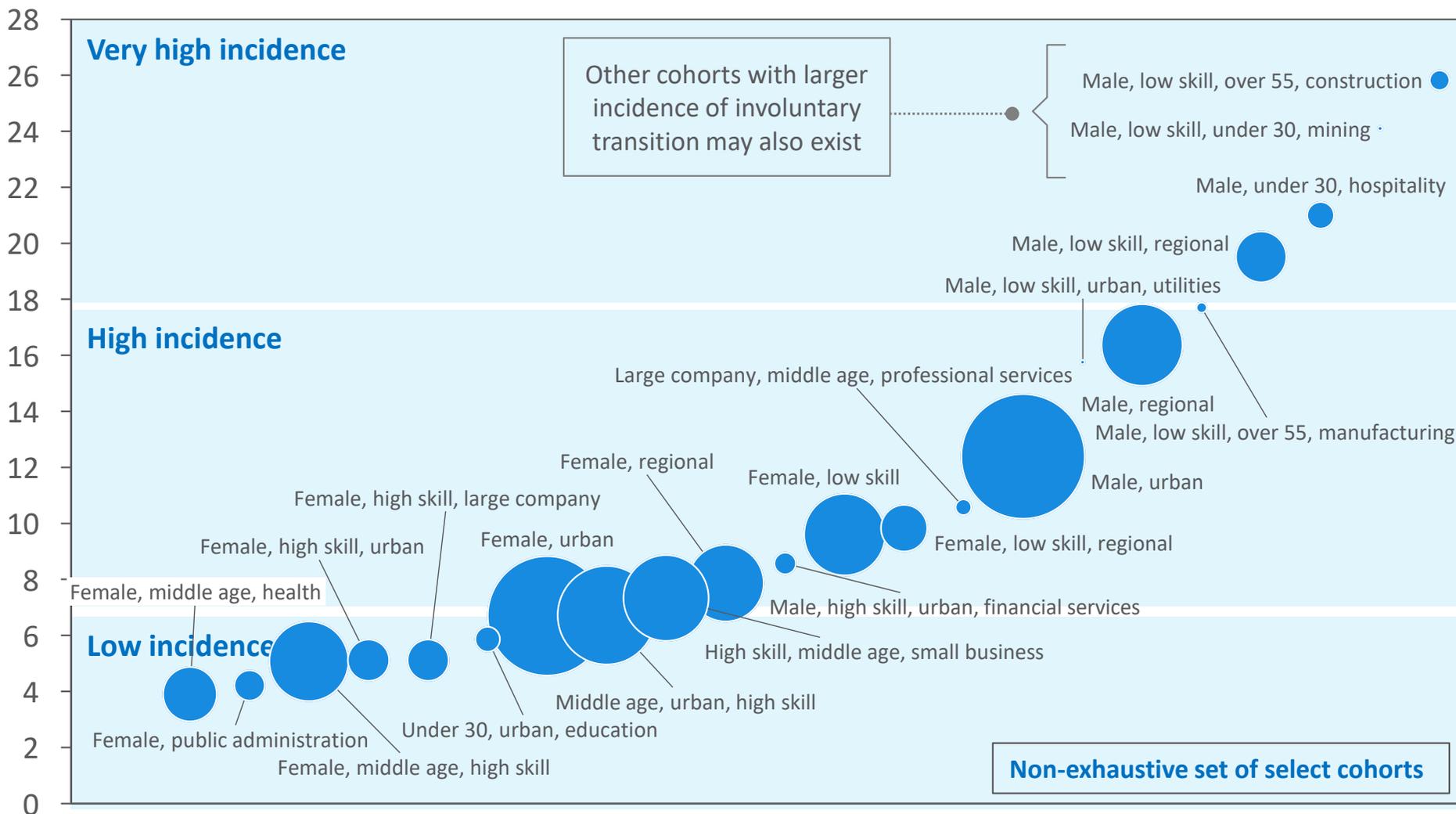
Personal services & professional industries including **health, education, financial services & administration** are among the lowest areas of involuntary transition

The incidence of involuntary transitions is much higher in some cohorts than the average

Incidence of experiencing involuntary transition in the past 5 years by specific cohorts¹

Percent, size of bubble represents population size of cohort

 Bubble size represents size of cohort



NOTE: Incidence of retrenchment based on retrenchment numbers in 2015/2016 HILDA sample. Sample size restricted ability to consider all cohorts. Middle age refers to workers between the ages of 30 and 55. These cohorts are a non-exhaustive subset of all cohorts chosen to represent a diverse range of relevant characteristics and illustrate the different probabilities of being retrenched

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- How are 'jobs' changing & who is at risk of job loss?
- **What is the relationship between 'task' change and 'job' change?**
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Key findings on relationship between task change and job change

- Overall, we find a **modest negative** relationship between the two types of change, i.e. parts of the labour market which experience **faster change in tasks are less likely to experience higher rates of job loss**
 - **Skills:** Higher skill occupations experience greater task change (10.9%) than average and experience a lower rate of job loss (7.5%)
 - **Locations:** Regional workers experience lower task change than the average (9.0%) and are more likely to experience involuntary job loss (11.7%)
 - **Age:** Middle aged workers experience the most task change of any age group (9.5%) and are least likely to experience involuntary transition (8.6%)
- The potential implication of this finding is that **by adapting jobs to new technologies and new processes**, businesses and workers may be able to **increase job security**

Workforce change is not inconsistent with job security: Jobs that are changing fastest in terms of tasks have lower incidence of involuntary loss

Task change and incidence of involuntary transition by skill level

2011-2016

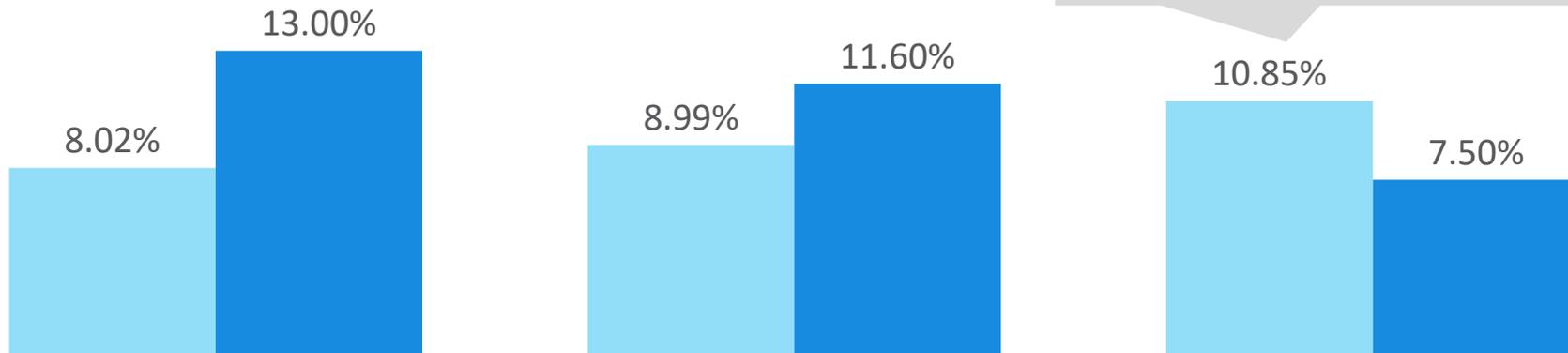
Task change (percentage point change)
Incidence of involuntary transition (%)

Low skill

Medium skill

High skill

Highly skilled workers experience more task change (10.85%) compared to lower skill workers (8.02%)



Examples:

- Domestic Cleaners
- Handypersons
- Café Workers
- Sales Assistants
- Garden Labourer

Examples:

- Plumbers
- Secretaries
- Panelbeaters
- Hairdressers
- Veterinary Nurses

Examples:

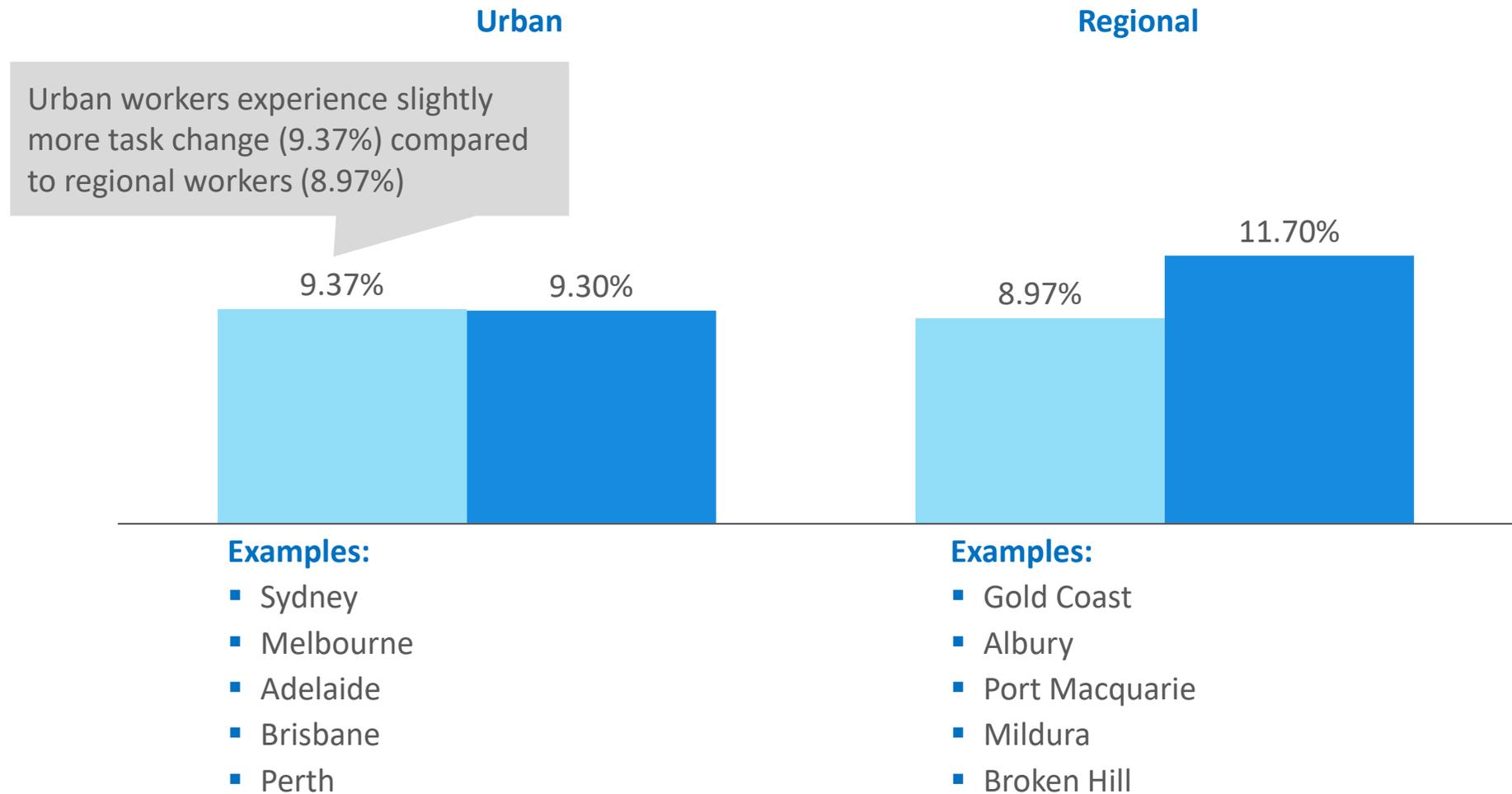
- Chief Executive Officers
- Accountants
- Lawyers
- Engineers
- School teachers

NOTE: Task change is measured by taking the absolute value of the per cent change in time spent on tasks between 2006-2014, annualised and then multiplied by 5 (to represent task change between 2011-2016). High skill: ANZSCO skill levels 1 and 2, Medium skill: ANZSCO skill level 3, Low skill: ANZSCO skill levels 4 and 5

Urban areas have experienced more task change but less involuntary transition than regional areas

Task change and incidence of involuntary transition by geography
2011-2016

Task change (percentage point change)
Incidence of involuntary transition (%)



NOTE: Task change is measured by taking the absolute value of the per cent change in time spent on tasks between 2006-2014, annualised and then multiplied by 5 (to represent task change between 2011-2016). Urban: ASGS Remoteness Area (RA) 'Major City', Regional: ASGS RAs: 'Inner Regional', 'Outer Regional', 'Remote Australia', 'Very Remote Australia'.

Mid-age workers (30-55 year old) have experienced more change within jobs but have been less likely to experience involuntary transition

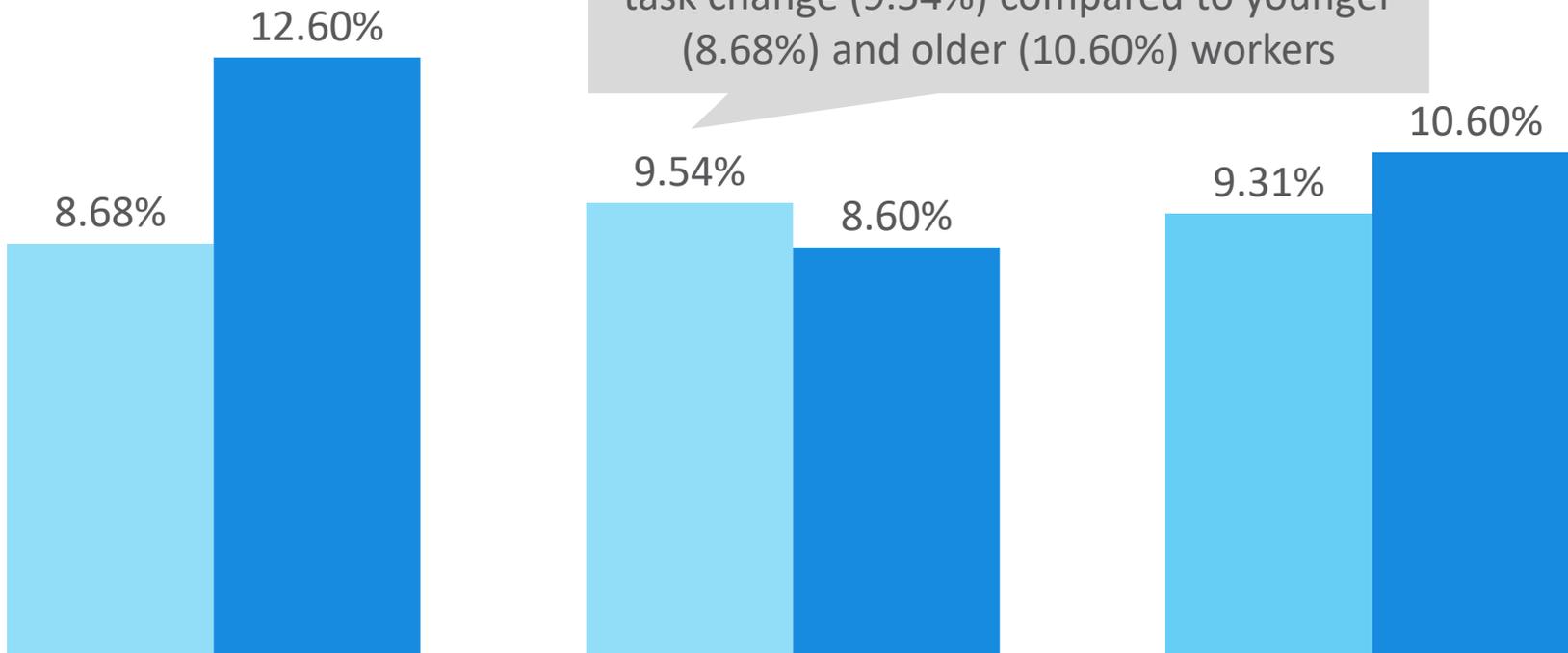
Task change and incidence of involuntary transition by age
2011-2016

Task change (percentage point change)
Incidence of involuntary transition (%)

<30 years

30-55 years

> 55 years



Mid-age workers experience slightly more task change (9.54%) compared to younger (8.68%) and older (10.60%) workers

NOTE: Task change is measured by taking the absolute value of the per cent change in time spent on tasks between 2006-2014, annualised and then multiplied by 5 (to represent task change between 2011-2016).

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Task change varies along industry lines with skill level also important (I/II)

Task change between 2011 and 2016 by industry and other characteristics (I/II)



	All	Agriculture	Mining	Manufacturing	Utilities	Construction	Wholesale Trade	Retail Trade	Hospitality	Transport, and Warehousing
Younger (<30 years old)	8.7%	9.0%	9.6%	7.7%	8.8%	8.0%	9.3%	7.8%	6.2%	8.7%
Mid career (30-55 years old)	9.5%	9.2%	9.8%	8.5%	9.2%	8.2%	9.8%	8.9%	7.9%	8.2%
Older (> 55 years old)	9.3%	9.1%	9.5%	8.3%	8.8%	8.2%	9.5%	8.6%	7.7%	7.8%
Male	9.9%	9.9%	9.8%	8.5%	9.0%	8.2%	10.1%	8.9%	7.4%	8.1%
Female	8.6%	8.0%	9.2%	7.7%	9.3%	7.8%	8.9%	8.0%	6.5%	8.5%
Urban	9.4%	9.2%	9.8%	8.5%	9.2%	8.2%	9.8%	8.5%	6.9%	8.3%
Regional	9.0%	9.1%	9.7%	7.7%	8.8%	8.1%	9.2%	8.2%	6.9%	7.8%
High skill	10.9%	11.6%	12.3%	12.0%	12.0%	13.0%	13.2%	16.2%	12.7%	11.4%
Medium skill	9.0%	10.6%	11.5%	8.8%	9.7%	8.7%	10.7%	7.9%	8.0%	8.3%
Low skill	8.0%	9.4%	10.6%	7.6%	8.8%	8.3%	9.1%	7.7%	6.2%	9.2%
All	9.3%	10.1%	11.4%	9.1%	10.2%	9.6%	10.5%	9.4%	7.7%	9.5%

53% of highly skilled retail trade workers are retail managers, who have experienced a high level of task change (20% over 5 years)

NOTE: Urban: ASGS Remoteness Area (RA) 'Major City', Regional: ASGS RAs: 'Inner Regional', 'Outer Regional', 'Remote Australia', 'Very Remote Australia'. High skill: ANZSCO skill levels 1 and 2, Medium skill: ANZSCO skill level 3, Low skill: ANZSCO skill levels 4 and 5

Task change varies along industry lines with skill level also important (II/II)

Task change between 2011 and 2016 by industry and other characteristics (II/II)



	TMT	Financial Services	Real Estate / rentals	Professional Services	Administrative Services	Public Administration and Safety	Education and Training	Health Care and Social Assistance	Arts and Recreation Services	Other Services
Younger (<30 years old)	8.9%	8.5%	8.3%	10.5%	7.9%	9.4%	7.5%	7.2%	8.3%	8.2%
Mid career (30-55 years old)	9.5%	9.4%	8.9%	10.6%	8.2%	9.4%	7.7%	7.3%	9.2%	8.5%
Older (> 55 years old)	9.0%	9.1%	8.7%	10.2%	8.0%	9.3%	7.9%	7.2%	8.8%	8.5%
Male	9.3%	10.0%	9.0%	11.1%	8.5%	9.5%	8.3%	7.1%	9.1%	8.8%
Female	9.2%	8.4%	8.4%	9.8%	7.8%	9.3%	7.5%	7.2%	8.5%	8.0%
Urban	9.4%	9.3%	8.8%	10.6%	8.2%	9.5%	7.8%	7.2%	8.8%	8.5%
Regional	8.6%	8.2%	8.4%	9.7%	7.9%	9.0%	7.4%	7.2%	8.7%	8.3%
High skill	10.8%	12.8%	11.7%	12.5%	11.6%	10.4%	8.2%	7.8%	11.8%	12.6%
Medium skill	8.0%	8.8%	8.7%	10.9%	10.9%	9.7%	9.8%	9.2%	9.2%	8.5%
Low skill	9.4%	6.8%	7.6%	7.3%	8.2%	10.1%	7.6%	7.9%	8.1%	9.1%
All	10.0%	9.9%	9.2%	11.6%	9.0%	10.2%	8.1%	7.9%	9.6%	9.5%

The relatively high levels of task change in professional services may be explained by the fact that it is largely (85%) comprised of high / medium skill workers who are experiencing more task change than low skill workers

NOTE: Urban: ASGS Remoteness Area (RA) 'Major City', Regional: ASGS RAs: 'Inner Regional', 'Outer Regional', 'Remote Australia', 'Very Remote Australia'. High skill: ANZSCO skill levels 1 and 2, Medium skill: ANZSCO skill level 3, Low skill: ANZSCO skill levels 4 and 5

The incidence of involuntary transition in past 5 years is heavily influenced by industry, with smaller variations by other characteristics (I/II)

Incidence of involuntary transition in past 5 years by industry and other characteristics (I/II)

Higher incidence of experiencing invol. transition  Lower incidence of experiencing invol. transition

	All	Agriculture	Mining	Manufacturing	Utilities	Construction	Wholesale Trade	Retail Trade	Hospitality	Transport, and Warehousing
Male	13.5%	16.7%	19.8%	17.3%	18.7%	24.1%	16.8%	13.3%	18.6%	13.1%
Female	7.0%	11.9%	13.1%	12.5%	11.3%	16.5%	11.7%	9.8%	14.0%	7.6%
Younger (<30 years old)	12.6%	21.3%	21.3%	19.4%	18.3%	27.0%	20.8%	13.0%	17.5%	12.8%
Mid career (30-55 years old)	8.6%	13.9%	17.6%	14.6%	15.9%	20.6%	14.0%	9.1%	12.2%	10.5%
Older (> 55 years old)	10.6%	13.7%	21.6%	17.4%	21.9%	25.0%	15.5%	11.0%	16.1%	12.9%
High skill	7.5%	12.3%	14.7%	13.2%	13.4%	19.8%	12.4%	9.4%	12.7%	10.2%
Medium skill	11.6%	14.9%	18.8%	16.1%	19.2%	22.6%	15.9%	10.4%	14.1%	11.4%
Low skill	13.0%	16.5%	23.0%	18.3%	18.5%	26.1%	18.2%	12.4%	17.6%	12.7%
Regional	11.7%	15.5%	22.7%	18.6%	20.6%	26.7%	18.6%	12.0%	16.5%	13.8%
Urban	9.3%	12.8%	15.9%	14.8%	14.6%	21.6%	14.5%	10.8%	15.6%	10.7%
Large company	7.8%	25.5%	19.0%	17.5%	15.5%	24.0%	14.0%	11.0%	13.3%	9.7%
Medium company	8.4%	11.8%	20.2%	15.5%	15.4%	21.8%	12.3%	11.0%	15.8%	11.0%
Small company	10.9%	15.1%	17.6%	15.9%	19.8%	23.4%	15.8%	11.2%	16.0%	12.0%
All	10.0%	15.1%	18.9%	16.0%	17.4%	23.3%	15.4%	11.2%	15.9%	11.5%

NOTE: Large company: >500 workers, medium company: 100-500 workers, small company: <100 workers; Urban: ASGS Remoteness Area (RA) 'Major City', Regional: ASGS RAs: 'Inner Regional', 'Outer Regional', 'Remote Australia', 'Very Remote Australia'. High skill: ANZSCO skill levels 1 and 2, Medium skill: ANZSCO skill level 3, Low skill: ANZSCO skill levels 4 and 5

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Incidence of involuntary transition in past 5 years by industry and other characteristics (II/II)

Higher incidence of experiencing invol. transition  Lower incidence of experiencing invol. transition

	TMT	Financial Services	Real Estate / rentals	Professional Services	Administrative Services	Public Administration and Safety	Education and Training	Health Care and Social Assistance	Arts and Recreation Services	Other Services
Male	12.0%	9.0%	16.6%	13.0%	12.4%	6.1%	6.6%	6.2%	12.2%	12.9%
Female	9.1%	6.8%	12.8%	9.6%	8.6%	4.2%	4.5%	4.4%	8.8%	9.0%
Younger (<30 years old)	12.4%	9.4%	16.2%	13.0%	11.7%	6.3%	6.0%	5.3%	11.1%	13.3%
Mid career (30-55 years old)	9.0%	7.2%	12.8%	10.4%	9.2%	4.8%	4.5%	4.2%	9.4%	9.6%
Older (> 55 years old)	13.2%	9.0%	16.9%	13.3%	11.9%	6.2%	5.9%	5.6%	11.7%	12.9%
High skill	9.5%	7.4%	13.2%	11.0%	8.6%	4.9%	4.8%	4.4%	8.8%	9.2%
Medium skill	10.9%	7.6%	15.0%	11.8%	10.4%	5.6%	5.3%	4.8%	11.0%	11.2%
Low skill	12.7%	8.6%	15.0%	13.1%	11.9%	6.1%	6.1%	5.5%	11.6%	13.1%
Regional	12.1%	8.8%	15.0%	13.4%	11.4%	6.1%	5.7%	5.2%	11.4%	12.5%
Urban	10.3%	7.6%	14.0%	11.1%	9.8%	5.0%	4.8%	4.5%	10.3%	10.6%
Large company	9.1%	7.5%	9.8%	11.0%	10.1%	5.2%	5.4%	4.7%	10.6%	11.5%
Medium company	10.5%	7.4%	15.3%	10.9%	8.9%	4.9%	4.8%	4.6%	9.8%	9.9%
Small company	11.1%	8.1%	14.3%	11.6%	10.6%	5.6%	5.1%	4.8%	10.7%	11.2%
All	10.5%	7.7%	14.3%	11.5%	10.3%	5.2%	5.1%	4.7%	10.5%	11.1%

NOTE: Large company: >500 workers, medium company: 100-500 workers, small company: <100 workers; Urban: ASGS Remoteness Area (RA) 'Major City', Regional: ASGS RAs: 'Inner Regional', 'Outer Regional', 'Remote Australia', 'Very Remote Australia'. High skill: ANZSCO skill levels 1 and 2, Medium skill: ANZSCO skill level 3, Low skill: ANZSCO skill levels 4 and 5

Methodology: Measuring task change in Australian jobs

We compared the time spent on ~2000 tasks in 2006 and 2014 for over 1000 US occupations, using O*NET data. We then translated the results into an Australian context by matching American occupations to their Australian equivalent unit group.

Step 1: Identify time spent on tasks in US occupations

- The O*NET database contains information on the **frequency of tasks** performed (such as daily, weekly, etc.) in each occupation.
- We converted the frequency of a task to the amount of **time spent** on a task using a **power function**.
- This is due to the non-linear **inverse relationship between frequency and time spent** (i.e. individuals spend more time on tasks with a higher frequency).
- Timeshares were then **standardised** for cross-occupational task variation. In doing this, we assumed that the total time spent on different tasks equals **40 hours – the weekly full-time equivalent**.

Step 2: Calculate the change in time spent on a task between 2006 and 2014

- Change in timeshares for each occupation was calculated by taking the **percentage point difference in task timeshares** between 2006 and 2014.
- We took the **absolute value of timeshares change** (so that positive and negative changes would not cancel out and create a misleading impression of minimal task change). We then **halved this value** so as to proxy for average task change.
- Changes in the time workers spent per task were **summed up** for each occupation.
- The annual change in time-share was derived by taking a **simple average of the change** between 2006 and 2014.

Step 3: Translate results into an Australian context using concordance tables

- **US occupations** were mapped to the International Standard Classification of Occupations (ISCO) based on occupation taxonomies.
- The ISCO was in turn **mapped to ANZSCOs** (Australian occupation groups).
- This produces a **correspondence** between US occupations and 4 digit ANZSCOs.
- The Australian change in timeshare was then calculated by taking a **weighted average of each US occupation mapped to that ANZSCO**, based on the number of workers in that US occupation in 2014.

Methodology: Estimating the incidence of involuntarily transitions

What we did:

- We performed a **logistic regression** using a sample of **10,000 workers** from the 2015 and 2016 Household, Income and Labour Dynamics Survey (**HILDA**) to measure the incidence of involuntary transitions in a given year for various workforce cohorts.
- A logistic regression is a statistical technique used to estimate the impact of independent variables (in this case: combinations of gender, age, industry) on the likelihood of an outcome, which can only take on **one of two binary values** (in this case: a worker experiences an involuntary transition or they do not).
- The probabilities derived from the logistic regression are **not an attempt to predict the future** – rather, they provide insights on the bearing certain characteristics have on a worker’s likelihood of experiencing an involuntary transition, based on recent data.

How we did it:

- **Step 1:** decide the **independent variables** to include in the regression.
 - A group of key **demographic and economic variables** of interest encompassing age, region, occupation, industry, union membership, company size, gender, and several key interactions (particularly between gender, skill and region) were included.
 - Variables which were assessed to be **potentially highly correlated** with other included variables were excluded.
- **Step 2: perform the regression.**
 - The overall model itself is **statistically significant** at $p < 0.001$, using a **likelihood ratio test** which compares the likelihood of the data under the model with all parameters included against a model with fewer or no parameters - the equivalent of a global F test in an OLS regression.
 - The output from the logistic regression is contained in the following slides.
- **Step 3:** estimate the **probabilities** that a worker with a given characteristic, or combination of characteristics would be retrenched over a five year period, based on the **coefficients from the logistic regression**
 - We first calculated the incidence of **worker being employed** in 2016.
 - We then calculated the incidence that the worker would be **employed in subsequent years**, based on the incidence in the first year, adjusting this incidence upwards to account for the fact that some people are more likely to be retrenched (a core group of workers may be retrenched again and again).
 - We then subtracted the incidence of being employed in subsequent years from one to arrive at the incidence that an **individual will be retrenched once or more than once** in five years.

Logistic regression results: coefficients of independent variables (I/III)

Logistic regression coefficients						LLR p-value: 0.00	
No. observations: 10,267		■ Significant at p<0.01		■ Significant at p<0.05		■ Significant at p<0.1	
	Coefficient	Std. error	Z-score	P> z	90% confidence Interval		
Constant	-3.7647	0.552	-6.824	0	-4.846	-4.846	
Low skill	0.2351	0.298	0.789	0.43	-0.349	-0.349	
High skill	-0.0112	0.286	-0.039	0.969	-0.572	-0.572	
Over 55	0.3147	0.235	1.341	0.18	-0.145	-0.145	
Regional	0.2256	0.155	1.456	0.145	-0.078	-0.078	
Under 30	0.2476	0.21	1.179	0.238	-0.164	-0.164	
Low skill regional	-0.2702	0.336	-0.804	0.421	-0.928	-0.928	
Large company	0.1174	0.227	0.517	0.605	-0.327	-0.327	
Small company	0.1019	0.159	0.64	0.522	-0.21	-0.21	
Male, low skill	-0.0278	0.343	-0.081	0.935	-0.699	-0.699	
Male, low skill, regional	0.2285	0.364	0.628	0.53	-0.485	-0.485	
Male, low skill, over 55	-0.4166	0.358	-1.165	0.244	-1.118	-1.118	
Male, high skill	0.065	0.33	0.197	0.844	-0.581	-0.581	
Union	0.0476	0.145	0.328	0.743	-0.236	-0.236	
Male	0.3437	0.275	1.251	0.211	-0.195	-0.195	

Logistic regression results: coefficients of independent variables (II/III)

Logistic regression coefficients						LLR p-value: 0.00
No. observations: 10,267		■ Significant at p<0.01	■ Significant at p<0.05	■ Significant at p<0.1		
	Coefficient	Std. error	Z-score	P> z	90% confidence Interval	
Professionals	0.2991	0.234	1.277	0.202	-0.16	0.758
Technicians and Trades Workers	0.3344	0.231	1.449	0.147	-0.118	0.787
Community and Personal Service Workers	0.2329	0.283	0.823	0.41	-0.322	0.788
Clerical and Administrative Workers	0.2761	0.252	1.095	0.274	-0.218	0.77
Sales Workers	0.5379	0.27	1.995	0.046	0.01	1.066
Machinery Operators and Drivers	0.8848	0.249	3.56	0	0.398	1.372
Labourers	0.5903	0.232	2.549	0.011	0.136	1.044
Mining	-0.053	0.419	-0.126	0.899	-0.874	0.768
Manufacturing	-0.0841	0.291	-0.289	0.773	-0.655	0.487
Electricity, Gas, Water and Waste Services	-0.0231	0.502	-0.046	0.963	-1.007	0.961
Construction	0.2827	0.285	0.993	0.321	-0.275	0.841
Wholesale Trade	-0.1144	0.351	-0.326	0.745	-0.803	0.574
Retail Trade	-0.5432	0.326	-1.667	0.095	-1.182	0.095
Accommodation and Food Services	-0.1034	0.313	-0.33	0.741	-0.718	0.511

Logistic regression results: coefficients of independent variables (III/III)

Logistic regression coefficients						LLR p-value: 0.00
No. observations: 10,267						
■ Significant at p<0.01 ■ Significant at p<0.05 ■ Significant at p<0.1						
	Coefficient	Std. error	Z-score	P> z	90% confidence Interval	
Transport, Postal and Warehousing	-0.6973	0.361	-1.932	0.053	-1.405	0.01
Information Media and Telecommunications	-0.3701	0.488	-0.759	0.448	-1.326	0.586
Financial and Insurance Services	-0.6356	0.427	-1.488	0.137	-1.473	0.201
Rental, Hiring and Real Estate Services	-0.0823	0.461	-0.179	0.858	-0.986	0.821
Professional, Scientific and Technical Services	-0.2573	0.329	-0.783	0.434	-0.902	0.387
Administrative and Support Services	-0.535	0.394	-1.359	0.174	-1.307	0.236
Public Administration and Safety	-1.1704	0.436	-2.685	0.007	-2.025	-0.316
Education and Training	-1.1148	0.376	-2.963	0.003	-1.852	-0.377
Health Care and Social Assistance	-1.1523	0.351	-3.282	0.001	-1.84	-0.464
Arts and Recreation Services	-0.5233	0.491	-1.067	0.286	-1.485	0.438
Other Services	-0.4042	0.369	-1.095	0.274	-1.128	0.319