The Australia Institute
Research that matters.

How many jobs is 23,510, really?

Recasting the mining job loss debate

Technical Brief No. 9
June 2011
ISSN 1836-9014

Bruce Chapman and Kiatanantha Lounkaew
Crawford School of Economics and Government, Australian National University

The Australia Institute
Research that matters.

About TAI

The Australia Institute is an independent public policy think tank based in Canberra. It is funded by donations from philanthropic trusts and individuals, memberships and commissioned research. Since its launch in 1994, the Institute has carried out highly influential research on a broad range of economic, social and environmental issues.

Our philosophy

As we begin the 21st century, new dilemmas confront our society and our planet. Unprecedented levels of consumption co-exist with extreme poverty. Through new technology we are more connected than we have ever been, yet civic engagement is declining. Environmental neglect continues despite heightened ecological awareness. A better balance is urgently needed.

The Australia Institute's directors, staff and supporters represent a broad range of views and priorities. What unites us is a belief that through a combination of research and creativity we can promote new solutions and ways of thinking.

Our purpose—'Research that matters'

The Institute aims to foster informed debate about our culture, our economy and our environment and bring greater accountability to the democratic process. Our goal is to gather, interpret and communicate evidence in order to both diagnose the problems we face and propose new solutions to tackle them.

The Institute is wholly independent and not affiliated with any other organisation. As an Approved Research Institute, donations to its Research Fund are tax deductible for the donor. Anyone wishing to donate can do so via the website at https://www.tai.org.au or by calling the Institute on 02 6206 8700. Our secure and user-friendly website allows donors to make either one-off or regular monthly donations and we encourage everyone who can to donate in this way as it assists our research in the most significant manner.

LPO Box 5096
University of Canberra, Bruce ACT 2617
Tel: (02) 6206 8700 Fax: (02) 6206 8708
Email: mail@tai.org.au
Website: www.tai.org.au

Acknowledgements

We are grateful for critical commentary from Jeff Borland, Richard Denniss, Robert Dixon, John Freebairn, Quentin Grafton, Bob Gregory, Raja Junankar, David Richardson and participants at a Crawford School of Economics and Government research workshop. The authors alone are responsible for the analysis and inferences drawn.

Summary

It is commonplace in Australian policy debate for groups presumed to be adversely affected by proposed policies to provide estimates of the undesirable consequences of change. A fashionable form relates to predictions of job losses for the group affected, usually accompanied by counter-claims made by the government of the day or other groups in favour of the policy.

A highly public example of the above is the claim by the Minerals Council of Australia (MCA), based on work done in 2009 by Concept Economics (2009) that the then-planned Emissions Trading Scheme (ETS) would result in 23,510 fewer jobs in Australian mining than would otherwise be the case. A major background issue is that most economists would argue that any changes in the relative price of carbon-producing output must also be associated with offsetting increases in employment as a result of the higher level of activity in, for example, alternative energy production, and this is perhaps the critical point in the jobs debate concerning the consequences of policy reform. While we acknowledge this fact, the very large "job loss" figure might be a frighteningly large number for many observers, so we address the question: how many jobs is 23,510, really?

Our research reports on findings using three different data series and methods to put into context the supposed jobs loss figure. The paper presents analyses of different data sets aimed at improving the understanding of, and putting into an aggregate economy context, the projected mining sector "job losses" as a result of the 2009 planned ETS. While the focus is on the ETS and mining, the illustrations apply to almost all public and political debate concerning the meaning of job loss projections from anticipated policy reform in an aggregate labour market context. It matters, for example, for the Murray Darling Basin Plan.

We recognise that there are some weaknesses with respect to the data and methods used. Even so, a very clear and consistent message has come through. It is that the projected job losses from the ETS, particularly when considered over a 10 year time horizon, are in a statistical sense close to invisible with respect to employment and unemployment stocks, and trivial with respect to aggregate flows in the labour market. Also, it is apparently the case that with respect to mining sector employment the projected losses are a very small proportion of overall inflows to and outflows from mining. Further, it seems to be the case that those leaving mining periods of growth are not then entering a protracted period, and more likely any period at all, of unemployment.

Our results should not be taken to mean that economic policy reform is costless to all employees who might be affected by sectoral changes in the labour market, and there remain clear roles for government to minimise the personal costs for those so disadvantaged. As well, the details of this research cannot be translated into precise analyses of the employment effects of the carbon price policy being developed by the current government. But the essential points concerning the size and meaning of mining sector employment effects should not be in dispute; the alleged "jobs losses" aspect of the climate change policy debate is not in any sense important to the overall discourse.

1 Background

It is commonplace in Australian policy debate for groups presumed to be adversely affected by proposed policies to provide estimates of the undesirable consequences of change. A popular and fashionable form relates to predictions of job losses for the group affected, usually accompanied by counter-claims made by the government of the day or other groups in favour of the policy.

A highly public example of the above is the claim by the Minerals Council of Australia (MCA), based on work done in 2009 by Concept Economics (2009) that the then-planned Emissions Trading Scheme (ETS)[1] would result in 23,510 fewer jobs in Australian mining than would otherwise be the case. What follows has been motivated by the 2009 ETS debate, but there are very many examples in contemporary public policy debate related to the employment effects of reform. To illustrate how common this practice is, we note also the claim made by The Climate Institute (2011) that a shift in production towards cleaner energy will result in around 34,000 net new jobs in the Australian power sector by 2030; obviously the issue relates to both sides of the carbon price debate.[2] For our purposes the ETS is a particularly useful case in point in part because the report commissioned by the MCA made it very clear how the figure was arrived at.

Many Australian policy-makers are likely to consider projected job losses of more than 20,000 to be a very high price to pay for policy reform, particularly if an implication is that the people affected consequently become unemployed and economically disadvantaged for long periods of time. And it should be acknowledged that for all changes in economic behaviour there will be some individuals, particularly mature-aged workers with long associations with a specific industry, who if laid off can experience significant personal costs from such an experience. Our point is not to gloss over or ignore this possibility, but rather to explain the meaning of employment change in the context of the aggregate economy.

The concern of job losses of the magnitudes recognised could provide the basis for reconsideration of the overall presumed net benefits of a policy proposal and could even promote the case for significant taxpayer-financed compensation to help minimize the anticipated damage. For these reasons it is important to pose the basic question: in the context of the aggregate Australian economy, what does the figure of 23,510 really mean?[3]

[1] This is sometimes also referred to as the Carbon Pollution Reduction Scheme (CPRS).

[2] As a further example, in late 2010 the release of the Murray Darling Basin Plan encouraged assessments of direct job losses from the plan, most being in the range of around 3,500 to 12,000 (ABARE (2010) and Grafton and Jiang (2010)). An understanding of the size and meaning of these projections can be understood through reference to the methods adopted and the results reported in this paper.

[3] It is important to note that the paper is concerned with job effects in an aggregate context and not with respect to specific localities.

In what follows we use three different data series and methods to put into context the supposed jobs loss figure, and these are:

(i) Australian Bureau of Statistics aggregate employment and unemployment stock information;
(ii) ABS information on so-called "gross flows" in the labour market; and
(iii) The Household and Income, Labour Dynamics of Australia (HILDA) survey over the period 2001-2008.

Even with these different surveys and disparate approaches there appears to be a strong consistency concerning what the data mean: for the overall economy, and particularly with respect to the time period involved from ETS policy employment effects, 23,510 is a very small number when viewed in the context of the entire Australian labour market. For members of the group directly affected – mining employees – the HILDA part of our analysis on these workers suggests strongly that the unemployment consequences do not appear to be adverse.

There is a critical background point for analyses of job losses from policy reform, one which is understood poorly in public debate. This is that there is actually no information available to measure the extent to which job numbers change in the Australian economy. Instead, what is measured are numbers of people in particular labour market situations (such as being employed or not being employed) and, for two of the surveys used, we can measure changes in the population's employment status. It should become clear that the distinction between *jobs* and *employment experience* are usually conflated and confused in public policy debate[4], and that this misunderstanding matters for interpretation of the consequences of policy reform.

2 Expected Impact of the ETS: Job Stocks

2(i) Labour Market Stock Identities

A very straightforward way of understanding the aggregate impact of policy on employment and unemployment is with respect to overall stocks, which are represented in the ABS' (monthly) *Labour Force* survey by the numbers of people in particular labour market states at a given point in time. This can be done by comparing the estimated number of people in employment with and without the policy, and computing differences in the unemployment rate. While this is uncontroversial in practice, even such a simple empirical exercise requires several assumptions, now clarified.

Some simple identities with respect to the aggregate labour market are useful, and these are:

$$LF = Pop.p \qquad (1)$$

$$LF = E + U \qquad (2)$$

$$Ur = (U/[E + U]).100 \qquad (3)$$

[4] For example, the Concept Economics report uses the term ""displaced workers" when it is describing fewer jobs than would otherwise be the case (Concept Economics (2009) page 8). But there is no reason to believe that fewer jobs compared to a healthy counter-factual situation means that more workers will be "displaced" (that is, by implication, laid off)

where LF, Pop, p, E, U and Ur are respectively the labour force, the adult population, the labour force participation rate, employment, unemployment and the unemployment rate.

The simplest illustration of the effect of the 2009 planned ETS on the stocks of people in employment requires only a comparison of E, U and Ur for two different policy regimes (to be labelled Business as Usual (BAU) and ETS). In this basic exercise it is assumed that the only effects of the ETS policy on the labour market relate to E and U, using the MCA's estimate of 23,510 decreases in mining employment. This is a minimalist way of presenting the comparison, and assumes that the ETS has no effect on:

(a) participation in the labour market; and
(b) employment in all other parts of the economy.

Assumption (b) is critical to an assessment of the policy consequences since it imposes on the exercise the restriction that the ETS is associated with decreases only in mining employment, with no consequences for all other areas of economic activity. However, all policy initiatives have both indirect and sectoral effects, and our restriction introduces obvious biases to the data.

One of these biases is that the introduction of the ETS would have meant some employment decreases in production complementary to mining, such as in the transportation of coal. On the other hand, the policy must also be associated with offsetting increases in employment as a result of the higher level of activity in, for example, alternative energy production. Indeed, most economists would argue that this is perhaps the critical point in the jobs debate concerning the consequences of policy reform. There must be structural changes favouring the expansion of some sectors at the expense of others, but we have chosen to focus on just the meaning of the supposed mining employment changes. This suggests that the effect of the assumptions imposed is to exaggerate the aggregate extent of employment decrease from the 2009 ETS and serves to reinforce the conclusions drawn.

With the above limitations in mind the stock approach can be used in both comparative static and more dynamic contexts, and these are now shown.

2(ii) Comparative Static Labour Market Stock Effects

Assuming that the employment effects estimated by the MCA occur instantaneously, showing the labour market stock effects from the policy change requires only a comparison of E, U and Ur for the BAU and ETS. The results are shown in Table 1 for 2010, illustrated by taking as the base period August 2010.

Table 1
Hypothetical 2010* Comparative Static Labour Market Effects from the ETS

	BAU	ETS	Percent change
Labour Force	11,783,700	11,783,700	0
Employment	11,208,300	11,184,790	-0.21
Unemployment	575,400	598,910	4.09
Unemployment Rate	4.88	5.08	4.09 (0.20)**

*August 2010 is the assumed base. ABS, *The Labour Force*, 6203.0 (August)
** Percentage point change

The main points from Table 1 are that, through its assumed direct effect of a decrease in mining employment of 23,510, the ETS will, in a comparative static context:

(a) add 23,510 to the stock of unemployment, increasing it from 575,400 to 598,910, which is a change of about 4 percent; and
(b) add about 0.2 percentage points to the unemployment rate, which is also an increase of about 4 per cent.

These data suggest that even if the direct employment decreases from the ETS are both instantaneous and not offset in any way by economic activity in non-mining areas of production, it would be reasonable to describe the aggregate labour market changes as quite small. That is, a seemingly large fall in employment of 23,510 is in reality an insignificant proportion of total employment and total unemployment, although it will obviously be a much larger proportion of mining sector employment. It is now illustrated that in circumstances in which these employment changes do not happen instantaneously but instead take place over time, the per-period employment stock consequences of the ETS are much lower than this comparative static exercise suggests.

2(iii) Labour Market Stock Effects in a Dynamic Context

The MCA has suggested that the employment changes envisaged from the 2009 ETS would not have been instantaneous but would instead take place over a 10 year period, starting in 2011. Illustrating what this means for the aggregate labour market requires some simple modelling of a decade-long counter-factual involving what would transpire both with and without the 2009 ETS. To approach this exercise the following assumptions are imposed with respect to the 2010-2020 period:

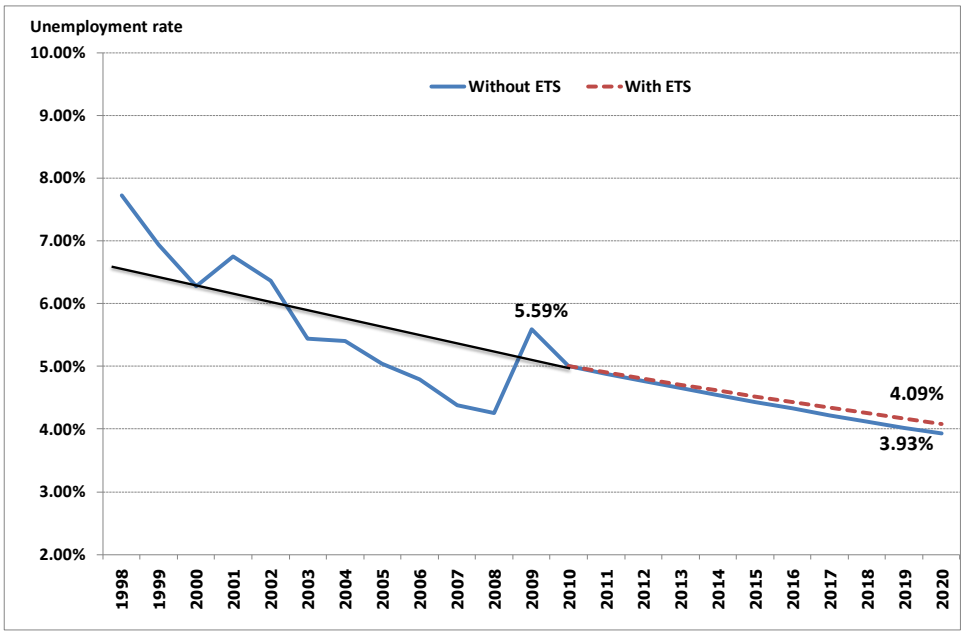
(a) the average annual labour force growth for the 10 years after 2010 is the same as the average annual labour force growth in the period 1998-2009, of 2.3 per cent, and is unaffected by the ETS;
(b) the average annual growth in unemployment without the ETS is the difference between the average annual growth in both the labour force and employment in the period 1998-2009, of -0.27 percent;

(c) all employment changes as a result of the ETS are spread evenly over the 2011-2020 period, meaning that employment decreases each year as a result of the policy by 2,351 (23,510/10); and
(d) as with the static exercise, there are assumed to be no offsetting increases in employment in other areas of the economy as a result of the policy.

Figure 1 shows the differences between the BAU and ETS for the counterfactuals described.

A first aspect of the figure involves the use of the actual ABS unemployment rates which are shown for the period 1998-2010. From these data we fitted an OLS regression line which then allowed us to extrapolate a hypothetical linear representation of unemployment rates after 2011. These data were used to construct a base (and very simple) case for future levels of the unemployment rate, and this line is shown as a linear representation of the aggregate Australian unemployment rate over the period 1998 to 2010. We used these estimated relationships to extrapolate a hypothetical unemployment experience from 2011 to 2020, which resulted in a projected unemployment rate in 2020 of 3.93 percent (based on assumptions (a) and (b)). A third straight line shows the projected unemployment rate starting in 2011 under assumptions (c) and (d), and this results in a different (2009 ETS) hypothetical unemployment rate in 2020 of 4.09 per cent.

Figure 1
Illustrating the Impact of the ETS on Unemployment Rates, 2011-2020)



Source: Authors' calculations based on ABS, *The Labour Force* 6203 (1998-2010).

The simple point concerning how small the ETS employment stock changes are, made in Section 2(i) with respect to an instantaneous change in the labour market, is now strongly reinforced. Specifically, if the presumed employment changes from the ETS take place

evenly over 10 years the average annual projected unemployment rate will be 0.016 percentage points higher[5]; this can be described reasonably as miniscule.

The remainder of this paper is concerned with the analysis of these presumed policy influences on unemployment in a context beyond that of labour market stocks. We begin with ABS gross flows data.

3 What Can We Learn from Gross Flows Data?

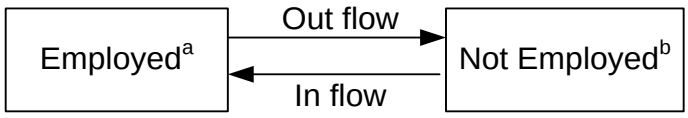
3(i) Background

Very important research concerning the dynamics of the labour market has been undertaken by Australian economists for almost 30 years with what is known as gross flows analysis. The seminal work is Foster and Gregory (1984) with recent contributions in the job flows area being Borland (1996), Dixon, Freebairn and Lim (2004), and Ponomareva and Sheen (2010). Our exercise now uses this type of analysis for the ETS public policy debate.

3(ii) Gross Flows in Concept

As already noted, statistical agencies do not collect information directly concerning actual jobs. But we are able to infer labour market experiences over time with the measurement of changes in the employment situation of people. For our purposes the dynamic processes can be shown very simply in Figure 2[6], which assumes only two mutually exclusive labour market states that people can be in, "employed" or "not employed". The figure shows the essence of employment flows: from one month to the next an employed person who moves into not-employed is said to be an *outflow* from employment, while a not-employed person in the first month who has a job is in the second month is considered to be an *inflow* into employment. Flow statistics measure changes and thus cannot be captured by the stock data examined in Section 2.

Figure 2
Employment Flows



[a] "Employed" includes both full-time and part-time employment.
[b] "Not Employed" includes both unemployed and not-in-the-labour-force

Gross flows are affected by a number of factors related to so-called "job creation" and "job destruction" (Borland, 1996). Job creation comes from an increase in employment within existing, or the birth of new, workplaces, while job destruction results from contractions within establishments and with the death of firms. Both phenomena are associated with employment changes by people and it is this that we now examine.

[5] That is [(4.09 – 3.93)/10].

[6] This can be done in a more complicated way by including the category "not in the labour force", with the more sophisticated figure being shown in the Appendix. This figure could be made more even complicated with a breakdown of the employment data into full and part-time categories.

3(iii) Measures of Gross Flows

Monthly labour market flows data are collected by the ABS to construct inflows, outflows and net inflows/outflows data. To illustrate the size of these flows Table 2 presents statistical characteristics of the monthly data for the 1998 to 2009 period (with thus 144 monthly observations). Inflow is defined as the number of persons who moved from either unemployment or not in the labour force last month, to employment in the current month; and outflow is defined as the movement of people from employment last month to either unemployment or not in the labour force in the current month.

A particular representation of the flows data is shown in Figure 3, which illustrates monthly inflows into, and outflows out of, employment for 2009.

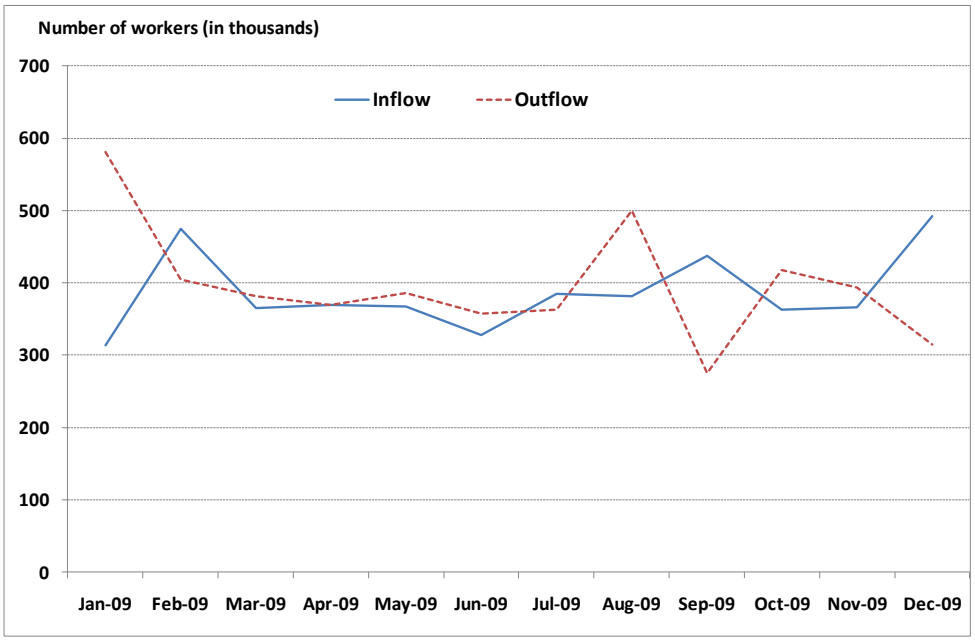
Table 2
Monthly Gross Flows Descriptive Statistics (000s) (1998 – 2009)

Data	Mean	Standard Deviation	Min	Max
Inflow	372.27	51.59	284.87	530.68
Outflow	367.92	71.96	226.41	588.86
Net inflow	4.35	103.80	-271.75	200.33

N = 144

Source: ABS, *Labour Market Flows*, Cat. 6202.

Figure 3
Monthly Employment Inflows and Outflows in 2009



There are several salient points from Table 2 and Figure 3, which are:

(i) The extent of monthly movements of people into and out of employment is quite extraordinary, indeed almost incredible, to those new to gross flows analysis;

(ii) On average over 1998-2010 around 372,000 people who were jobless in the previous month were employed in the month following (and in December 2009 the figure was close to 500,000); and

(iii) On average over 1998-2010 around 369,000 people who were employed in the previous month were jobless in the following month (and in January 2009 the figure was close to 600,000).

These figures, adjusting for the size of the economies, are very similar to the data revealed for both Canada and the US (Baldwin, Dunne, and Haltiwagner, 1998), and suggest extremely large employment status changes over short periods of time in mixed economies generally. Just how large the numbers are for Australia can be illustrated as follows: assuming a 30 day month and an 8 hour day, the data suggest that on average in each working hour around 1,550 people move from being jobless to being employed, and about 1,530 people leave employment and become jobless.

At the same time in any given period very large numbers of people move into different jobs, and from full to part-time work (and vice-versa), without actually changing employment status. This means that the extent of changes in the labour market must be much greater than even that suggested by these simple gross flows data.

3(iv) Estimating the Contribution of the ETS to Gross Outflows

Gross flows measurement allows a different perspective on the size of the effect of the ETS on the Australian labour market. We are now in a position to ask: what would be the relative contribution of the ETS planned in 2009 for increases in employment outflows per time period? To address this question we need only to impose some assumptions on the data consistent with the MCA estimates of employment losses of 23,510 over 2011-2020. The simplest way to do this is to assume equivalent processes as those set out for the across-time comparisons of Section 2 (ii): that the same number of outflows from mining occurs each month from 2011 to 2020, which means 196 additional outflows per month. The size of this figure is put into perspective in Table 3.

Table 3
Contribution of the ETS to Monthly Employment Outflows (2011-2020)

Variable	Person/Percent
Average monthly outflow without the ETS*	370,204 persons
Additional outflow contribution from the ETS	196 persons
Average monthly outflow with the ETS	370,400 persons
Contribution of ETS to outflow	0.05 per cent

* Calculated by taking the average of monthly outflow from 1998-2009.

The essential message from Table 3 is that, when considered in a gross employment outflows context, the contribution of the 2009 ETS to increases over 2011-2020 would have been trivial. That is, the increased outflow figure is 5 per cent of 1 per cent, meaning an additional 5 people leaving employment for every 10,000 that would have left anyway.

4 What Do Panel Data Tell Us?

4(i) Background

The Australian economics research community is blessed with the availability of the Household, Income and Labour Dynamics of Australia (HILDA) survey, which is an annual longitudinal data set of around 13,000 households, begun in 2001. Because HILDA has a substantial amount of demographic and labour market information it can be used to address several critical issues raised by the 2009 ETS mining employment losses.

An important aspect of the use of panel data is that there is information on the extent to which employees change their industry of work. This matters for our exercise because there is a presumption when considering job losses that these are associated with high costs for workers as a result of them being displaced involuntarily. However the notion that diminished employment prospects in a given industry are the result of workers being laid off or made jobless from the closure of firms is mostly inaccurate. HILDA provides the prospect of determining the extent of employee movement between jobs and thus into and

out of mining employment; and also allows some insights into the extent to which job mobility is associated with continuing joblessness.

The following issues are addressed in the context that we are able to identify those in HILDA employed (full or part-time) in the mining sector[7] in 2001 and to follow their labour market situation annually through to the 2008 survey. These data allow us several opportunities, to: (i) illustrate the extent to which those originally employed in mining in 2001 leave the sector; (ii) use the results from step (i) to generalise aggregate mining employment dynamics for the economy and offer projections of what these might mean for the future; (iii) estimate inflows into and outflows from the mining sector on an annual basis for the 2001-08 period and compare these findings with the monthly ABS inflow and outflow findings reported above; and (iv) determine what happens to those who leave mining after 2001 in employment status terms.

A critical background point is that the HILDA surveys available to us, 2001-2008, was a period of rapid mining expansion, which is the experience very likely to be replicated over 2011-2020. This implies that the use of HILDA for the period of its availability will have implications which could be quite similar in mining employment terms for the MCA job loss predictions in the next decade.

An important caveat should be acknowledged with respect to the use of the HILDA mining sector employment data: the sample sizes involved in the exercises are very small, particularly in comparison with those usually associated with unit record data set analyses. This means that the results of the exercises following should be considered to be illustrative rather than definitive.

4(ii) Using HILDA to Estimate Cumulative Job Separations

With HILDA we are able to estimate what is known as a "hazard/survival function", which is a formal statistical method of illustrating in probabilistic terms the cumulative likelihood of individuals remaining in or leaving defined states, such as mining sector jobs. In the context of this study, the method used is a survival function and refers to the probability of remaining in mining sector employment over time.

Technically the survival takes the form:

$$E = Ae^{-\gamma t}$$

where *E* is the employment outcome; γ is the rate of decline of the probability of remaining in the mining sector; *A* is a constant; and *t* is the time dimension. With this formulation, the corresponding survival function estimated for those remaining in mining sector employment from 2001 to 2008 using HILDA is as follows:

$$E = 0.9237e^{-0.185t}$$

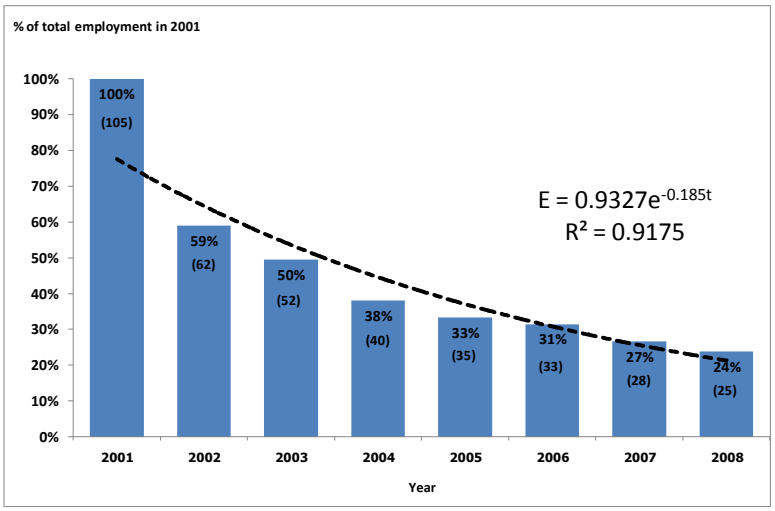
The data and the corresponding survival result[8] are illustrated in Figure 4, in which initially (2001) there were 105 persons employed in the mining sector. The columns show the numbers of this initial group remaining in mining each year; for example only 62 of the initial

[7] We define "mining sector" in accordance with the Australian and New Zealand Standard Industrial Classification.

[8] The t-test on γ showed that the coefficient is significantly different to zero at the 99 per cent level, which means that there is less than 1 chance in 100 that this result is a statistical accident.

group were also employed in mining in 2002, and this number fell consistently until 2008 when 25 of the original cohort were still recorded as being employed in the mining sector. In other words, the probability of remaining employed in the sector after one year is about 59 per cent, and falls to about 25 per cent by the end of the eight year period. The function estimated to fit these data is the broken line shown in the figure and should be interpreted as the cumulative employment probability of remaining employed in mining over the period.

Figure 4
Proportion of Remaining Mining Employment from the 2001 HILDA Cohort

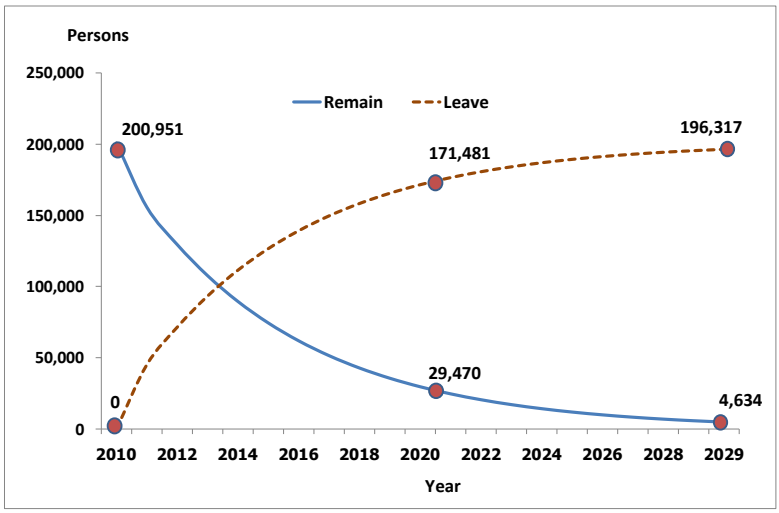


The striking result from Figure 4 is how large the outflows from the mining sector employment are with respect to the same individuals over quite a long period of time. It is reassuring in a research sense that these findings are quite consistent with the main inferences drawn above from the ABS gross flows data. Further, with the imposition of some uncontroversial assumptions, the results of the econometric exercise can now be used to highlight the likely extent of mining sector outflows for the economy as a whole.

4(iii) The Meaning of the HILDA Survival Estimation for Aggregate Flows Analysis of Mining Employment

It is credible and interesting to use ABS mining employment stock data of a recent period (we have chosen November 2010 when there were 200,951 mining sector employees) together with the HILDA survival function result to project hypothetical numbers of employees who will remain in the sector in the future. The reverse side of this coin of course involves projections of the numbers of employees who will leave the sector overtime. The assumptions imposed for this exercise are that the estimations obtained from HILDA are applicable to the mining sector as a whole, and that the 2001-08 mining sector experience modelled with HILDA is similar in essence to mining employment changes over the post- 2011 period. The results of these exercises are shown in Figure 5.

Figure 5
Projections of Mining Employees Who Will Leave/Remain in the Sector*



*Mining employment data are from ABS Catalogue 6291.0.55.003 (November 2010)

Our hypothetical projections imply that, with no changes to carbon pricing policy, of the November 2010 200,951 mining employees, 29,470 only would remain employed in the sector by 2020. Further, by using an extrapolation at the tail of the survival function, the method projects that only 4,634 of the original 200,951 employees would still be working in the mining sector by 2029. This means that about 85 per cent of 2011 mining employees will leave the sector by 2020 and 97 per cent will not be employed in mining in 2020[9]. Given that the MCA analysis implies roughly an additional increase in outflows of 2,351 per year over the 2011 period in the event of the 2009 ETS, this translates to about 4.5 and 3.3 per cent of on-going mining sector outflows and inflows respectively.

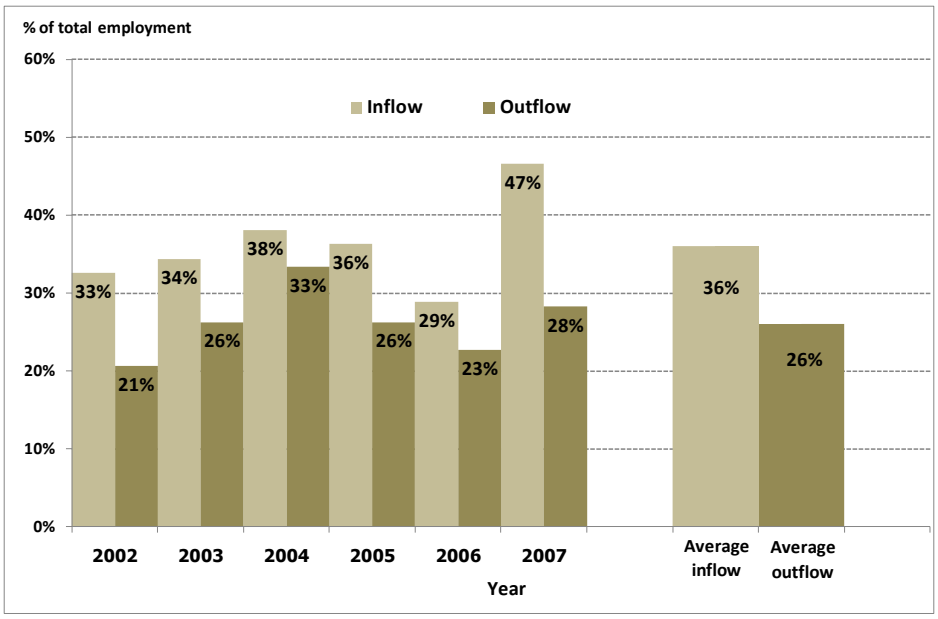
Thus projections shown in Figure 5 reinforce the evidence from all other aspects of the exercises of this paper, which is that the big story with respect to the labour market effects of policy lies in the extraordinary extent of flows. By implication very little importance should be given to changes in the job stock figures as a result of the 2009 ETS suggested policy reforms.

4(iv) HILDA Mining Sector Annual Inflows and Outflows, 2001-08

Importantly the HILDA data provide information not only concerning the annual probabilities of employees remaining in and leaving mining after 2001, but also with respect to annual inflows to, and outflows from, mining for the 2001-08 period. As part of a check on the comparability of the ABS gross flows and HILDA surveys we are able to calculate these data for the latter. This involves examining the proportion of a given year's mining employment with the numbers of employees who in this year: found employment in the mining sector and in the previous year were not employed in mining (inflows); and, those who were not in a given year employed in the mining sector but had been in the previous year (outflows). The results are shown in Figure 6.

[9] We stress that these are the results from exercises reflecting a non-carbon pricing world.

Figure 6
Employment Inflows and Outflows from Mining, HILDA 2001-2008



The data from Figure 6 can be explained as follows using as an example the year 2002. The "inflows" figure of 33 per cent is the ratio of those taking up new mining employment in 2002 relative to the number of mining employees in 2002, and the "outflows" figure of 21 per cent is the ratio of those who were employed in mining in 2001 but not in 2002, relative to the number of mining employees in 2002.

It is clear from HILDA that, just as with the ABS monthly gross flows analysis, there is a very large movement of employees into and out of mining observed on an annual basis. From the HILDA exercises it can be seen that on average around 36 per cent of people employed in mining in a current year were not employed in mining the previous year (inflows), and about 26 per cent of those employed in mining in the previous year were not employed in mining in the current year (outflows). This suggests strongly that the supposed job losses from the 2009 ETS would have been dwarfed by the effects of natural attrition.

Again, and as with the aggregate ABS labour market information, HILDA reveals that there are extraordinary levels of labour mobility, in both inflow and outflow terms, with respect the mining sector. This suggests that notwithstanding the small sample sizes involved, the HILDA data set results are a useful addition to the more broadly-based gross flows data.

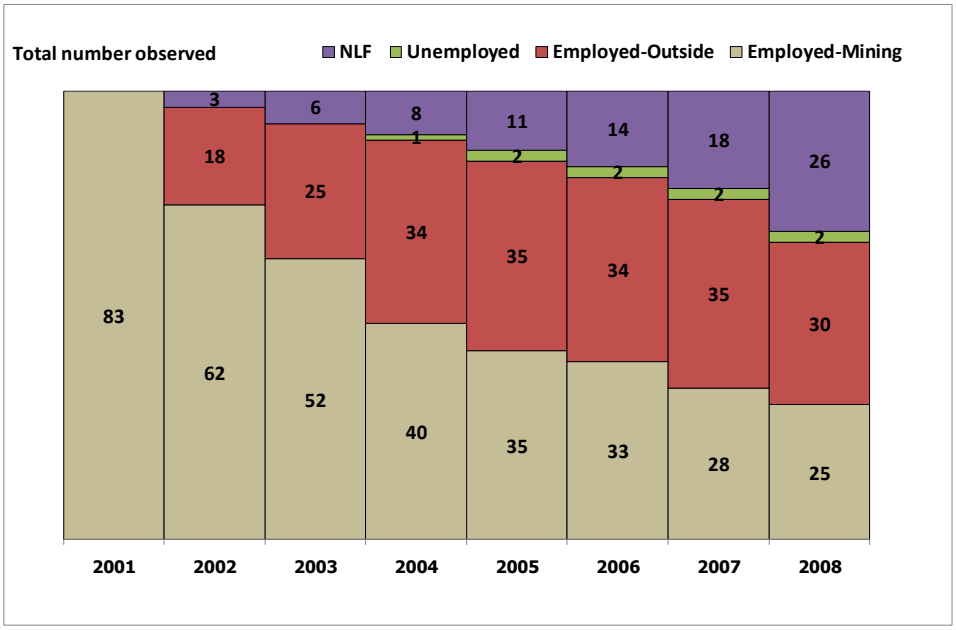
4(v) Where do HILDA Mining Sector Outflows Go?

The longitudinal nature of HILDA allows us also to determine the longer-term labour market situation of former mining sector employees. Unlike from the ABS gross flows data we are able to determine the situation of those initially employed in mining over quite a long period of time, in our case seven years[10]. This has been done by considering changes to the job

[10] Because we are interested in following the same individuals over the entire 2001-2008 period we have excluded from the analysis people who were not surveyed in all years. This number is around 20.

status of all the 83 employees in HILDA in the mining sector in 2001 who remained in the HILDA survey until 2008, with respect to the categories: employed in mining; employed but not in the mining sector; unemployed; and not in the labour force. These data are presented in Figure 7.

Figure 7
Labour Market Destinations of Mining Employees, HILDA 2001-08.



The data from Figure 7 reveal three clear facts: nobody who left mining after 2001 is unemployed when observed a year later; the vast majority of those leaving mining sector employment are employed in other jobs in all the years following; and an increasing number of people over the seven year period who left mining jobs eventually leave the labour force. As illustrations, of the 21 employees who left mining and are observed in the year after 2001, 18 were employed, 3 were not in the labour force and none were unemployed. By 2008 25 of the 83 originally employed in mining were still employed in that sector, 30 others were employed elsewhere, 26 had left the labour force and two only were unemployed.

Much more could be done with these data, such as determining the numbers who left the labour force for aged retirement, or to rear children, but the essential points about a lack of disadvantage for those leaving mining employment seems to be clear. This implies strongly that just about all those in the HILDA survey who left mining employment in the 2001-08 period did not end up in situations of high unemployment duration.

Conclusion

We have presented analysis of different data sets aimed at improving the understanding of, and putting into an aggregate economy context, the projected mining sector “job losses” as a result of the 2009 planned ETS. While the focus is on the ETS and mining, the illustrations apply to almost all public and political debate concerning the meaning of job loss projections from anticipated policy reform in an aggregate labour market context.

As is always the case in empirical economics there are some weaknesses with respect to all the surveys and methods used. Specifically: (i) the 2009 ETS is assumed to have no employment-creating effects as a result of behavioural change associated with the changes in relative prices that must accompany any carbon price reform policy; (ii) by necessity we have had to impose restrictive assumptions to allow simple comparisons to be made between two different policy regimes, and different assumptions in these areas could have been used; and (iii) the sample sizes available for analysis of mining employment flows from the HILDA survey are by necessity quite small.

Even so, a very clear and consistent message has come through the use of these disparate samples and methods. It is that the projected job losses from the ETS, particularly when considered over a 10 year time horizon, are in a statistical sense close to invisible with respect to employment and unemployment stocks, and trivial with respect to aggregate flows in the labour market. Also, it is apparently the case that with respect to mining sector employment the projected losses are a very small proportion of overall inflows to and outflows from mining. Further, it seems to be the case that those leaving mining in a period of growth are not then entering protracted periods, or perhaps any period at all, of unemployment.

Our results should not be taken to mean that that economic policy reform is costless to all employees who might be affected by sectoral changes in the labour market, and there remain clear roles for government to minimise the personal costs for those so affected.[11] As well, the details of this research cannot be translated into precise analyses of the employment effects of the carbon price policy being developed by the current government. But the essential points concerning the size and meaning of mining sector employment effects should not be in dispute.

[11] The compensation point is apposite for the debate concerning potential employment losses from the Murray Darling Basin Plan in which there are more likely to be displaced workers than is the case for mining. This is simply because the mining sector is expected to be growing strongly over the next decade and, as in shown in Figure 7, there do not appear to be displaced workers entering long term unemployment in such periods. This is less likely to be the case for employment changes from the Murray Darling Basin Plan.

References

Australian Bureau of Agricultural and Resource Economics (2010), "Assessing the regional impact of the Murray-Darling Basin Plan and the Australian Government's Water for the Future Program in the Murray-Darling Basin", Australian Government, Canberra.

Baldwin, J., Dunne, T. and Haltiwagner, J. (1998), "A Comparison of Job Creation and Job

Destruction in Canada and the United States", *Review of Economics and Statistics*, **80**: 347-56.

Blanchard, O.J. and Diamond, P. (1990), "The Cyclical Behavior of the Gross Flows of U.S. Workers", *Brookings Papers on Economic Activity*, **2**: 85-143.

Borland, J. (1996), "Job Creation and Job Destruction in Manufacturing Industry in Australia", *Economic Record*, **72**: 46-62.

Concept Economics (2009), *The Employment Effects in the Australian Minerals Industry from the Proposed Carbon Pollution Reduction Scheme in Australia,* A report prepared for the Minerals Council of Australia, Canberra.

Davis, S. and Haltiwagner, J. (1992), 'Gross Job Creation, Gross Job Destruction and Employment Reallocation', *Quarterly Journal of Economics*, **107**, 819-63.

Dixon, Robert, Freebairn, John and Lim. G. C. (2004), "An Examination of Net Flows in the Australian Labour Market", *Australian Journal of Labour Economics,* 8(1): pp. 25-42 (2005).

Foster, W. *and* Gregory, R. *(*1984*), '*A Flow Analysis of the Labor Market in Australia*', in* Blandy, R. *and* Covick, O. *(eds), Understanding Labour Markets in Australia. Allen & Unwin, Sydney:* 111–36*.*

Grafton, R. Quentin and Jian, Qiang (2010), "Economics of Drought, Water Diversions, Water Recovery and Climate Change in the Murray-Darling Basin", Centre for Water Economics, Environment and Policy, Crawford School of Economics and Government, Australian National University.

Hall, R.E. (2005), 'Job Loss, Job Finding, and Unemployment in the U.S. Economy Over the Past Fifty Years', *NBER Macroeconomics Annual*, **20**, 275-310.

Ponomareva, N. and Sheen, J. (2010), "Cyclical Flows in Australian Labour Markets", *Economic Record*, **86** (Supplement): 35-48.

The Climate Institute (2011), *Clean Energy Jobs in Regional Australia*, cleanenergyjobsmap.climateinstitute.org.au

Appendix

Gross Flows Including “Not in the labour force”