The Distributional Effects of the Australian Cash Bonus Payments

Response to the Global Financial Crisis

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Abstract

This paper uses HILDA survey data to analyse the distributional effects of the cash-payments to low and middle income individuals and families, received as part of the 2008/09 Australian fiscal response to the Global Financial Crisis (GFC). The total package amounted to 5% of GDP, and the cash-payments 2%. More than 80% of working-age Australians, and 90% of households, received payments worth 4-5% of income on average. First, I compare estimates of the GFC income shocks to the bonus payments received. Second, I use error component models to examine how the bonus payments were related to alternative components of income.

Introduction

Macroeconomic shocks can have large and uneven impacts across the population (Frankenberg, Smith and Thomas, 2003). In response to such shocks, governments may introduce temporary measures aimed at alleviating the macroeconomic effects of the shock, in addition to existing social assistance and welfare support policies.[1] Given the speed with which such responses are generally designed and implemented, it is worth asking how efficiently targeted and effective such measures are in counteracting the distributional effects of such shocks.

In response to the growing strength of the Global Financial Crisis (GFC) during 2008, the Australian Federal government introduced a $52B stimulus package, to be delivered over the 2008–2010 period. The total package, which amounted to about 5% of 2008 annual GDP, has been estimated to have roughly countered the recessionary effect of the GFC, and ensured Australia avoided recession in 2009.[2] A substantial component of the fiscal stimulus package consisted of one-off cash bonus payments to low and middle income individuals and families, announced and paid in two tranches during 2008/09. These cash-bonus payments totaled $21B, or 2% of GDP, and were widely distributed. For example, about 80% of working-age individuals, and over 90% of households, received some cash-bonus payment, worth 4-5% of annual income on average. Furthermore, about twice as many individuals and households received some public cash transfer payments (including cash-bonuses) in 2008/09 than either the previous or the following year, suggesting the cash bonus payments represented potentially windfall income for a large fraction of individuals and households.

[1] For example, in response to the Global Financial Crisis (GFC), the US provided a variety of tax credits and other measures under the Economic Stimulus Act (2008), the American Recovery and Reinvestment Act (2009), and the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act (2010).
[2] For example, see Barrett (2011); however, Makin (2010) argues that monetary policy and foreign demand were primarily responsible for counteracting the GFC effects on the Australian economy.

The focus of the paper is twofold. First, the paper examines the distributional impacts of the cash-bonus payments on both individual-level income, and household equivalised disposable income in 2008/09 and subsequent years. The analysis uses longitudinal data from the Household Income and Labour Dynamics in Australia (HILDA) survey, which collects detailed information on individual- and household-level income from various sources. In addition, in Wave-9, the HILDA survey collected information on cash-bonus payments to individuals and households separately from other welfare benefits received in 2008/09, which facilitates the identification and analysis of the impacts of the bonus payments. I first provide a descriptive analysis of the 2009 distribution of income with and without bonus-payments, and also trends in summary measures. I then use dynamic panel data models to predict what individuals (households) 2008/09 incomes would have been in the absence of the GFC and bonus payments. By comparing these predictions with their actual (non cash-bonus) income provides an estimate of the GFC income-shock for each individual (household). The contemporaneous impact of the bonus payments response to the GFC in 2008/09 is then assessed by comparing the distributions of the GFC income-shock and bonus-payments for the population as a whole, as well as subgroups. This analysis suggests the bonus-payments were comparatively effective, in aggregate, at counteracting the adverse effects of the GFC shock, and also well targeted to individuals and families on average.

The second aim of the paper is to assess whether the bonus-payments acted as insurance to counteract the individual-specific income-shock associated with the GFC.[3] For this analysis, I use error component models for individuals' (household's) non-bonus incomes and their 2009 bonus-payments to examine the extent to which the bonus-payments were

[3] For example, Blundell and Pistaferri (2003), Gruber (2000), Gruber and Yelowitz (1999), and Kniesner and Ziliack (2002), provide empirical analyses of the redistributive effects of alternative tax and transfer programmes, focusing on the insurance effects in terms household consumption and saving. In contrast, I focus more directly on how the Australian bonus-payments acted to insure individual- and household-level income shocks associated with the GFC.

related to alternative observed, unobserved persistence or transitory, and the 2009 GFC-shock components of their incomes. Consistent with the results above, the results of this analysis find that around 60% of the variance in bonus payments to individuals, and over 90% of the variance in bonus payments to household, is attributed to the variance in GFC-income shocks, suggesting the bonus-payments were remarkably effective in counteracting the idiosyncratic GFC-shocks, particularly at the household level.

The paper is organized as follows. The next section provides some background on the cash bonus payments, and related literature. Section 3 describes the HILDA data, and discusses descriptive statistics and trends. Section 4 outlines the analytical frameworks used; the results are presented in section 5; and the paper concludes with a discussion.

2. Background and Literature Review

In response to the growing strength of the Global Financial Crisis (GFC) and its possible effects on the domestic economy, in late 2008 and early 2009 the Australian government announced a range of economic stimulus policies. These were announced and implemented in two main tranches. First, in October 2008, it announced a $10.4 billion 'Economic Security Strategy' (ESS), which included $8.7 billion of one-off payments to pension recipients and low-to-middle income families.[4] These consisted of tax-free lump-sum payments of $1,400 for single pension recipients and $2,100 for couples, $1,000 for those receiving the Carer Allowance, and $1,000 for each child of families receiving Family Tax Benefits (FTB-A). Eligibility for these payments was determined as at the ESS announcement date (14th October) and payments made during the middle of December.

Second, in February 2009, the Australian government announced a $42 billion 'Nation Building and Jobs Plan' (NBJP), which included $12.2 billion of one-off payments to

[4] In addition, this ESS included $1.5 billion of additional support for first home buyers, and $0.2 billion funding for jobs and training.

low-to-middle income individuals.[5] This consisted of tax-free lump-sum *Tax-bonus for Working Australians* payments of $900 to those earning less than $80,000, $600 to those earning between $80,000 and $90,000, and $250 to those earning between $90,000 and $100,000.[6] Eligibility for these payments was determined by an individual's 2007/8 income tax return, and were typically made between April and June 2009.[7] In addition, the NBJP included a *Back-to-school bonus* of $950 per child for low-to-middle income families receiving FTB-A, and a *Single-income Family bonus* of $900 per family to low-to-middle income families receiving FTB-B.[8]

Individuals and families could receive multiple bonus payments, both within each of the ESS and NBJP, and also across them. For example, a couple who were both earning $50,000 with two school aged children, would receive $1,900 in back-to-school bonuses and $900 tax-bonus each, so a total of $3,700 (3.7 percent of their family income). Cash-bonus payments were both widely distributed across the population and comparatively large. As we will see below, about 80% of working-age individuals, and over 90% of households, received some payments. The average bonus was about $1,600 among those receiving payments, and accounted for 4-5% of income on average.

The total GFC response package, including short and medium-term infrastructural investment, was substantial ($52B) accounting for about 5% of GDP, and the $21B of cash bonus component accounted for about 2% of GDP. In contrast to most developed economies, Australia avoided recession through the GFC period, experiencing only a single quarter of

[5] In addition, the NBJP included funding for short and medium term infrastructural building and construction projects.
[6] The announced amounts were $950, $650 and $300 respectively, but subsequently revised downwards by $50 per payment in February 2009.
[7] A person was eligible if they filed their 2007-08 tax return before 30 June 2009, with taxable income less than $100,000 and a positive tax liability, and were an Australian resident for tax purposes.
[8] FTB-A eligibility depends on family income and the number of children: eligibility for 1-child families extended up to about $100,000, and 3-child families up to about $125,000. FTB-B eligible families are single parents or couples where the primary earner's income was less than about $150,000, and the secondary earner's income less than about $20,000, both depending on the number of children.

negative GDP growth in first quarter 2009. Macroeconomic analysis suggests that the fiscal stimulus package largely counterbalanced the adverse effects of the GFC on GDP, and prevented a recession in 2009 (Barrett, 2011, and references within). However, Makin (2010) argues that a combination of foreign demand effects and Monetary Policy easing was primarily responsible for countering the recessionary impacts of the GFC. Leigh (2012) analysed households' response to the bonus payments, using a survey of households, conducted in June 2009, which asked respondents if they received a bonus payment and, if so, what they did with the payments. Consistent with the government's objective, Leigh finds that a large fraction of households (40%) spent the cash-bonus, while a further 35% used it to reduce their debt obligation (the remaining households saved the payments).

3. Data

We use data from Release–12 of the Household Income and Labour Dynamics in Australia (HILDA) panel survey, collected in 2001–2012. The HILDA survey is conducted annually from August, and collects current information at the time of the survey as well as retrospective information dating back to July of the previous year. There are on the order of 10,000 working age individuals annually in the HILDA survey up until 2010. In 2011, a refresher sample was added to the HILDA sample which resulted in there being over 13,000 working-age individuals in 2011 and 2012. All of the analysis presented will be based on unbalanced samples, in which I use all individuals observed in a year, or a pair of years in the case of longitudinal modelling.

The primary focus of interest is individual annual income of working-age individuals (aged 18-65), and the equivalised household disposable annual incomes of those individuals,

where the annual income period corresponds to the Australian tax-year to the end of June.[9] We will use the June-year to refer to the July-June annual period – e.g. we refer to annual income from the 2008/09 financial year as "2009" income, which is collected in the 2009 HILDA survey or wave-9. The HILDA survey collects information about various components of income (e.g. earnings, benefits, etc) and taxes paid for individuals' and households' over the previous July – June fiscal year. In 2009 (wave 9), the survey also specifically collected information on the fiscal stimulus related cash-bonus payments received during the 2008/09 fiscal year, separately from other government transfer payments. In the analysis, I will make a distinction between the 2009 individual and household incomes, including (i.e. total) and excluding cash-bonus payments.

3.1 Descriptive Statistics and Summary Trends

Table 1 contains summary statistics of the samples over the three years 2008–2010, including the 2009 year of bonus-payments as well as the previous and following year. Over 97 percent of working-age individuals have positive total income in each of these three years (and typical of other years also), and almost all (99.6 percent or more) of those individuals' have positive household income. Average individual incomes (and equivalised household disposable incomes) showed a steady increase across the 3-years, although excluding the 2009 cash bonus income there was a dip in 2009 before recovering in 2010. This dip in ex-bonus average income is reflected in a drop in individuals' average earnings in 2009, before recovering in 2010, although the fraction of individuals who worked at some stage during the year increased very slightly in each year.

[9] Equivalised household disposable annual income is equal to total household disposable income divided by a household equivalisation factor, which I take as the square-root of the number of people in the household. For brevity, any subsequent use of the term 'household income' in the paper will refer to 'equivalised household disposable income'.

The table also shows the prevalence of cash bonus payments in 2009: 81 percent of individuals and 94 percent of households reported receiving a bonus payment. As a result, 84 percent of individuals and 95 percent of households reported transfer income (including bonus payments) in 2009, compared to about 40-42 percent of individuals and 51-53 percent of households in adjacent years. The cash bonus payments were also non-trivial: accounting for 5.7 percent of individuals' income on average, and 4.2 percent of household income.[10]

Table 2 presents more detailed descriptive statistics associated with the 2009 cash bonus payments for the full samples, and various demographic subsamples. In terms of individual incomes, females were 2.7 percentage points more likely to receive bonus payments than males, received about $240 more on average, and the payments contributed a larger fraction of their incomes (6.7 percent versus 4.4 percent). Stratifying by family status (single versus couple and with and without children), also shows the cash bonus payments were larger on average, both in absolute terms and relative to income, for individuals with children than those without. Roughly similar patterns are seen for household incomes, although the differences between males and females are more muted, while the differences by family status are perhaps more pronounced.

Figure 1 shows the trends over the 12-year period in two measures of income inequality, the standard deviation of log(income) and the Gini coefficient of income, for both individual income and equivalised household disposable income. The trends in both inequality measures suggest a slight U-shape pattern, centred around 2006, which is more pronounced for the standard deviation measure. Also, there is a noticeable increase in the standard deviation measure for both individual and household income in 2009; in contrast, the Gini measure increased marginally for individual incomes and fell for household income.

[10] Note, 45 percent of individuals received only cash bonus payment transfer income in 2009, and their average cash bonus payments was $900 (or 3.4 percent of their income). The average cash payments and transfer income among the other 39 percent who received transfer income was $2,260 and $10,060 respectively.

A simple measure of the (equalising) effect that the cash bonus payments had in 2009, is provided by calculating the inequality based on incomes excluding the cash bonus payments, and is shown by the dashed lines between 2008 and 2010. This shows that 2009 income inequality would have been noticeably lower in the presence of the cash bonus payments: inequality in individual incomes is 1.5–2 percent lower, and in household incomes 3–4 percent lower.[11]

4. Analytical Framework

4.1 Decomposing Income into GFC-shock and cash-bonus components

First, we focus on individual-*i*'s total income (alternatively, their equivalised household disposable income) in year-*t* (Y_{it}), where *t* will index the HILDA wave: *t=1, …, 12*, corresponding to waves 1–12 for the years 2000/01–2011/12. Importantly, we distinguish fiscal stimulus related cash-bonus payments (Y_{it}^{B}, which is equal to 0 in all years except 2009, i.e. *t≠9*) and other, non cash-bonus, income ($Y_{it}^{N} = Y_{it}$ if *t≠9*). Therefore, total income, $Y_{it} = Y_{it}^{N} + Y_{it}^{B}$. Note, Y_{it}^{N} and Y_{it}^{B} are each observed in the data.

Alternatively, to facilitate analysis in terms of log(income), let $\tilde{b}_{it} = Y_{it}^{B} / Y_{it}^{N}$ be *i*'s cash-bonus income as a fraction of their non-bonus income. Then,

$$Y_{it} = Y_{it}^{N} + \tilde{b}_{it} Y_{it}^{N} = Y_{it}^{N}\left(1 + \tilde{b}_{it}\right), \tag{1}$$

and expressed in log-terms, $\log(Y_{it}) = \log(Y_{it}^{N}) + \log\left(1 + \tilde{b}_{it}\right)$, or

$$y_{it} = y_{it}^{N} + b_{it}. \tag{1′}$$

[11] The patterns based on alternative inequality measures are broadly similar. However, the equalising effect of the 2009 cash bonus payments is larger using the coefficient of variation and Theil inequality measures (3–5 percent for individual incomes, and 4–7 percent for household incomes).

Conceptually, non-bonus income, $y_{it}^{N} = \log(Y_{it}^{N})$, can be decomposed as

$$y_{it}^{N} = y_{it}^{NC} + y_{it}^{NS},$$

where y_{it}^{NC} is *i*'s non-GFC counterfactual income – i.e. the income that they would have received in the absence of the GFC; and y_{it}^{NS} is *i*'s income-shock associated with the GFC.[12] Substituting this expression into equation (1′) for y_{it}, gives

$$y_{it} = y_{it}^{NC} + y_{it}^{NS} + b_{it}. \tag{2}$$

Although y_{it}^{N} and b_{it} are each observed in the data, neither y_{it}^{NC} nor y_{it}^{NS} are observed, and need to be estimated. To estimate these components, I assume that the GFC did not affect incomes before 2008/09 (wave *t=9*), and specify and estimate a simple dynamic panel data regression for individual incomes using HILDA data from waves 1–8 (i.e. before the GFC occurred). This model is then used to predict what individual-*i*'s income in 2008/09 would have been in the absence of the GFC, $\hat{y}_{i9}^{NC}$; and, based on this prediction, we estimate $\hat{y}_{i9}^{NS} = y_{i9}^{N} - \hat{y}_{i9}^{NC}$.

In particular, consider the standard first order dynamic panel data model with individual fixed-effects,

$$y_{it} = \gamma y_{it-1} + X_{it}'\beta + \alpha_i + u_{it}, \tag{3}$$

where X_{it} is a vector of individual observable variables that affect incomes, α_i is an unobserved individual income fixed effect, and u_{it} is an idiosyncratic component of income, assumed to be iid across individuals and time. As is well known for this model, the

[12] This implies $Y_{it}^{N} = \exp(y_{it}^{NC}) * \exp(y_{it}^{NS})$, so that, in levels, the GFC income-shock can be viewed as a multiplicative relative component.

parameters γ and β on the time-varying variables can be consistently estimated by first-differencing the model to eliminate α_i,[13]

$$\Delta y_{it} = \gamma \Delta y_{it-1} + \Delta X'_{it}\ \beta + \Delta u_{it}, \tag{4}$$

and then using y_{it-2} and/or previous lags as instruments for Δy_{it-1}, which is correlated with Δu_{it} in this differenced regression. In what follows, we use this approach to first estimate γ and β, and then use these estimates to predict the 2008/09 change in income in the absence of the GFC conditional on pre-2009 incomes and observed characteristics (X_{it}),

$$\Delta \hat{y}_{i9} = \hat{\gamma} \Delta y_{i8} + \Delta X'_{i9} \hat{\beta},$$

and thus obtain predictions of y_{i9}^{NC} and y_{i9}^{NS}, as

$$\hat{y}_{i9}^{NC} = y_{i8} + \Delta \hat{y}_{i9}, \text{ and } \hat{y}_{i9}^{NS} = y_{i9}^{N} - \hat{y}_{i9}^{NC}.$$

To examine the post-2009 dynamic impacts of the GFC we can also use the estimated model and $\hat{y}_{i9}^{NC}$ to predict counterfactual incomes beyond 2009, and compare these with actual incomes to infer the dynamic shocks:

$$\hat{y}_{it}^{NC} = \hat{y}_{it-1}^{NC} + \hat{\gamma} \Delta \hat{y}_{it-1}^{NC} + \Delta X'_{it}\ \hat{\beta}, \text{ and } \hat{y}_{it}^{NS} = y_{it}^{N} - \hat{y}_{it}^{NC} \ (t=10, 11, 12).$$

4.2 The Covariance Structure of Incomes and Cash-bonus Payments

Second, we explore the extent to which the bonus payments individuals received are related to persistent versus transitory differences in individuals' incomes. To do this, we adopt an error components model approach that first specifies individuals' non-bonus incomes in terms of observable characteristics, permanent versus transitory components, and then allows their 2009 cash-bonus payments to vary differentially with each of these components. This

[13] See, eg, Anderson and Hsiao (1981), Arellano and Bond (1991). Note that, in first-differencing the equation, any individual-specific time-invariant observable variables in X_{it} are eliminated as well as α_i.

model is then applied to, and estimated from, the covariance structure of individuals' 2009 cash-bonus income and their non-bonus incomes over the 2001–2012 sample period.

In particular, we consider various error components models for individuals' non-bonus (y_{it}^N) and their 2009 cash-bonus (b_{i9}) incomes over the period. These models have the following form:

$$\begin{aligned} y_{it}^N &= X_{it}' \beta^N + \delta_{\alpha t}\alpha_i + \delta_{\varepsilon t}\varepsilon_{it} + s_i\,(t=9) + u_{it}; \quad t = 1,...,T = 12 \\ b_{i9} &= X_{i9}' \beta^b + \lambda_\alpha \delta_{\alpha 9}\alpha_i + \lambda_\varepsilon \delta_{\varepsilon 9}\varepsilon_{i9} + \lambda_s s_i + u_{i9}^b \end{aligned} . \qquad (5)$$

In this specification, individual incomes consist of the following mutually orthogonal components: X_{it}' is a vector of socio-economic variables that affect income, α_i is a person-specific permanent component of error (i.e. unobserved income: $\alpha_i \sim (0, \sigma_\alpha^2)$), $\varepsilon_{it} = \rho\varepsilon_{it-1} + \nu_{it}$ is a serially correlated transitory component assumed to follow a stationary AR(1) process ($\nu_{it} \sim (0, \sigma_\nu^2)$), s_i is a shock associated with the 2009 GFC ($s_i \sim (0, \sigma_s^2)$), and u_{it} is a purely transitory component that captures classical measurement errors and other idiosyncratic effects ($u_{it} \sim (0, \sigma_u^2)$). In order to allow the variance of incomes to vary over time, we include factor loadings on each of the permanent ($\delta_{\alpha t}$) and AR(1) error ($\delta_{\varepsilon t}$) components; for identification, we will normalise the year-1 loading factors to 1 – i.e. $\delta_{\alpha 1} = 1$ and $\delta_{\varepsilon 1} = 1$. The specification for 2009 bonus incomes allows bonus incomes to vary with the same vector of socio-economic variables, and differentially with each of the (unobserved) permanent, serially correlated and GFC-shock components of income, according to the parameters ($\lambda_\alpha, \lambda_\varepsilon, \lambda_s$); and we also include an idiosyncratic random component ($u_{i9}^b \sim (0, \sigma_{ub}^2)$). Since the bonus payments were targeted at low-middle income earners and

those with children, we expect each of the parameters that specify how bonus payments vary with income ($\lambda_\alpha, \lambda_\varepsilon, \lambda_s$) to be negative.

The parameters of the error components model are identified by assuming that the observed and each of the unobserved components are mutually orthogonal. Together with the year-1 normalised factor loadings, we can identify the model and estimate the parameters $(\sigma_\alpha^2, \sigma_\varepsilon^2, \rho, \sigma_s^2, \sigma_u^2, \lambda_\alpha, \lambda_\varepsilon, \lambda_s, \sigma_{ub}^2, \delta_{\alpha 2}, ..., \delta_{\alpha T}, \delta_{\varepsilon 2}, ..., \delta_{\varepsilon T})$.[14] First we estimate regressions for individuals' non-bonus income over the 12-year pooled samples, and their 2009 bonus-income, to obtain the contributions of the observed variables.[15] We then use the variance-covariance matrix of the estimated regression residuals as the basis for estimating the unobserved components of the error components model. We estimate three model specifications contained within this general framework: the first model restricts the factor loadings on both the permanent and AR(1) error components to be 1 in all years; the second allows the permanent component variance to time-vary by allowing factor loadings ($\delta_{\alpha t}$); and the third also allows time-varying factor loadings on the AR(1) component ($\delta_{\varepsilon t}$).

Each of the error component models are estimated using two-step minimum distance estimation to minimise the weighted difference between the empirical variances and covariances of the regression residuals, and their model-predicted counterparts, using the inverse variances of the estimated variances and covariances as weights.[16]

[14] Note, that $\sigma_\varepsilon^2 = \sigma_v^2 / (1-\rho^2)$.

[15] Analogous analysis is also conducted using individuals' equivalised household disposable non-bonus incomes together with their 2009 equivalised household disposable bonus incomes.

[16] See Abowd and Card (1989) and Chamberlain (1984) for minimum distance methods, and Altinji and Segal (1996) for finite sample problems with optimal minimum distance estimation.

5. Results

5.1 Dynamic effects of the GFC-shock and Cash-bonus components

We begin by examining the distributional impact of the GFC and bonus payments on 2009 incomes for the full sample and subsamples stratified by gender, family status and transfer receipt described previously. To do this, Table 3 presents averages of actual 2009 total and non-bonus log(income), and the changes relative to 2008, and compares these to the counterfactuals based on the dynamic model described in section 4.3.

For the full sample and consistent with the summary statistics in Table 2 based on income levels, bonus payment accounted for 5.6 percent of 2009 individual incomes and 4.3 percent of equivalised household disposable incomes on average. Excluding bonus payments, 2009 individual log(income) was 1.6 percent lower than 2008 log(income). By contrast, the average individual counterfactual log(income) (10.56) implies that in the absence of the GFC log(incomes) would have increased by 4.7 percent from 2008. Also, based on these estimates, the average income shock associated with the GFC was -6.3 percent (the average difference between non-bonus and counterfactual log(incomes)),[17] and the overall effect net of the cash bonus payments was -0.7 percent (the average GFC shock plus average bonus payments). Broadly similar, though more muted effects, are estimated for log(equivalised household disposable income): excluding bonus-payments, on average there was a marginal (0.4 percent) increase, compared to an increase of 3.7 percent for counterfactual incomes, implying an average GFC shock of -3.3 percent and net of-bonus effect of 1.0 percent.

[17] Note, to the extent general equilibrium effects associated with the bonus payments were at work within 2009, the observed non-bonus incomes are likely to overstate income what would have been received in the absence of the cash-payments, and consequently the GFC income shocks will be underestimated. In this case, these estimates can be interpreted as lower-bound estimates.

Figure 2 presents the average bonus income, estimated shock, and net effect of the GFC shock and bonus income (calculated as the sum of these two components), stratified by the percentiles of the non-bonus income distribution in 2009. For both individual incomes and household incomes, there is a distinct negative correlation between the bonus payments and income shocks. As expected, the average bonus income declines gradually across the distribution, from about 10% in the lower percentiles; while the average estimated income shock is relative large (and negative) in the lowest percentiles, and gradually declines and in fat is positive across the higher range of the distribution. Particularly for household income, the net effect is roughly zero over much of the distribution: the exception is that it is negative in the lowest 5-10 percentiles, and positive in the top quartile.

These aggregate results are consistent with macroeconomic analyses (e.g., Barrett, 2011) that the cash bonus payments largely counteracted the adverse shock of the GFC and stabilised the economy in 2009. To assess how well targeted the cash-bonus payments were, I next examine the relative impacts of the GFC and cash-payment responses across different population subgroups. First, columns 2 and 3 in Table 3 present the actual and counterfactual log(income) averages for males and females respectively. These show similar falls in 2009 actual non-bonus individual incomes (1.5 – 1.8 percent), and increases in counterfactual income (4.5 – 4.8 percent), resulting in similar average GFC income shocks of -6.0 for females and -6.6 percent for males. However, the much larger relative cash-bonus payments to females (7.4 percent versus 3.8 percent for males) resulted in quite different average net effects of the GFC of +1.4 percent for females versus -2.8 percent for males. In contrast, panel B of Table 3 shows much closer effects of the GFC net of cash-bonus payments for males and females at the household level, due to the household bonus incomes being more similar for males and females.

Second, columns 4 – 7 in Table 3 present summaries of population subgroups stratified by family status, according to whether the household has one or more adults, and any children. In terms of individual incomes, the average non-bonus incomes of single adults and those in couple households all fell by about 1.8 percent in 2009; in contrast, the non-bonus income of single parents actually increased by 2.1 percent.[18] In the absence of the GFC, counterfactual incomes were predicted to increase by between 4.0 percent (couple-adults) and 6.5 percent (single parents), resulting in predicted GFC shocks of between -7.8 percent (single adults) and -4.4 percent (single parents), and a wide range of net effects from -4.3 percent (single adults) to +7.2 percent (single parents). In terms of household incomes, the results tend to be closer across the subgroups, but still show single adults experienced large GFC shocks on average that were only partially counterbalanced by cash-bonus payments.

In order to consider the possible longer run effects of the GFC on incomes I next extend the counterfactual predictions from the dynamic models beyond 2009. The results from this exercise are summarised in Table 4. The full sample patterns suggest that, although the incomes recovered after the 2009 GFC, the rate of growth was noticeably slower than prior to 2009.

5.2 Error Components Models

I now turn to the question of to what extent the cash-bonus payments were related to alternative components of individuals and household incomes over time, the analysis of which is based on error component models of non-bonus and bonus incomes. I begin by discussing the empirical variance-covariance structures of total (i.e. not regression-adjusted)

[18] The sample size of the single parent subgroup in particular is relatively small, suggesting the estimated effects for that group is relatively noisy.

non-bonus income in each year (y_{it}^{N}) and their 2009 cash-bonus income (b_{i9}), which are presented in Table 5. These estimates and our analysis are based on the unbalanced panels. In the table, the variances of y_{it}^{N} and b_{i9} are presented in bold down the main diagonal, the covariances between y_{it}^{N} and y_{is}^{N} (and between y_{it}^{N} and b_{i9}) below the diagonal, and the associated correlations above the diagonal. The sample means are presented at the bottom of the table. Also, the estimated standard errors of the means, variances and covariances are presented in parentheses below each estimate, and the pairwise sample sizes in square brackets below the relevant correlation (or means, in the case of the variances). The broad patterns for individual incomes and household equivalised disposable incomes are similar, allowing for scale differences in the income measures.

First, although the income variances vary over time, there does not appear to be a systematic trend in these: the variances of individual log(non-bonus income) range between 0.94 (in 2006) to 1.18 (in each of 2001 and 2011); for household log(income), the range is from 0.33 (in 2006) to 0.41 (in 2009). In addition, the variance of log(income) is roughly 10 percent higher in 2009 than either 2008 or 2010, consistent with the patterns in figure 1 and suggesting a possible increase in inequality associated with the GFC, although this may be due to year-to-year random variability.

Second, the first-order autocorrelation in non-bonus incomes is on the order of 0.7 (range 0.67 – 0.76 for individual incomes and 0.63 – 0.75 for household incomes), and the autocorrelations decline steadily to 0.36 for individual incomes and 0.37 for household incomes between 2001 and 2012. These patterns in the autocorrelations suggest a combination of persistent and transitory factors characterise the income processes, which the error components model above describes.

Third, the estimated variance of bonus income is small compared to non-bonus income, although the estimates imply that the standard deviation of bonus income is 10-15 percent of 2009 non-bonus income. Fourth, the correlations between the 2009 bonus income and non-bonus income in any year are always negative, and stronger for household equivalised income measure than individual incomes. The negative correlation is largest for 2009 non-bonus incomes (-0.45 for individual income, and -0.62 for household equivalised income), and declines steadily and roughly symmetrically away from 2009: the correlation between 2009 bonus and 2001 non-bonus incomes is -0.19 for individual incomes, and -0.24 for household incomes. These patterns of negative correlations, and stronger correlations for the household equivalised measure, are consistent with the cash bonus targeted to low and middle-income earners and families; while the declining correlations away from 2009 suggest the cash bonus payment was related to both persistent and transitory characteristics of the individual and household incomes.

I turn next to the results of the error components models, which are based on the residuals from regressions of annual non-bonus income (and 2009 bonus income, separately) on a set of observed sociodemographic characteristics of individuals and households. These characteristics consist of dummy variables for married and female, a quadratic in age, and the numbers of children in the household aged 0-4 years, 5-9 years, 10-14 years, and 15-17 years. The R^2's for the regressions of individual log(income) and bonus payments are 0.16 and 0.08 respectively, and for household income and bonus payments, the R^2's are 0.10 and 0.10.

We estimate three models for each of the individual and household log(income) measures. The first model restricts each of the error components to have constant variances over the sample; the second model relaxes this restriction for the permanent component of error by including a factor loading for each year; and the third model further allows the

AR(1) component of error to have a time varying factor loading. The estimates from the error component models are presented in Table 6.

Although relaxing each of these restrictions is important in terms of the statistical fit of the models, none of the models satisfy a formal goodness of fit test at conventional statistical levels. However, the models provide a reasonable fit to the patterns in the empirical covariance matrices described above, and the basic results across these three models are similar. First, the estimates imply each of the income components are important in characterising non-bonus incomes. The variances of the permanent and purely transitory components are similar in magnitude, while the AR(1) component has a somewhat larger variance and also a relatively high degree of serial correlation which also generates significant persistence in income differences. Also, in each of the models there is a substantial and statistically significant estimated variance of a 2009 idiosyncratic GFC shock, on the order of 0.08 – 0.10 for individual incomes and 0.04 – 0.05 for household incomes. This is consistent with the relative magnitude of the 2009 non-bonus income variance in the covariance structures.

Second, the loading parameters on the non-bonus income components in the 2009 bonus income equation are each negative and statistically significant. The coefficient on the GFC-shock (λ_s) is much larger (around -0.3) than the coefficients on the permanent component (λ_α, about 0.06) which, in turn, is larger than the coefficient on the AR(1) component (λ_ε, about 0.02 – 0.03). These estimates suggest the variation in 2009 bonus income was substantially more responsive to GFC shocks than persistent differences in individual and/or household incomes. The estimated variance of the pure noise component of bonus income (σ_{ub}^2) is about 0.003 but statistically insignificant for the individual income models, and estimated to be zero in the household income models.

To provide a better sense of the model estimates, in Table 7 I present various predictions of the three models for the 2009 non-bonus and bonus incomes. I will focus attention on the predictions of model 3, although the predictions across the models are similar. The predicted variances from this model closely match the empirical variances of the regression-adjusted residual incomes: 0.99 versus 1.02 for individual incomes, and 0.38 versus 0.39 for household incomes. For individual incomes, 32% of the estimated variance is permanent, 36% is due to the AR(1) component, 8% to the estimated GFC shock, and 24% purely transitory noise; while, for household incomes, 40% is permanent and 28% AR(1) persistent, 10% to the GFC shock, and 22% pure noise. In terms of the bonus incomes, each model correctly predicts the variance. Of more interest, is that the model predicts that only 11% of the variance in individuals' bonus income is related to either the permanent and/or AR(1) component of non-bonus income, with about two-thirds attributed to the GFC income shock, and the remaining 24% associated with transitory factors. For household incomes, only 9% is associated with permanent and transitory non-bonus income effects, and the remaining 91% associated with the GFC income shock.

In summary, the bonus payments were (negatively) correlated with non-bonus incomes in all years, and substantially more correlated in 2009. In addition, the correlations were stronger in household equivalised incomes than individual incomes. These two patterns suggest that bonus payments did target lower income earners and families with children. Furthermore, the error component model results suggest that the 2009 bonus income payments were remarkably effective at counterbalancing the negative GFC income shocks correlated with non-bonus incomes.

6. Concluding Discussion

The analysis in this paper has focused on the impact of the cash-bonus payment components of Australian federal government's fiscal response to the Global Financial Crisis in 2008/9. The cash bonus payments totaled about 2 percent of GDP in 2008/9 fiscal year, and accounted for around 5 percent of individual and household incomes. The paper also examined the extent to which the bonus payment received by individuals and households were related to alternative (permanent, transitory and GFC-shock) components of income.

The analysis suggests that, in the absence of these fiscal responses, the GFC would have caused individuals and households would have experienced significant adverse income shocks. For example, the simple dynamic model predictions suggest the average GFC income shock was on the order of 6 percent of individual incomes and 3 percent of equivalised household disposable incomes, while the error component models imply there would have been a significant increase in income inequality as measured by the variance or standard deviation of log(incomes). The results of each of these analyses imply that the cash-bonus payments received by individuals and households roughly balanced the adverse GFC income shocks. In addition, the error components model estimates show that the variance in cash bonus payments was most strongly correlated with the 2009 GFC income shock. Thus, as well as counteracting the macroeconomic effects of the GFC on the Australian economy, the 2009 Australian cash bonus payments appear to have been relatively effective in counteracting the transitory GFC income shocks to individuals and their households.

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Table 1: Descriptive Statistics on HILDA Incomes and Bonus Payments

	2008	2009	2010
A: Individual-level Income summary statistics			
Fraction with:			
(Income>0)	0.977	0.973	0.972
(Earnings>0)	0.804	0.805	0.806
(Transfers>0)	0.418	0.843	0.397
(Cash-bonus>0)		0.808	
Conditional average:			
Total income	$50,065	$50,412	$50,941
Earnings	$41,882	$41,294	$42,613
Transfer income	$7,933	$5,181	$8,400
Bonus income		$1,605	
Bonus/Total Income		0.057	
B: Individual-level Equivalised Household Income summary statistics			
Fraction with:			
(Income>0)	0.996	0.996	0.997
(Transfers>0)	0.525	0.953	0.511
(Cash-bonus>0)		0.936	
Conditional average:			
Eq HH Total income	$63,113	$63,952	$64,499
Eq HH Disposable	$52,171	$53,551	$53,953
Eq HH Transfer	$3,763	$5,046	$3,918
Eq HH Bonus		$1,489	
Bonus/Eq HH Total Income		0.039	
Bonus/Eq HH Disposable Income		0.042	
Number of Individuals	9,979	10,506	10,651

Notes: Data from HILDA Release-12. Samples selected on the basis of working-age individuals (aged 18-65), and any households containing such individuals. All estimates weighted by the Household responding person weight (hhwtrp). All incomes adjusted using CPI, and expressed in December 2008 dollar values.

Table 2A: 2009 Fiscal-Stimulus Bonus Payments Descriptive Statistics – Individual Incomes

		By Gender:		By family status:				By Transfer receipt:			
	All	Males	Females	Single	Single w/ Kids	Couple	Couple w/ Kids	No Transfer income	Bonus income only	Non-bonus Transfer only	Bonus & Other Transfer
A: Individual-level Incomes, Working-age individuals											
Fraction:											
Income>0	0.973	0.980	0.967	0.988	1.000	0.957	0.988	0.855	0.997	1.000	0.993
Any Transfers	0.843	0.829	0.858	0.843	0.984	0.793	0.899	0	1	1	1
Bonus Income	0.808	0.794	0.821	0.786	0.977	0.748	0.878	0	1	0	1
Average:											
Total Income	$50,412	$61,564	$39,226	$51,138	$48,951	$48,037	$53,307	$65,308	$57,766	$16,107	$39,009
Transfer income	$5,181	$4,300	$6,023	$3,619	$21,868	$3,244	$6,470	---	$896	$6,488	$10,413
Bonus income	$1,605	$1,484	$1,721	$1,007	$4,613	$1,006	$2,170	---	$896	---	$2,492
Bonus Income as fraction of:											
Total Income	0.057	0.044	0.069	0.033	0.111	0.034	0.087	0	0.034	0	0.112
Transfer income	0.678	0.712	0.645	0.759	0.265	0.792	0.559	---	1	0	0.342
No. Individuals	10,506	5,032	5,474	1,435	373	4,553	4,145	1,592	4,714	353	3,847
Population/Fraction	13.9m	0.497	0.503	0.102	0.027	0.491	0.379	0.157	0.449	0.036	0.359

Notes: Data from HILDA Release-12. Samples selected on the basis of working-age individuals (aged 18-65), and any households containing such individuals. All estimates weighted by the Household responding person weight (hhwtrp). All incomes adjusted using CPI, and expressed in December 2008 dollar values.

Table 2B: 2009 Fiscal-Stimulus Bonus Payments Descriptive Statistics – Individuals' Equivalised Household Disposable Incomes

		By Gender:		By family status:				By Transfer receipt:			
	All	Males	Females	Single	Single w/ Kids	Couple	Couple w/ Kids	No Transfer income	Bonus income only	Non-bonus Transfer only	Bonus & Other Transfer
B: Equivalised Household Incomes, Working-age individuals											
Fraction with Household:											
Total Income>0	0.996	0.996	0.995	0.988	1.000	0.996	0.997	0.955	0.998	0.982	0.998
Transfer Income>0	0.953	0.948	0.958	0.843	0.990	0.951	0.983	0	1	1	1
Bonus Income>0	0.936	0.932	0.939	0.786	0.979	0.931	0.979	0	1	0	1
Average Equivalised Household:											
Total Income	$63,952	$65,632	$62,289	$51,138	$30,679	$71,646	$59,833	$98,453	$79,909	$31,969	$47,521
Disposable Income	$53,551	$54,707	$52,406	$42,464	$27,992	$60,279	$49,662	$75,047	$65,603	$28,551	$41,588
Transfer Income	$5,046	$4,726	$5,363	$3,087	$12,771	$4,064	$6,282	$0	$969	$7,171	$9,112
Bonus Income	$1,489	$1,450	$1,527	$801	$2,651	$1,145	$2,033	$0	$969	$0	$2,146
Equivalised Household Bonus Income as fraction of:											
Total Income	0.039	0.038	0.040	0.033	0.110	0.028	0.049	0	0.018	0	0.063
Disposable Income	0.042	0.041	0.044	0.035	0.114	0.030	0.054	0	0.020	0	0.067
Transfer Income	0.653	0.672	0.634	0.759	0.256	0.746	0.537	1	1	0	0.344
No. Individuals	10,506	5,032	5,474	1,435	373	4,553	4,145	552	4,731	181	5,042
Population/Fraction	13.9m	0.497	0.503	0.102	0.027	0.491	0.379	0.047	0.444	0.017	0.492

Notes: Data from HILDA Release-12. Samples selected on the basis of working-age individuals (aged 18-65), and any households containing such individuals. All estimates weighted by the Household responding person weight (hhwtrp). All incomes adjusted using CPI, and expressed in December 2008 dollar values.

Table 3A: 2009 Fiscal-Stimulus Bonus Payments Predictions – Individual Incomes

		By Gender:		By family status:				By Transfer receipt:			
	All	Males	Females	Single	Single w/ Kids	Couple	Couple w/ Kids	No Transfer income	Bonus income only	Non-bonus Transfer only	Bonus & Other Transfer
Actual log(income)											
2009 total	10.548	10.790	10.317	10.599	10.670	10.495	10.587	10.519	10.816	9.561	10.304
	(.010)	(.014)	(.014)	(.024)	(.033)	(.017)	(.016)	(.059)	(.010)	(.056)	(.014)
Ex-bonus	10.492	10.752	10.243	10.563	10.554	10.459	10.505	10.519	10.788	9.561	10.193
	(.011)	(.015)	(.015)	(.025)	(.036)	(.017)	(.018)	(.059)	(.011)	(.056)	(.016)
Change	-0.016	-0.018	-0.015	-0.019	0.021	-0.017	-0.018	0.061	-0.017	0.147	-0.048
	(.008)	(.011)	(.011)	(.021)	(.032)	(.012)	(.013)	(.044)	(.008)	(.066)	(.011)
Bonus/	0.056	0.038	0.074	0.036	0.116	0.036	0.082	0	0.028	0	0.111
Income	(.001)	(.001)	(.002)	(.003)	(.005)	(.002)	(.002)		(.001)		(.002)
Predicted log(income)											
2009 total	10.555	10.818	10.303	10.641	10.598	10.516	10.573	10.473	10.865	9.436	10.283
	(.011)	(.015)	(.016)	(.026)	(.038)	(.018)	(.018)	(.062)	(.009)	(.065)	(.017)
Change	0.047	0.048	0.045	0.059	0.065	0.040	0.050	0.015	0.059	0.023	0.041
	(.002)	(.003)	(.003)	(.005)	(.009)	(.003)	(.003)	(.011)	(.002)	(.017)	(.003)
GFC shock	-0.063	-0.066	-0.060	-0.078	-0.044	-0.056	-0.068	0.047	-0.077	0.124	-0.090
	(.009)	(.013)	(.012)	(.023)	(.036)	(.013)	(.014)	(.049)	(.009)	(.076)	(.013)
Net GFC	-0.007	-0.028	0.014	-0.043	0.072	-0.021	0.014	0.047	-0.049	0.124	0.021
	(.008)	(.012)	(.011)	(.022)	(.035)	(.013)	(.013)	(.049)	(.008)	(.076)	(.012)
No. Obs	8,189	3,857	4,332	1,200	316	3,336	3,337	865	3,857	209	3,258

Notes: Standard errors are in parentheses. GFC shock = predicted change – actual change (ex-bonus). Net GFC effect = GFC shock + Bonus.

Table 3B: 2009 Fiscal-Stimulus Bonus Payments Predictions – Individuals' Equivalised Household Disposable Incomes

		By Gender:		By family status:				By Transfer receipt:			
	All	Males	Females	Single	Single w/ Kids	Couple	Couple w/ Kids	No Transfer income	Bonus income only	Non-bonus Transfer only	Bonus & Other Transfer
Actual log(income)											
2009 total	10.749	10.783	10.717	10.467	10.163	10.871	10.723	10.946	10.968	10.187	10.461
	(.006)	(.009)	(.009)	(.021)	(.025)	(.010)	(.007)	(.024)	(.007)	(.050)	(.008)
Ex-bonus	10.706	10.743	10.672	10.430	10.045	10.844	10.667	10.933	10.945	10.167	10.384
	(.007)	(.009)	(.009)	(.022)	(.028)	(.010)	(.008)	(.025)	(.007)	(.050)	(.009)
Change	0.004	0.004	0.004	-0.062	-0.070	0.014	0.015	0.020	0.016	0.095	-0.024
	(.005)	(.007)	(.007)	(.020)	(.025)	(.008)	(.006)	(.020)	(.006)	(.051)	(.007)
Bonus/	0.043	0.040	0.045	0.037	0.118	0.028	0.056	0.013	0.024	0.020	0.077
Income	(.001)	(.001)	(.001)	(.003)	(.004)	(.001)	(.001)	(.001)	(.001)	(.002)	(.001)
Predicted log(income)											
2009 total	10.739	10.777	10.704	10.518	10.142	10.867	10.691	10.944	10.969	10.097	10.443
	(.007)	(.010)	(.009)	(.022)	(.026)	(.011)	(.009)	(.029)	(.007)	(.052)	(.009)
Change	0.037	0.037	0.036	0.026	0.027	0.038	0.039	0.032	0.040	0.025	0.035
	(.001)	(.001)	(.001)	(.003)	(.005)	(.001)	(.001)	(.004)	(.001)	(.007)	(.001)
GFC shock	-0.033	-0.034	-0.032	-0.088	-0.097	-0.023	-0.024	-0.012	-0.024	0.070	-0.058
	(.005)	(.008)	(.007)	(.021)	(.026)	(.008)	(.007)	(.022)	(.006)	(.054)	(.008)
Net GFC	0.010	0.006	0.013	-0.051	0.021	0.004	0.032	0.001	0.000	0.090	0.018
	(.005)	(.007)	(.007)	(.020)	(.024)	(.008)	(.006)	(.022)	(.006)	(.054)	(.007)
No. Obs	8,433	3,949	4,484	1,212	316	3,504	3,401	1,003	3,910	219	3,301

Notes: Standard errors are in parentheses. GFC shock = predicted change – Actual change (ex-bonus). Net GFC effect = GFC shock + Bonus.

Table 4A: 2009 Fiscal-Stimulus Bonus Payments Predictions – Individual Incomes

		By Gender:		By family status:				By Transfer receipt:			
	All	Males	Females	Single	Single w/ Kids	Couple	Couple w/ Kids	No Transfer income	Bonus Income only	Non-bonus Transfer only	Bonus & Other Transfer
2009: Nobs	8,189	3,857	4,332	1,200	316	3,336	3,337	865	3,857	209	3,258
Actual Change	0.040	0.020	0.059	0.016	0.137	0.019	0.064	0.061	0.010	0.147	0.062
	(.007)	(.011)	(.010)	(.020)	(.030)	(.011)	(.012)	(.044)	(.008)	(.066)	(.011)
Predicted Change	0.047	0.048	0.045	0.059	0.065	0.040	0.050	0.015	0.059	0.023	0.041
	(.002)	(.003)	(.003)	(.005)	(.009)	(.003)	(.003)	(.011)	(.002)	(.017)	(.003)
2010: Nobs	7,696	3,616	4,080	1,111	305	3,117	3,163	809	3,642	194	3,051
Actual Change	-0.024	-0.006	-0.043	0.047	0.014	-0.023	-0.049	0.038	-0.023	0.103	-0.051
	(.008)	(.012)	(.011)	(.020)	(.028)	(.014)	(.011)	(.041)	(.010)	(.075)	(.011)
Predicted Change	0.042	0.043	0.042	0.051	0.073	0.033	0.048	0.029	0.044	0.043	0.044
	(.001)	(.001)	(.001)	(.002)	(.004)	(.001)	(.001)	(.003)	(.001)	(.006)	(.001)
2011: Nobs	7,288	3,402	3,886	1,071	277	3,024	2,916	783	3,449	179	2,877
Actual Change	0.021	0.021	0.022	0.032	0.088	0.015	0.020	0.032	-0.010	0.215	0.045
	(.008)	(.012)	(.011)	(.018)	(.027)	(.014)	(.012)	(.036)	(.011)	(.067)	(.012)
Predicted Change	0.038	0.037	0.038	0.044	0.068	0.026	0.047	0.027	0.035	0.044	0.043
	(.001)	(.001)	(.001)	(.002)	(.002)	(.001)	(.001)	(.002)	(.001)	(.005)	(.001)
2012: Nobs	6,917	3,231	3,686	1,027	266	2,842	2,782	743	3,288	161	2,725
Actual Change	0.018	0.028	0.008	-0.001	0.105	-0.010	0.047	-0.001	0.003	-0.041	0.045
	(.008)	(.012)	(.012)	(.021)	(.026)	(.013)	(.013)	(.036)	(.012)	(.050)	(.012)
Predicted Change	0.035	0.035	0.035	0.039	0.061	0.022	0.045	0.027	0.031	0.039	0.041
	(.001)	(.001)	(.001)	(.002)	(.002)	(.001)	(.001)	(.002)	(.001)	(.004)	(.001)

Notes: Standard errors are in parentheses.

Table 4B: 2009 Fiscal-Stimulus Bonus Payments Predictions – Individuals' Equivalised Household Disposable Incomes

		By Gender:		By family status:				By Transfer receipt:			
	All	Males	Females	Single	Single w/ Kids	Couple	Couple w/ Kids	No Transfer income	Bonus Income only	Non-bonus Transfer only	Bonus & Other Transfer
2009: Nobs	8,433	3,949	4,484	1,212	316	3,504	3,401	1,003	3,910	219	3,301
Actual Change	0.046	0.043	0.049	-0.025	0.048	0.042	0.071	0.033	0.040	0.115	0.053
	(.005)	(.007)	(.007)	(.019)	(.023)	(.007)	(.006)	(.020)	(.006)	(.051)	(.007)
Predicted Change	0.037	0.037	0.036	0.026	0.027	0.038	0.039	0.032	0.040	0.025	0.035
	(.001)	(.001)	(.001)	(.003)	(.005)	(.001)	(.001)	(.004)	(.001)	(.007)	(.001)
2010: Nobs	7,974	3,720	4,254	1,126	305	3,312	3,231	955	3,710	205	3,104
Actual Change	-0.016	-0.019	-0.013	-0.011	-0.114	0.003	-0.033	0.004	-0.012	-0.030	-0.026
	(.005)	(.008)	(.007)	(.019)	(.028)	(.009)	(.006)	(.020)	(.007)	(.056)	(.007)
Predicted Change	0.035	0.035	0.036	0.030	0.025	0.036	0.037	0.034	0.035	0.033	0.036
	(.001)	(.001)	(.001)	(.001)	(.004)	(.001)	(.001)	(.001)	(.001)	(.004)	(.001)
2011: Nobs	7,561	3,497	4,064	1,083	277	3,210	2,991	902	3,529	191	2,939
Actual Change	0.029	0.029	0.029	-0.003	-0.038	0.041	0.030	0.046	0.010	0.095	0.043
	(.005)	(.007)	(.007)	(.017)	(.026)	(.008)	(.006)	(.019)	(.007)	(.047)	(.007)
Predicted Change	0.034	0.034	0.033	0.025	0.026	0.032	0.039	0.032	0.031	0.031	0.038
	(.000)	(.001)	(.001)	(.001)	(.004)	(.001)	(.001)	(.001)	(.001)	(.004)	(.001)
2012: Nobs	7,175	3,316	3,859	1,044	266	3,025	2,840	856	3,361	175	2,783
Actual Change	0.002	0.004	0.000	-0.048	-0.024	-0.008	0.032	-0.038	-0.016	0.014	0.037
	(.005)	(.008)	(.007)	(.020)	(.023)	(.009)	(.006)	(.018)	(.008)	(.042)	(.007)
Predicted Change	0.032	0.032	0.032	0.025	0.027	0.031	0.036	0.029	0.029	0.031	0.037
	(.000)	(.001)	(.001)	(.001)	(.004)	(.001)	(.001)	(.001)	(.001)	(.004)	(.001)

Notes: Standard errors are in parentheses.

Table 5A: Covariance Structure of Individual Incomes

	log(Non-bonus income) in Year												2009
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Bonus
2001	**1.176**	0.676	0.628	0.574	0.522	0.500	0.466	0.422	0.388	0.371	0.363	0.359	-0.188
	(.029)	[9,216]	[8,488]	[7,938]	[7,749]	[7,469]	[7,011]	[6,732]	[6,573]	[6,345]	[6,089]	[5,856]	[6,573]
2002	0.728	**1.108**	0.717	0.640	0.581	0.558	0.505	0.470	0.411	0.396	0.395	0.392	-0.175
	(.018)	(.026)	[8,784]	[8,156]	[7,918]	[7,612]	[7,150]	[6,856]	[6,709]	[6,486]	[6,230]	[6,003]	[6,709]
2003	0.654	0.723	**1.041**	0.729	0.667	0.629	0.575	0.520	0.450	0.439	0.439	0.434	-0.198
	(.016)	(.017)	(.023)	[8,622]	[8,247]	[7,909]	[7,412]	[7,115]	[6,938]	[6,699]	[6,447]	[6,217]	[6,938]
2004	0.592	0.636	0.725	**1.056**	0.723	0.663	0.616	0.558	0.483	0.473	0.454	0.448	-0.209
	(.015)	(.015)	(.017)	(.025)	[8,612]	[8,168]	[7,652]	[7,359]	[7,137]	[6,903]	[6,635]	[6,400]	[7,137]
2005	0.529	0.575	0.655	0.723	**1.016**	0.756	0.681	0.620	0.550	0.518	0.490	0.484	-0.219
	(.014)	(.014)	(.015)	(.017)	(.025)	[8,940]	[8,327]	[7,960]	[7,738]	[7,460]	[7,160]	[6,889]	[7,738]
2006	0.483	0.529	0.582	0.630	0.703	**0.935**	0.764	0.674	0.604	0.563	0.530	0.508	-0.251
	(.013)	(.014)	(.014)	(.016)	(.016)	(.021)	[8,891]	[8,404]	[8,130]	[7,822]	[7,521]	[7,212]	[8,130]
2007	0.468	0.492	0.548	0.602	0.645	0.700	**1.036**	0.737	0.650	0.613	0.575	0.555	-0.247
	(.015)	(.015)	(.015)	(.016)	(.015)	(.015)	(.026)	[8,838]	[8,466]	[8,143]	[7,828]	[7,499]	[8,466]
2008	0.423	0.461	0.499	0.546	0.598	0.612	0.706	**1.018**	0.726	0.662	0.613	0.580	-0.255
	(.014)	(.015)	(.014)	(.017)	(.016)	(.014)	(.016)	(.024)	[8,901]	[8,514]	[8,155]	[7,805]	[8,901]
2009	0.415	0.430	0.452	0.487	0.547	0.584	0.637	0.723	**1.160**	0.696	0.651	0.587	-0.452
	(.016)	(.016)	(.015)	(.015)	(.015)	(.014)	(.015)	(.017)	(.033)	[9,287]	[8,829]	[8,419]	[10,242]
2010	0.380	0.393	0.418	0.466	0.503	0.520	0.591	0.638	0.717	**1.065**	0.727	0.654	-0.289
	(.015)	(.014)	(.014)	(.015)	(.014)	(.013)	(.015)	(.016)	(.017)	(.027)	[9,434]	[8,924]	[9,287]
2011	0.381	0.397	0.426	0.445	0.480	0.506	0.544	0.576	0.655	0.701	**1.183**	0.727	-0.266
	(.016)	(.016)	(.015)	(.016)	(.014)	(.014)	(.015)	(.014)	(.015)	(.016)	(.025)	[12,209]	[8,829]
2012	0.379	0.400	0.432	0.459	0.491	0.488	0.543	0.570	0.602	0.642	0.786	**1.151**	-0.229
	(.018)	(.018)	(.017)	(.018)	(.016)	(.015)	(.016)	(.016)	(.016)	(.016)	(.016)	(.025)	[8,419]
2009	-0.025	-0.022	-0.024	-0.025	-0.024	-0.028	-0.027	-0.027	-0.055	-0.031	-0.028	-0.025	**0.013**
Bonus	(.002)	(.002)	(.002)	(.002)	(.002)	(.002)	(.002)	(.001)	(.004)	(.003)	(.002)	(.002)	(.001)
mean	10.223	10.224	10.254	10.269	10.330	10.394	10.403	10.435	10.389	10.437	10.393	10.421	0.055
	(.010)	(.010)	(.010)	(.010)	(.010)	(.010)	(.010)	(.010)	(.011)	(.010)	(.009)	(.009)	(.001)
N	[11,005]	[10,244]	[9,967]	[9,642]	[9,936]	[9,997]	[9,847]	[9,787]	[10,242]	[10,408]	[13,592]	[13,484]	[10,242]

Notes: Variances in **bold** are on the diagonal, Covariances below the diagonal, and Correlations are above the diagonal. Standard errors of variances and covariances are in parentheses, and cell sample sizes are in square brackets. All Covariance estimates are weighted by pairwise sqrt(hhwtrp(t)*hhwtrp(s)).

Table 5B: Covariance Structure of Individuals' Equivalised Household Disposable Incomes

	log(Equivalised Household Disposable Non-bonus income) in Year												2009
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Bonus
2001	**0.387**	0.632	0.589	0.548	0.551	0.525	0.496	0.488	0.421	0.411	0.416	0.372	-0.239
	(.011)	[9,463]	[8,700]	[8,148]	[7,941]	[7,647]	[7,181]	[6,896]	[6,757]	[6,525]	[6,255]	[6,017]	[6,757]
2002	0.239	**0.376**	0.669	0.582	0.575	0.552	0.507	0.500	0.397	0.420	0.422	0.386	-0.159
	(.006)	(.012)	[8,965]	[8,340]	[8,082]	[7,770]	[7,304]	[6,995]	[6,863]	[6,634]	[6,373]	[6,139]	[6,863]
2003	0.205	0.234	**0.344**	0.697	0.656	0.632	0.566	0.545	0.489	0.446	0.467	0.421	-0.251
	(.005)	(.006)	(.008)	[8,799]	[8,391]	[8,045]	[7,556]	[7,244]	[7,091]	[6,846]	[6,594]	[6,351]	[7,091]
2004	0.196	0.209	0.233	**0.351**	0.694	0.637	0.596	0.567	0.492	0.469	0.473	0.431	-0.253
	(.005)	(.005)	(.005)	(.010)	[8,788]	[8,337]	[7,826]	[7,514]	[7,316]	[7,081]	[6,795]	[6,557]	[7,316]
2005	0.193	0.204	0.217	0.238	**0.338**	0.730	0.655	0.604	0.554	0.502	0.521	0.455	-0.306
	(.005)	(.005)	(.005)	(.005)	(.008)	[9,093]	[8,479]	[8,096]	[7,899]	[7,625]	[7,315]	[7,041]	[7,899]
2006	0.181	0.194	0.205	0.214	0.238	**0.327**	0.749	0.676	0.609	0.564	0.573	0.511	-0.291
	(.005)	(.005)	(.005)	(.005)	(.005)	(.009)	[9,076]	[8,572]	[8,332]	[8,018]	[7,698]	[7,385]	[8,332]
2007	0.181	0.187	0.198	0.211	0.230	0.256	**0.378**	0.717	0.636	0.603	0.588	0.528	-0.311
	(.005)	(.006)	(.005)	(.005)	(.005)	(.006)	(.010)	[9,020]	[8,682]	[8,350]	[8,017]	[7,680]	[8,682]
2008	0.167	0.178	0.182	0.197	0.206	0.227	0.253	**0.349**	0.702	0.632	0.622	0.538	-0.355
	(.006)	(.005)	(.005)	(.006)	(.005)	(.005)	(.005)	(.009)	[9,115]	[8,732]	[8,349]	[7,993]	[9,115]
2009	0.157	0.156	0.178	0.183	0.196	0.223	0.238	0.250	**0.406**	0.683	0.664	0.567	-0.616
	(.005)	(.007)	(.006)	(.005)	(.005)	(.006)	(.006)	(.006)	(.013)	[9,548]	[9,066]	[8,654]	[10,439]
2010	0.146	0.152	0.149	0.162	0.172	0.191	0.216	0.223	0.251	**0.361**	0.712	0.602	-0.355
	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)	(.006)	(.011)	[9,696]	[9,180]	[9,548]
2011	0.141	0.148	0.151	0.159	0.174	0.187	0.205	0.211	0.236	0.247	**0.374**	0.672	-0.357
	(.005)	(.006)	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)	(.008)	[12,538]	[9,066]
2012	0.135	0.142	0.141	0.152	0.160	0.174	0.193	0.192	0.211	0.219	0.246	**0.360**	-0.284
	(.007)	(.006)	(.005)	(.006)	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)	(.011)	[8,654]
2009	-0.011	-0.008	-0.012	-0.012	-0.011	-0.013	-0.012	-0.012	-0.029	-0.013	-0.013	-0.010	**0.005**
Bonus	(.001)	(.001)	(.001)	(.001)	(.0004)	(.001)	(.001)	(.0005)	(.003)	(.001)	(.001)	(.0004)	(.001)
mean	10.484	10.477	10.492	10.515	10.569	10.622	10.662	10.702	10.692	10.734	10.728	10.744	0.044
	(.006)	(.006)	(.006)	(.006)	(.006)	(.006)	(.006)	(.006)	(.006)	(.006)	(.005)	(.005)	(.001)
N	[11,219]	[10,400]	[10,103]	[9,793]	[10,053]	[10,130]	[9,991]	[9,922]	[10,439]	[10,610]	[13,838]	[13,722]	[10,439]

Notes: Variances in **bold** are on the diagonal, covariances below the diagonal, and correlations above the diagonal. Standard errors of variances and covariances are in parentheses, and cell sample sizes are in square brackets. All Covariance estimates are weighted by pairwise sqrt(hhwtrp(t)*hhwtrp(s)).

Table 6: Error Component Model Estimates

	A: Individual Incomes			B: Equivalised Disposable Incomes		
	(1)	(2)	(3)	(1)	(2)	(3)
Income parameters:						
σ_α^2	0.261	0.223	0.265	0.105	0.107	0.115
	(.020)	(.027)	(.018)	(.008)	(.007)	(.006)
σ_ε^2	0.384	0.423	0.506	0.126	0.120	0.141
	(.016)	(.023)	(.029)	(.006)	(.005)	(.009)
ρ	0.820	0.851	0.733	0.836	0.815	0.717
	(.014)	(.014)	(.016)	(.016)	(.013)	(.017)
σ_s^2	0.091	0.097	0.081	0.050	0.041	0.040
	(.030)	(.028)	(.030)	(.011)	(.009)	(.009)
σ_u^2	0.255	0.259	0.228	0.095	0.094	0.085
	(.007)	(.006)	(.007)	(.003)	(.002)	(.003)
Bonus payment parameters:						
λ_α	-0.062	-0.067	-0.055	-0.062	-0.059	-0.051
	(.009)	(.011)	(.005)	(.007)	(.005)	(.003)
λ_ε	-0.029	-0.031	-0.029	-0.026	-0.020	-0.024
	(.008)	(.007)	(.008)	(.007)	(.008)	(.008)
λ_s	-0.277	-0.263	-0.306	-0.301	-0.335	-0.340
	(.086)	(.074)	(.109)	(.023)	(.026)	(.027)
σ_{ub}^2	0.003	0.003	0.003	---	---	---
	(.002)	(.002)	(.003)			
Annual factor loadings on						
α_i ($\delta_{\alpha t}$)	No	Yes	Yes	No	Yes	Yes
ε_i ($\delta_{\varepsilon t}$)	No	No	Yes	No	No	Yes
GoF	450.3	406.7	259.1	398.7	322.1	168.7
(df)	(82)	(71)	(60)	(83)	(72)	(61)

Notes: Standard errors are in parentheses. The specified models,

$$y_{it}^N = X_{it}'\beta^N + \delta_{\alpha t}\alpha_i + \delta_{\varepsilon t}\varepsilon_{it} + s_i(t=9) + u_{it}; \quad t = 1,...,T = 12,$$

$$b_{i9} = X_{i9}'\beta^b + \lambda_\alpha\delta_{\alpha 9}\alpha_i + \lambda_\varepsilon\delta_{\varepsilon 9}\varepsilon_{i9} + \lambda_s s^s + u_{i9}^b$$

are estimated by minimum distance methods with inverse variance weights, fit to the 91 variances and covariances of (y_{it}^N, b_{i9}) of the residuals from first-stage regressions for y_{it}^N and b_{i9} on dummy variables for married and female, a quadratic in age, and the numbers of children in the household aged 0-4 years, 5-9 years, 10-14 years, and 15-17 years. The R^2's for the regressions of individuals' income and 2009 bonus income are 0.157 and 0.082, and for individuals' household equivalised disposable income and 2009 equivalised bonus income are 0.103 and 0.098 respectively. For each of the equivalised household disposable income models, σ_{ub}^2 converged to 0, so u_{i9}^b was dropped from these models.

Table 7: Error Component Model Predictions

	A: Individual Income Models			B: Equivalised Income Models		
	(1)	(2)	(3)	(1)	(2)	(3)
2009 Non-bonus income						
Variance(y_{i9}^{N})	0.991	0.991	0.991	0.377	0.381	0.381
Percentage due to:						
$\delta_{\alpha 9}^2 \sigma_\alpha^2$	26.3%	21.3%	32.8%	27.9%	33.0%	39.7%
$\delta_{\varepsilon 9}^2 \sigma_\varepsilon^2$	38.7%	40.4%	36.1%	33.6%	37.2%	27.5%
σ_s^2	9.2%	9.8%	8.1%	13.2%	10.7%	10.4%
σ_u^2	25.7%	26.2%	23.0%	25.4%	24.7%	22.4%
Percentage persisting:						
1 year	58.1%	57.6%	59.3%	56.0%	58.8%	59.4%
3 years	47.7%	47.6%	47.0%	47.5%	50.1%	49.8%
5 years	40.7%	40.3%	40.4%	41.6%	44.3%	44.9%
10 years	31.6%	29.8%	34.4%	33.5%	37.1%	40.7%
2009 Bonus income						
Variance(b_{i9})	0.012	0.012	0.012	0.005	0.005	0.005
Percentage due to:						
$\left(\lambda_\alpha \delta_{\alpha 9}\right)^2 \sigma_\alpha^2$	8.7%	8.2%	8.5%	8.0%	8.6%	7.9%
$\left(\lambda_\varepsilon \delta_{\varepsilon 9}\right)^2 \sigma_\varepsilon^2$	2.9%	3.4%	2.5%	1.7%	1.0%	1.2%
$\lambda_s^2 \sigma_s^2$	60.7%	58.3%	65.2%	90.3%	90.4%	90.9%
σ_{ub}^2	27.8%	30.1%	23.8%	---	---	---
Percentage persisting:						
1 year	11.0%	11.1%	10.4%	9.5%	9.4%	8.8%
3 years	10.2%	10.3%	9.5%	9.0%	9.2%	8.4%
5 years	9.7%	9.7%	9.0%	8.7%	9.0%	8.1%
10 years	9.1%	8.9%	8.6%	8.3%	8.8%	7.9%

Notes: Predictions based on the estimated models presented in Table 6.

Figure 1: Income Inequality Trends, 2001 – 2012

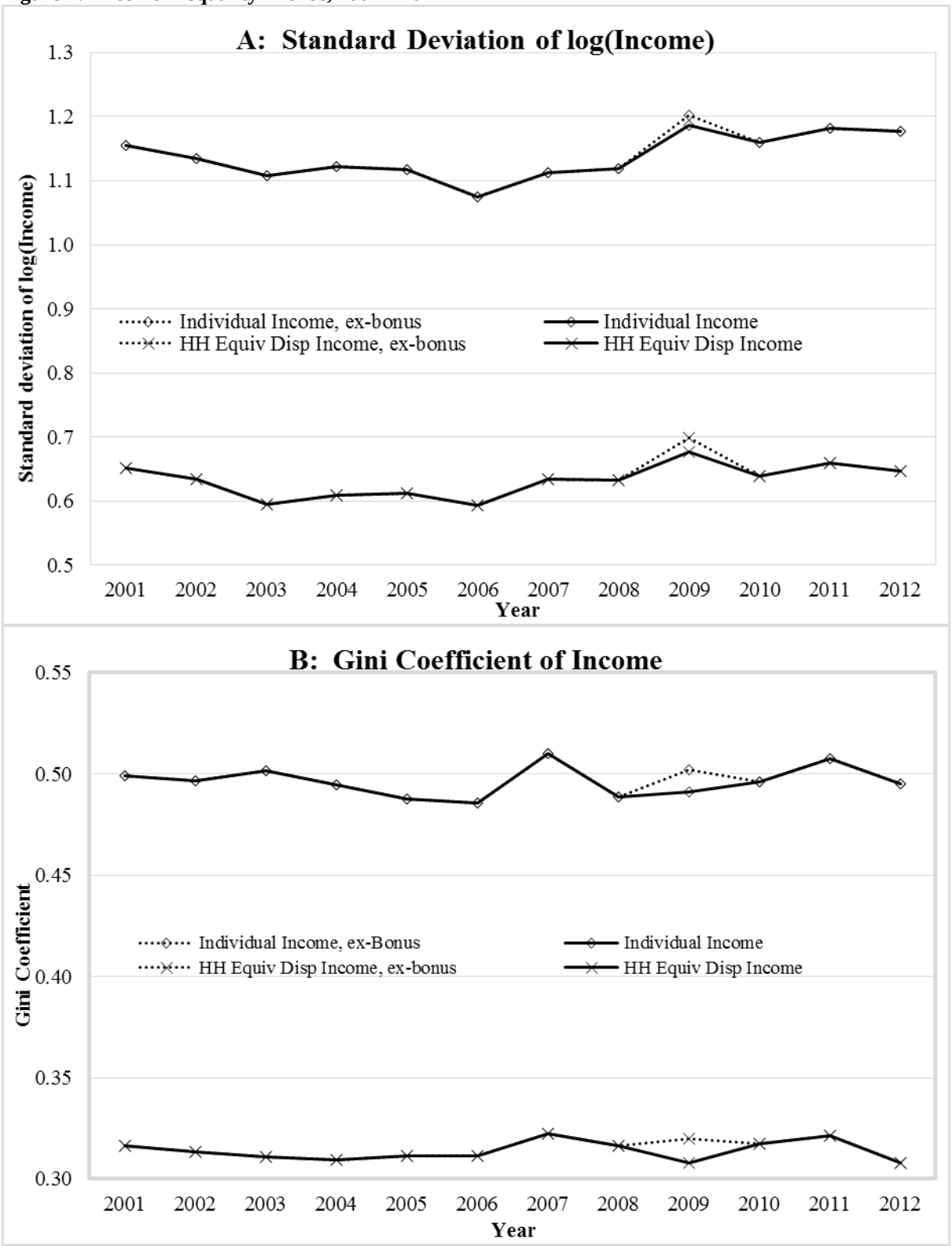

Figure 2: Average Bonus and GFC Income-shocks across the Distribution