



THE UNIVERSITY OF SYDNEY

Economics Working Paper Series

2013 - 03

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Australia**

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February 2013

The Decline of the Self-Employment Rate in Australia

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Abstract

This paper using the Australian panel data (HILDA) investigates the declining trend of self-employment rate in Australia, a pattern observed in a number of other developed countries in the 2000s. We focus on the entry into and the exit from self-employment, treating males and females separately. Our results show that the self-employment rate has declined in Australia because older workers, especially older female workers, remained longer in paid-employment. This finding indicates that although the self-employment rate of older workers is higher than that of younger workers, the gap has decreased in recent years so that the average self-employment rate has declined. In addition, we provide some evidence that industry and institutional changes, such as reforms in tax and pension systems, may have contributed to an increase in the labour force participation of older females, which may explain why the decline of self-employment has been severe for this group.

JEL classifications: J23, J26, J14

Keywords: Self Employment, Retirement, Older Workers

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[‡] This paper was written while Woo-Yung Kim was a visiting scholar at the School of Economics in the University of Sydney. He thanks Garry Barrett for providing a good research environment and valuable discussions on this topic.

1. Introduction

An increase in self-employment rate in developed countries during the 1980s and 1990s had sparked research on the determinants of self-employment. For example, Blau (1987) and Parker (1996) estimated time-series models and identified changes in technology and industry structure, tax rates and unemployment rates as important for explaining the observed increase in the self-employment rate. Evans and Leighton (1989) and Evans and Jovanovic (1989) considered the role of financial constraints in the entry into self-employment while Holtz-Eakin, Joulfaian and Rosen (1994) and Taylor (1999) highlighted the role of financial constraints in the formation and in the success of enterprises. Consumer discrimination and tax rates have also been proposed as factors that influence the decision to become self-employed (Borjas and Bronars 1989; Robson 1998, Evans and Leighton 1989, Schuetze 2000). There is also large literature that attempts to find the relationship between economic conditions, normally proxied by the unemployment rate, and the growth of self-employment.¹

In recent years, however, rates of self-employment have stabilized and in many countries actually declined. Such a pattern is of interest to policy makers and academics because self-employment has long been regarded as an engine for economic growth and hence job creation. Despite the pattern of decreasing rates of self-employment, there are few studies investigating why the self-employment rate has been declining.² This paper attempts to fill this gap in the literature by providing empirical evidence from the Australian experience. Like other countries, self-employment in Australia has fallen over the past decade (see Online Resource Table A1). Moreover, Australia like other countries is experiencing demographic and economic changes that may explain changes in self-employment rates. The analysis here also provides insight into what, if any, policy changes might be put into place to address declining rates of self-employment.

This paper investigates the declining trend of self-employment rate in Australia by estimating the entry into and the exit from self-employment. The approach is similar to that used by Evans and Leighton (1989), Evans and Jovanovic (1989), and, Holtz-Eakin, Joulfaian and Rosen (1994) amongst others. We depart from the approach of earlier studies on self-employment that focus on the choice between paid-employment and self-employment by including non-employment as an additional labour market state. Incorporating non-employment into the model represents an important contribution to existing analyses as the empirical evidence suggests that changes in older workers', especially older women's, retirement behavior is an important factor to consider. This finding is significant in light of factors such as the ageing demographic profile of workers in Australia and elsewhere.

Using the Household Income and Labour Dynamics in Australia (HILDA) dataset a series of models of entry into and exit from self-employment are estimated. We find that one reason that the self-employment rate has declined in Australia is because older workers, especially older female workers, remained longer in paid-employment. The implication is that the self-employment rate as traditionally

¹ See Meager (1992) and Blanchflower (2000) for discussion about the relationship between unemployment rate and self-employment rate in OECD countries. Also, see Le (1999) and Parker (2004) for comprehensive reviews of the existing empirical literature on self-employment.

² The only study the authors are aware of is Genda and Kambayashi (2002) which provides a cross sectional analysis on the declining trend in self employment rates of younger households in Japan between 1989 and 1994.

defined has decreased more rapidly for older workers compared to younger workers. This finding is important as rates of self-employment are generally considered to be higher among older workers relative to younger workers (Fuchs, 1982; Quinn and Kozy, 1996; Blanchflower et al 2001). Our results indicate that although the self-employment rate of older workers is higher than that of younger workers, the gap has decreased in recent years so that the average self-employment rate has declined.

Following the empirical analysis, we explore several possibilities that may be responsible for the declining trend of self-employment rate in Australia. In each case, the factors are similar to those that impact on other countries with similar experiences to Australia. For example, we discuss changes in discrimination laws designed to address the concern that older workers have been discouraged from continued participation in the labour market by virtue of implicit or explicit discrimination on the part of employers. The empirical analysis suggests that the *Age Discrimination Act 2004* did not decrease the exit probability from paid-employment in a significant way. We also consider if changes in industry structure have increased the demand for older workers using the method proposed Katz and Murphy (1992). Finally, we discuss the impact of the changes in tax and transfer programs, especially the publicly funded age pension, on the exit probability from paid-employment.

The paper proceeds as follows. In section 2 a discussion of self-employment in Australia and the probabilities of entry to and exit from self-employment are presented. In section 3 the econometric model and empirical strategy is set out. In section 4 the HILDA data is described. Results from the empirical analysis are presented in section 5. In section 6 we explore various channels that may provide an explanation for the decline in the self-employment rate in Australia. Section 7 concludes and discusses the broader implications of this study.

2. Trends in Self-Employment Rates in Australia

The literature on self-employment in Australia is relatively limited notwithstanding that the share of self-employment in Australia is of a similar magnitude to that of the United States and Canada. For Australia, earlier studies estimating the determination of self-employment have used both cross-section data (Chapman, Gregory and Klugman, 1998; Le, 2000) and longitudinal data (Blanchflower and Meyer, 1991). Le (1999) and Eastough and Miller (2004) estimate male-female wage gaps along with those for immigrants versus the native born in the self employment sector. However, to date there have been no studies dealing with the recent downward trend in the self-employment rate in Australia. This study examines the self-employment rate in the 2000s and contributes to the literature on self-employment in Australia as well as the literature on self-employment in general by examining a period during which self-employment has been declining.

[FIGURE 1 about here]

It is important to emphasize that there are various ways of defining the self-employed (Blanchflower, 2000). In this paper we follow the Australian Bureau of Statistics (ABS) definition of self-employment and define the self-employed to include ‘employers’ and ‘own-account workers’. Paid

workers are defined so as to include ‘employees’ and ‘employee of own business’.³ Following conventional practices, the self-employment rate is measured as the proportion of the self-employed out of total employment.⁴ Figure 1 shows that after several years of increase, self-employment rates fallen in Australia, Canada and the United States. Over the period 1990-2010 self-employment rate has been fallen by 2.8 percentage points in Australia, 1.8 percentage points in the United States, 1.2 percentage points in the United Kingdom and 1.3 points in Canada. Other countries⁵ exhibit a similar decline during the same period. Our aim in this section is to provide some descriptive evidence on self-employment in Australia and outline possible driving forces behind the observed patterns. The analysis uses the Household, Income and Labour Dynamics in Australia (HILDA) dataset. The HILDA dataset is a longitudinal dataset in which annual data was collected at both the household and individual level beginning in 2001. We begin by showing the general trends in HILDA though all the analyses in this section are robust to using aggregate data. Results from analysis of aggregate data are reported in Appendix (Online Resources Figures A1 and A2.)

Figure 2 presents the trends of self-employment rates and labour force participation rates in Australia. There are two important points to notice. First, the HILDA dataset effectively replicates the aggregate trends in labour force participation and self-employment rates. Secondly, contrary to the downward trend in self-employment rates, labour force participation rates in Australia had been increasing substantially during the last decade. This is an important consideration since labour force participation rates are also having a direct effect on the self-employment rate calculations.

[FIGURES 2 and 3 about here]

Figure 3 shows the self-employment rates across the age and gender groups using the HILDA data. Although we observe a decline in self-employment rates across all groups, the largest decline is observed in the group of people aged 55 and over. In fact, self-employment rates for older males and females declined by 6.5 and 6 percent respectively, compared to 3 and 2 percent for younger individuals. One way to gain more insight about the downward trends of self-employment rates is to rearrange the definition of self-employment rate as follows. Let SE be the number of self-employed people, PE the number of wage and salary workers, NE the number of non-workers (unemployed plus people out of labour force), and POP the population aged 15 and over. The self-employment rate (SR) of group j can then be expressed as follows:

$$(1) \quad SR_j = \frac{SE_j}{SE_j + PE_j} = \frac{\frac{SE_j}{POP_j}}{\frac{SE_j + PE_j}{POP_j}} = \frac{\frac{SE_j}{POP_j}}{1 - \frac{NE_j}{POP_j}}$$

³ We have used an alternative definition of self-employment where ‘employees of own business’ are classified as a part of self-employed. The decreasing trend of self-employment remains unchanged.

⁴ An alternative approach is to measure the proportion of self-employed out of labour force. Given the unemployment rate in Australia was roughly constant around 5% during the period 2001-2010, both measures show a similar trend of self-employment.

⁵ For detailed discussion see OECD 2011 “Self-employment”.

This transformation expresses self-employment rate as a proportion of self-employment out of population relative to the labour force participation rate. Moreover, it highlights the importance of labour force participation rates in self-employment rate calculations. An increase in the labour force participation, without a decline in the number of self-employed people out of population, will lead to a decline in self-employment rates as traditionally defined. For older workers recent reforms in the social security systems has tended to increase the labour force participation rates.⁶ This reduces NE_j/POP_j for older workers, whereas for younger workers, NE_j/POP_j will be relatively constant. Therefore, even if the percentage of the self-employed out of the population SE_j/POP_j is constant, the conventional measure of the self-employment rate for older individuals decrease if the proportion of non-employed individuals falls. To examine this possibility, we calculate SE_j/POP_j , and NE_j/POP_j for younger and older individuals over the period 2001-2010⁷. Figure 4 summarizes the results for four groups: males aged younger than 55 (*male-young*), males aged 55 and older (*male-old*), females aged younger than 55 (*female-young*) and females aged 55 and older (*female-old*).

[FIGURE 4 about here]

Panels (b) and (d) of figure 4 highlight that for older workers, the percentage of self-employment out of the population (SE_j/POP_j) has stayed relatively constant over time, whereas it has slightly decreased for younger workers (panels a and c). However, the percentage of the non-employed out of the population (NE_j/POP_j) has decreased significantly more for older people than for younger groups, which in turn led to a larger decrease in the self-employment rate for older individuals. For example for younger males, during the period 2001-10 the non-employed population increased by 0.13 percentage points, whereas for older males it decreased by 10.3 percentage points. This suggests that the rapid decline of the self-employment rate for older people has been accompanied by a decrease in retirement of older workers in the paid-employment sector.⁸

Overall, these numbers are compatible with the hypotheses that declining self-employment rate in Australia is driven by the increase in the labour force participation through an increase in the paid-employment, and not by the decrease in actual numbers of self-employed. We further find that these trends are much pronounced among the individuals aged 55 and over. It is important to note that although the descriptive statics are informative, they are far from to be conclusive and have several shortcomings. For instance, current analyses do not control for potentially confounding factors, such as changes in the characteristics of individuals during the same time period. In the following section, we introduce our empirical strategy that addresses these issues and provides more thorough analysis.

⁶ See Atalay and Barrett (2012), Ryan and Whelan (2011) for Australian evidence, and Mastrobuoni (2009) for the U.S. evidence.

⁷ We present our calculations from HILDA. The trends and numbers from aggregate data are similar and presented in the Appendix (see Online Resources Figures A1 and A2)

⁸ As we will show in section 5, the yearly transition probability from non-employment to employment for older people is approximately 2% during the period 2001-2010 whereas the corresponding figure for younger people is approximately 25%. Therefore, we can reasonably say that the non-employment state for older people is the state of retirement.

3. Empirical Strategy

To provide additional insight into the changes in the self-employment rate, we estimate a series of equations for the transitions into and from self-employment. In the Australian context, Chapman, Gregory and Klugman (1998) and Le (2000) estimated an individual's self-employment decision at a point of time. However, the probability that a person is self-employed at a point of time is a mixture of the entry into self-employment and the likelihood they remain self-employed⁹. For these reasons, we choose to estimate entry and exit probabilities and make inferences on the changes in the probabilities of self-employment.

Assume that the labour market status at time t (y_t) of an individual takes one of three states: paid-employment (P), self-employment (S) and non-employment (N). Further, assume that the transition probabilities of the person i from a state k at time t to a state j at time $(t+1)$ can be characterized as a Markov process so that they depend only on the characteristics of the person and economic conditions at time t . In particular, transition probabilities are assumed as follows:

$$\Pr(y_{t+1} = j | y_t = k) = p_{kj} = \frac{\exp(\alpha_{0kj} + \alpha_{1kj}X_k + \alpha_{2kj}A_k + \alpha_{3kj}R_k + \alpha_{4kj}UR_k)}{\sum_m \exp(\alpha_{0km} + \alpha_{1km}X_k + \alpha_{2km}A_k + \alpha_{3km}R_k + \alpha_{4km}UR_k)},$$

$$k, j, m = P, S \text{ \& } N \quad (2)$$

where X_k is a vector of personal characteristics at state k at time t , A_k a measure of assets held by the person, R_k a set of regional dummies, UR_k a region-gender specific unemployment rate, and the α 's are corresponding parameters to be estimated. Following the previous literature, X_k includes gender, age, marital status, number of young and old children, education, immigration status, and an index for risk aversion (Ekelund et al, 2005). HILDA includes a measure of risk aversion. However, a detailed measure of assets (A_k) are only available in HILDA for 2002, 2006, and 2010. Since a key objective is to investigate the declining trend of self-employment, we use the real value of housing wealth to proxy for the value of assets. We construct two-year panels from 2001 to 2010, generating nine inter-wave. Since our primary interest is in how these transition probabilities change over time, all nine transitions are pooled. Given the gender and age differences discussed in section 2, we estimate equation (2) for males and females separately, allowing transition probabilities to differ between age groups over time. Our final econometric model becomes:

⁹ In addition, estimating a self-employment choice using cross-section data can be easily susceptible to the endogeneity problem. For example, although it is correlated with self employment decision, education may also be correlated with unobserved taste variables that, in turn, influence self employment decision.

$$\Pr(y_{t+1} = j | y_t = k) = p_{kj} = \frac{\exp(\beta_{0j} + \beta_{1j}X_k + \beta_{2j}A_k + \beta_{3j}R_k + \beta_{4j}UR_k + \sum_{\tau} \beta_{5j\tau}D_{\tau} + \sum_{\tau} \beta_{6m\tau}Age55ov_k D_{\tau})}{\sum_m \exp(\beta_{0m} + \beta_{1m}X_k + \beta_{2m}A_k + \beta_{3m}R_k + \beta_{4m}UR_k + \sum_{\tau} \beta_{5m\tau}D_{\tau} + \sum_{\tau} \beta_{6m\tau}Age55ov_k D_{\tau})},$$

$$\tau = 2002, \dots, 2009 \quad (3)$$

where D_{τ} is a time dummy indicating whether the transition belongs to a particular year and is equal to 1 if $\tau = t$, and 0 otherwise. $Age55ov_k$ is an age dummy which is equal to 1 if the individual's age is 55 and over, and 0 otherwise. The interaction term between the age dummy and time dummy allows us to examine the changes in the impact of ageing on the transitions over time.¹⁰

The estimates of (3) provide six sets of results representing the following transitions between states: transition from paid- to self-employment (p_{ps}), transition from paid- to non-employment (p_{pn}), transition from self- to paid-employment (p_{sp}), transition from self- to non-employment (p_{sn}), transition from non- to paid-employment (p_{np}), and finally transition from non- to self-employment (p_{ns}). We test the hypothesis that the coefficients on D_{τ} 's are jointly zero to determine which transition probabilities have changed over time and the hypothesis that the coefficients on $Age55ov_k D_{\tau}$'s are jointly zero to determine whether there have been changes in behavior between younger and older generations over time.

Although self-employment rates are not estimated directly, information about transition probabilities provide insight into changes in the self-employment rate. Note that the self-employment rate and paid-employment rate of population at time $(t + 1)$ can be expressed, respectively, as follows:

$$(4) \quad S_{t+1} = p_{ps}P_t + p_{ns}N_t + p_{ss}S_t$$

$$(5) \quad P_{t+1} = p_{pp}P_t + p_{np}N_t + p_{sp}S_t$$

where P_t , N_t and S_t are the proportions of paid-, non-, and self-employment in population respectively, and p_{ij} is the transition probability from state i to state j . The self-employment rate (SR) out of employment at time $(t + 1)$ is then:

$$(6) \quad SR_{t+1} = \frac{S_{t+1}}{S_{t+1} + P_{t+1}}$$

Therefore, SR_{t+1} will increase as the entry probabilities into self-employment and the survival rate of self-employment increase while it will decrease as the entry probabilities into paid-employment and

¹⁰ We also allowed interaction terms between other personal characteristics and time dummies in the model, and tested whether the coefficients on the interaction terms are jointly zero. In all cases, the interactions terms are not found to be significant at the 10 percent level.

the survival rate of paid-employment increase, given the initial values for where P_t , N_t and S_t .¹¹

4. Data

Our empirical analysis relies on two year panels for the period 2001-2010 from the HILDA dataset. The HILDA is a longitudinal dataset that provides information on the characteristics and behaviour of Australian households and individuals. Collection of data began in 2001 and respondents are interviewed annually.

Table 1 presents summary statistics of the main variables used in analysis for the sample period.¹² We report the means for males and females separately. The proportion of people aged 55 and over is slightly larger for females than males. There is evidence that males are more risk-taking than females, which seems to conform with general expectations.¹³ The number of young children in the family is larger for females than males, and males (30 percent) are more likely to identify themselves as singles compared to females (23 percent).

There are some differences in education levels between males and females with males on average being less likely to have less than high school education (31 percent) compared to females (41 percent). There are no significant differences in the share of Australian born, real house value and parents' occupation between males and females. As expected, there are large differences between fathers' occupation and mothers' occupation. The percentage of people whose father's occupation was a manager is about 27% whereas the corresponding figure for mother's occupation is only about 7%. The geographic distribution of the sample is similar to that of the Australian population in general. The unemployment rate is slightly higher for females than males, while the self-employment rate is significantly higher for males (12 percent) compared to females (7.5 percent).

[TABLE 1 about here]

Table 2 presents the means of some important variables over time. There is some evidence that education level shows have tended to increase over time reflecting higher levels of education of more recently born cohorts. One noticeable feature of the data is the relatively low unemployment rate that Australia has experienced over time notwithstanding the increase in 2009 associated with the global financial crisis (GFC) in 2008. The self-employment rate, as we have seen from the earlier figures in section 2, has declined over time.

¹¹ In the steady state, the self-employment rate can be expressed solely with transition probabilities.

¹² Because our data consist of nine sets of two-year panels and we estimate transition probabilities rather than probabilities at a point of time, the variables used in the right hand side of equation (2) are taken from 2001 to 2009 HILDA. To maintain consistency with our regression and simulations, we present the means of variables from 2001-2009.

¹³ We also find that younger people are more risk-taking than older people, consistent with *a priori* expectations.

[TABLE 2 about here]

Changes in the self-employment rate can be explained by considering changes in transition probabilities into and out of various labour market states including self-employment. As seen in equations (4)-(6), the self-employment rate is a function of all transition probabilities, given initial proportions of states. In this section, we show how the entry probabilities to self-employment (p_{ps} and p_{ns}) and the exit probability from self-employment ($1 - p_{ss}$) change over time. If transition probabilities around non-employment are relatively constant, the self-employment rate will increase as the entry probabilities (p_{ps} and p_{ns}) increase and will decrease as the exit probability ($1 - p_{ss}$) increases.¹⁴

Figure 5 highlights that the decline of the self-employment rate may have resulted from the decline of entry rates rather than the increase in the exit rate. The exit rate from self-employment decreased until 2005 and following a temporary increase, it has decreased until 2008. Conversely, entry rates into self-employment from wage workers and non-employment have generally decreased, with the decline appears to be more pronounced for wage workers.

[FIGURE 5 about here]

Figure 6 presents entry and exit probabilities to and from self-employment for males and females, by younger and older age groups. For males, entry rates have decreased more for older individuals. Exit rates, on the other hand, show no definite pattern. The exit rate for younger males' dropped more than that of older males' prior to 2005, but since then this trend has reversed. Overall, between 2001 and 2010, exit rates from self-employment declined by 9.5 percent and 4.7 percent for younger and older males, respectively. The patterns in Figure 6 are consistent with our previous findings that the decrease in the entry into self-employment, rather than the increase in the exit from self-employment, may be responsible for the decline of the self-employment rate. Moreover, this decline is mainly driven by the changes in the behavior of older people rather than younger people.

For females, it is the decrease in entry into self-employment that largely contributes to the declining self-employment rate. Exits from self-employment have remained effectively unchanged over the period 2001 to 2009. For younger (older) females, the transition probability from non- to self-employment has decreased (increased) more than the transition probability from paid- to self-employment. Therefore, even though two groups are experiencing declining self-employment rate, the driving forces behind the trend appear quite different.

[FIGURE 6 about here]

¹⁴ A complete analysis requires to look at transition probabilities around non-employment as well, i.e., p_{pn} , p_{sn} , and p_{nn} . However, if these transition probabilities are relatively stable over time, knowing transition probabilities around self-employment provides sufficient information about the changes in self-employment rate. In this section, we focus on transition probabilities around self-employment, leaving the full analysis to the next section where we estimate all transition probabilities.

Figure 6 also highlights that the transition probability from paid to self-employment is greater for older people than for younger people, regardless of gender. This partly explains why the self-employment rate of older people is larger than that of younger people. Conversely, the transition probability from non- to self-employment is greater for younger people than for older people, most likely because non-employment for people aged 55 and over is in many cases effectively a retirement state. Unlike males, the exit probability from self-employment is generally lower for older females than for younger females, suggesting that older females stay longer in self-employment than younger females. It is also interesting to note that the 2008 US financial crisis has a different impact on older males and females. While the adverse economic shock increased the transition from paid- to self-employment for older males, it appears to have decreased the transition from paid- to self-employment for older females.

Figures 5 and 6 provide some insight into why the self-employment rate in Australia has declined during the last decade. In particular, it appears that it is the case that entry to, not exit from, self-employment has decreased, especially for older people. In the next section, we present results from the econometric analysis to provide additional insight into the determinants of changes in transition rates, and hence the self-employment rate, during the period 2001-10.

5. Estimation Results

As discussed in the section 3, equation (4) is estimated using two-year panels from 2001 to 2010 constructed from the HILDA data. The data consists of nine inter-wave transitions.. We employ a multinomial logit specification and estimate each model separately for males and females. In the multinomial logit model, one state is omitted or represents the reference category. In the models estimated, the initial state is considered the reference state.

5.1 Estimation Results for Males

Table 3 presents the estimates of transition probabilities for males. Older paid-workers are more likely to enter self-employment, and less likely to exit from self-employment into paid employment. These results are consistent with the findings of previous studies (Evans and Leighton, 1989; Le, 1999; Blanchflower *et al.*, 2001). On the other hand, older males are more likely to exit from employment into non-employment, most likely retirement, and are less likely to enter employment once they are not working. Risk taking plays an important role in labour market transitions, especially in the context of self-employment. The results in table 3 indicate that risk-taking males are more likely to enter self-employment, more likely to switch from self-employment to paid-employment, and more likely to exit from non-employment. Kihlstrom and Laffont (1979) set out a theoretical model in which less risk-averse people are more likely to become entrepreneurs and Ekelund *et al.* (2005) found that individuals with less risk aversion are more likely to be self-employed using Finnish data. The results in table 3, even though statistical significance is not so strong, provide some support for these findings. Our results also indicate that less risk-averse individuals are more likely to move from self-employment to paid-employment. This suggests that risk-taking individuals are more prepared to change between labour markets states and to tolerate the uncertainty associated with such a change.

The results in table 3 indicate that married males are more likely to enter and less likely to exit from self-employment. Le (1999) also reports that marriage has a positive effect on self-employment.¹⁵ Males who are separated, divorced or widowed are also more likely to enter self-employment. Recall that the omitted group in this context is single males. It may be the case that being currently or previously married proxies for level of assets as well as the size of social network. Such influences have been highlighted by Allen (2000) as being important in determining self-employment status.

Evidence on the effect of education on the transition into self-employment is quite mixed (Le, 1999). Poschke (2008) documents some evidence that the relationship between self-employment and education is U-shaped with individuals with low or high levels of education more likely to be self-employed. Coefficients on education variables in table 3 indicate no particular pattern between education and self-employment for Australian males. Having a bachelor degree actually reduces the transition from paid- to self-employment but increases the transition from self- to paid-employment. This result may reflect the differential impacts of education. While higher education may be correlated with managerial skills and the ability to identify self-employment opportunities, it also leads to better opportunities in the paid-employment sector. As expected, a higher level of education is associated with a higher probability of exiting from non-employment and moving into both paid- and self-employment.

Place of birth does not affect transitions between paid- and self-employment. Australian-born males are, however, significantly more likely to exit from non-employment and less likely to move to non-employment from paid-workers than their immigrant counterparts. Discrimination in the labour market is one possible explanation for this pattern (Chiswick and Miller, 1985). Having a father whose occupation was a manager increases the entry to self-employment and decreases the exit from self-employment for males. However, mother being a manager does not affect the transition probabilities around self-employment. Rather, it affects the probability around paid- and non-employment. There is evidence that an increase in the values of housing wealth increases the entry to self-employment from non-employment, and decreases the exit from self-employment for males. Evans and Jovanovic (1989), Holtz-Eakin et al (1994) and Taylor (1999) report similar findings. The coefficient on the gender-region specific unemployment rate is found to be statistically insignificant for all transition probabilities controlling for other covariates.

In table 3, statistics from the Wald tests that the coefficients on time dummies and interaction terms are jointly zero are also presented. First, note that a number of time dummies are statistically significant at the 10 percent level in p_{ps} , p_{sp} and p_{np} . The coefficients on time dummies in p_{ps} indicate that there is no clear trend in the entry into self-employment from paid-employment, while the coefficients on time dummies in p_{sp} are all negative. This result is consistent with the pattern identified in Figure 6, namely, that exit rates from self-employment are unlikely to be responsible for declining trend of self-employment.

Wald statistics on interaction terms between time dummies and older age group dummy cannot reject the hypothesis that their coefficients are jointly zero. In all transition probabilities, they are

¹⁵ Similarly, Cowling (2000) examined how the impact of marital status on the probability of self-employment differs across EU countries.

statistically insignificant at the 10 percent level. This result implies that for males, there is no systematic difference in the declining trend of self-employment rate between younger and older generations once we control for all the other covariates. Rather, the difference in the self-employment rate observed in averages between younger and older males is derived from the differences in their characteristics.

[TABLE 3 about here]

In order to see how time dummies in p_{ps} , p_{sp} and p_{np} affect the transition probabilities and hence the self-employment rate, we calculate two counterfactuals of self-employment rates using equations (4)-(6). In the first scenario, we calculate the self-employment rate assuming transition probabilities do not change from the 2001-2002 values. In the second counterfactual, we allow the transition probabilities of p_{ps} , p_{sp} and p_{np} to change according to the coefficients on the time dummies. In computation of both counterfactuals, we use the sample average of all males for the values of all covariates including unemployment rate.¹⁶ Because we are holding characteristics fixed, the changes in self-employment rates derived are not driven by the changes in personal characteristics or economic conditions proxied by unemployment rates. Rather, the difference in the self-employment rate between two counterfactuals is derived from the changes in transition probabilities alone.

Figure 7 shows predicted self-employment rates under the two scenarios for younger and older age groups.¹⁷ For both younger and older males, the predicted self-employment rate under scenario 2 is higher than the one under scenario 1 although the difference is less clear for younger males. This suggests that the changes in transition probabilities as reflected by the coefficients on time dummies in p_{ps} , p_{sp} and p_{np} have worked in favour of increasing self-employment for males, especially older males.

[FIGURE 7 about here]

There are a number of factors that may have affected the transition probabilities modeled in table 3. These include changes to industry structure which may have affected groups differently, or, institutional considerations such as changes to the tax and transfer system. Significantly, however, the patterns in figure 7 suggest that these changes are not responsible for the declines in self-employment

¹⁶ Transition probabilities from t to $t+1$ are calculated using the coefficients on time dummies and interaction terms as well as individual characteristics. We treat the coefficients on dummies as zero if they are not jointly statistically significant at the 10 percent level. To obtain the shares of self-employment and paid-employment at $t+1$ in (4) and (5), we use the shares of self-employment and paid-employment in cross-section data at t . If our sample is a balanced panel, we can calculate the whole series of shares of self-employment and paid-employment given initial shares and transition probabilities. However, our sample is not a balanced panel, which means that sequential calculations in (4) and (5) can lead to a biased outcome. For this reason, we decide to use sample shares at t to predict to the shares at $t+1$.

¹⁷ Actual numbers are provided in Online Resources Tables 2 and 3.

identified. In fact, if the transitions probabilities had not changed, the self-employment rate of males could have been lower. Prior to discussing these various factors we present the analysis of females.

5.2 Estimation Results for Females

The estimates of transition probabilities for females are present in table 4. Like males, older females are more likely to enter self-employment, and less likely to exit from self-employment. Females are also more (less) likely to exit from employment (enter employment) once they are out of labour force. Risk taking females are more likely to enter self-employment. However, unlike males, risk aversion only works in one direction, not affecting transition probability from self-employment to paid-employment.

Unlike males, an increase in the number of young children ($c0_4$) increases the transition from paid-employment to self-employment for females. It is possible that the flexibility of self-employment provides an opportunity for mothers to care of children around work commitments (Budig, 2006). As expected, women with young children are more likely to move into non-employment and more likely to stay there once they are not working. While the effect of marriage on the entry to self-employment is similar between females and males, the effect of education is quite different. For females, having a bachelor degree increases the transition from paid- to self-employment but does not increase the transition from self- to paid-employment. Holding a diploma or a certificate also increases the transition from paid- to self-employment. Like males, place of birth does not impact on transitions between paid- and self-employment.

For females, having a mother being a manager reduces the exit from self-employment to non-employment. That is, father's occupation seems more important for males' decision to be self-employed while mother's occupation seems more important for females' decision to be self-employed. Like males, an increase in the values of house owned increases the entry to self-employment from non-employment. However, unlike males, it does not affect the exit from self-employment in a significant manner. The gender-region specific unemployment rate is also found to be statistically insignificant for all transition probabilities controlling for other covariates.

The Wald statistics indicate that time dummies in p_{np} are only statistically significant at the 0.05 level. The coefficients on time dummies in p_{np} indicate that there has been an increase in transition from non-employment to paid-employment until 2008. Note that this trend is opposite for males in that there has been a decreasing or insignificant transition from non-employment to paid-employment and a larger negative effect in 2008 and 2009.

[TABLE 4 about here]

Unlike males, interaction terms between time dummies and age dummy are statistically significant at the 0.05 level in p_{pn} . The coefficients on the interaction terms are all negative, suggesting that older females are more likely to stay in the paid-employment and less likely to enter non-employment from paid-employment. Combining the results obtained with time dummies in p_{np} and interaction terms

in p_{pn} indicates that the probability of being a paid worker has increased, especially for older females, between 2001 and 2010. Significantly, this is likely to explain why the self-employment rate has declined more for older females over the same period.

Again, we calculate the two counterfactual self-employment rates for females. As before, the first counterfactual assumes constant transition probabilities fixed at 2001-2002 values and the second counterfactual allows the transition probabilities to vary according to the coefficients on time dummies in p_{np} and interaction terms in p_{pn} . In computation of both scenarios we use the sample averages of all females for the values of all covariates. Figure 8 depicts very different results for females compared to males. For both younger and older females, the predicted self-employment rate under counterfactual 2 is lower than the one under scenario 1 notwithstanding that the difference is small for younger males.¹⁸ This is the reverse to what was identified for males, and it implies that the changes in transition probabilities as reflected by the coefficients on time dummies in p_{np} and interaction terms in p_{pn} have worked unfavorably for females, especially older females, to become self-employed. Importantly, the decline of self-employment rate of older females is mainly driven by the increase in the proportion of paid-employment, not by the decrease in the proportion of self-employed out of total population.

[FIGURE 8 about here]

The key message from the preceding analysis is that changes in labour market *characteristics* in Australia during the last decade, not captured by changes in demographics and unemployment rates, have worked in such a way that they mainly reduce the self-employment rate of older females through an increase in the proportion of paid-employment. In other words, older females in Australia during the past decade have stayed longer in paid-employment sector relative to older males, *ceteris paribus*. In the next section, we examine possible reasons why this might occur.

6. Discussion

The analysis in the previous section highlights that patterns of self-employment observed in Australia appear to be driven by changes in the behavior of older females, especially the tendency to remain in paid employment over longer periods. In this section we examine economic and institutional reasons why such a pattern may have been observed. That is, the changes identified here are highlighted as potential driving forces of the results identified in section 5.

It is important to stress that the discussion here is not meant to attribute a causal interpretation to the analysis presented in section 5. Rather, the changes are identified as important influences on the patterns observed in Australia. Moreover, given the similar experience of other countries with respect to self-employment and changes in their economic and institutional environment, such a discussion is

¹⁸ To see the exact numbers, refer to appendix (see Online Resource Table A2.)

likely to be useful in framing the analysis of the recent patterns of self-employment.

6.1 Institutional, tax and transfer policies

The *Age Discrimination Act 2004* (the Act) is Commonwealth legislation designed, as its name suggests, to ensure that individuals are not discriminated against on the basis of age. Though not limited to employment relationships, the Act has as one of its principal aims to ensure that people are *not* treated less favourably on the ground of age in various areas of public life, including employment. Indeed, the Act can be seen as part of a set of changes designed to facilitate continued participation in the labour market beyond the traditional retirement age of 65 years for males and 60 years for females.

In light of the trend of increased participation in the labour force, especially among older females identified in section 5, it is pertinent to ask whether the Act played any role in the patterns observed in the data by mitigating withdrawal from the labour market associated with implicit or explicit age based discrimination. While the key provisions of the Act applied from 2004 onwards, the regression results reported in tables 3 and 4 would suggest that such a result is unlikely for a number of reasons. First, there is limited evidence that the trends observed in the data are relevant only post implementation of the Act. Moreover, the key result identified in the empirical analysis is that older women continued to participate in paid employment for an extended period. The Act applies equally to males and females and there is no *a priori* reason to expect that females experienced age based discrimination over and above that experienced by males.¹⁹

Changes to discrimination law can be viewed more generally as part of an effort by the Australian government to increase labour market activity over the business cycle. Coupled with this has been a concerted effort to limit reliance of older individuals on publicly funded pensions. What sets Australia apart from other countries is the particular mix of public and private pensions. The Australian retirement income system consists of a means-tested public pension (known as Age Pension), and mandatory and voluntary private savings. In Australia, there is no compulsory retirement age, and elderly Australians can supplement their retirement income through continued employment. Eligibility for the Age Pension is subject to residency and age conditions, and is available to self-employed individuals. Since inception of the Age Pension, the qualifying age for men has remained at 65 years. The qualifying age for female applicants, on the other hand, has undergone a gradual increase since 1995, from the initial 60 years to 65 years of age. It is possible that this change which has targeted females may explain, in part, the patterns identified in section 5.

Some evidence of this is presented in Figure 9, where age participation rates for selected birth cohorts of women in our sample are shown. By virtue of the change in Age Pension eligibility (APE) age initiated in 1995, for women, each birth cohort encounters different pension eligibility ages. Figure 9 shows that the labour force participation (LFP) rates of the younger cohorts of women, those born in later years, are substantially higher than those of the older cohorts. Atalay and Barrett (2012) and Ryan and Whelan (2011) explore this variation in the APE age of adjacent cohorts of females. These studies indicate that increase in the APE age by 1 year induces a decline in retirement probability by 8 to 15 percentage points for women. Figure 10 is similar to Figure 9 but plots the self-employment out

¹⁹ A test as to whether the post 2004 coefficients are jointly significant was rejected.

of population rates for birth cohorts of women in our sample. Unlike the LFP rates, it is clear that there aren't any cohort differences, especially at the affected ages between 60 and 65 years.

[FIGURES 9 and 10 about here]

In summary our analysis suggests that APE reform has an impact on overall labour force participation decision, but not the self-employment participation decision of women. These findings echo our results in section 5.

In a similar vein, there is a large body of empirical literature examining the effect of tax rates on self-employment participation decisions (Blau 1987; Bruce 2000; Parker 2003; Stabile 2004; Fossen and Steiner 2009). Moreover, since 2000 the Australian tax system has undergone substantial reform including the introduction of a broad based consumption tax and reductions in personal income tax rates. Significantly, the impact of tax rates on self-employment is theoretically ambiguous. High tax rates tend to encourage self-employment as it is easier to avoid taxation in self-employment through underreporting and other means. Conversely, it may have a negative effect since high tax rates reduces the expected return from opening a risky business.

Our discussion in this subsection, instead of addressing this debate, will focus on the changes in taxation arrangements of self-employed in Australia²⁰. It is important to emphasize that in order to conclude that tax arrangements is the main driving force of decreasing self-employment rates : i) there should be significant changes in tax rates during the 2001-10, ii) in addition these changes should be specific to individuals over 55 years, especially females. Recall that it is the group of older women whose behavior seems to have driven the patterns observed in the aggregate data.

Appendix Table A4 (see Online Resources Table A4) reports the average rate of income tax and employee' social security contributions as a percentage of personal income (the average rate of income tax) over the period of analysis. It is clear that although there is a decreasing trend the changes have been relatively small. Moreover, since these tax rates are similar for wage employees and the self-employed, labour supply effects of tax rates changes should be similar in both occupations. On the contrary, tax avoidance incentive should be weakened due to the lower marginal tax rates. These simple analyses suggest that there should be an increase in the overall labour force participation and decrease in the self-employment numbers due to the small changes in taxation arrangements. However, our analysis in section 5 suggests that these changes should particularly affect females aged 55 and over. To our best knowledge, there aren't any tax arrangements that specifically aim senior females. This would suggest that although tax arrangement may contribute to labour force and self-employment changes during our observation period, it is unlikely that they are the main driving forces changes in self-employment rates.

One other change posited in the literature as influencing patterns of employment is changes to minimum wages (Fang and Gunderson, 2009). In particular, increases in minimum wages may induce substitution of older workers for younger workers, leading to increased participation in paid

²⁰ See <http://comparativetaxation.treasury.gov.au> for a detailed review of Australian tax system and tax arrangements for self-employed.

employment for former group. In Australia, such an explanation is unlikely to explain the observed patterns of behavior. Australia is unusual in that it does have an extensive system of regulated or ‘award wages’ that are determined centrally. While changes to minimum and award wages in Australia (see the last column of Online Resource Table 4) have occurred over the past decade, they have not been gender specific and are unlikely to explain the differential patterns exhibited by males and females.

6.2 Industry Changes

The influences discussed above relate largely to policy decision. An alternative explanation for the patterns highlighted in section 5 is that changes in the demand for different types of labour have induced significantly different labour market outcomes across groups. One way to analyze whether changes in industry structure have influenced labour market outcomes across groups is to use the approach developed by Katz and Murphy (1992). Those authors exploit a simple supply and demand framework to analyse changes in wages in the United States between 1963 and 1987. A simplified version of the Katz and Murphy (1992) approach is used here to analyse the role of changes in demand for labour across industries. In particular, we ask if the growth in demand for ‘young’ and ‘old’ labour across industries is consistent with the patterns reported in section 5.

To apply the Katz and Murphy (1992) methodology, we use the ABS labour force survey (LFS) data at the two-digit industry level to identify the relative growth of industries employing different types of labour. In particular, we are interested in the growth of demand for ‘young’ (less than 55 years) and ‘old’ labour (55 and over) over the period 2001-10. The analysis is performed for all workers (paid employees and the self-employed) and employees only. The results of the analysis are reported in table 5 and indicate a growth in the demand for labour of females in excess of that for males. Moreover, there is evidence of an increase in the demand for older female employees. Again, this evidence is consistent with the patterns discussed above. Growth in the demand for older employees, especially females, is consistent with the observed decrease in self-employment rates being driven by increased participation in paid employment by this group of workers.

[TABLE 5 about here]

7. Conclusions

In this paper we investigated the declining trend of self-employment rate in Australia, a pattern observed in a number of other countries around the world. We did so by estimating the entry into and the exit from self-employment using the HILDA dataset. We find that the self-employment rate has declined in Australia because older workers, especially older female workers, remained longer in paid-employment. In turn, the self-employment rate for older workers is found to have decreased more rapidly than for younger workers. This result provides new information about the behavior of older workers since the self-employment rate among older workers is generally believed to be higher than younger workers (Fuchs, 1982; Quinn and Kozy, 1996; Blanchflower et al 2001). Although the self-employment rate of older workers is higher than that of younger workers, the gap has decreased

in recent years, which drives the average self-employment rate to decline.

We then explored several possibilities that may be responsible for the declining trend of self-employment rate in Australia. Put another way, we considered various factors that may have induced an increased participation in paid employment, especially by older female workers. The possible explanations can be categorized into two broad groups, namely institutional considerations and industry changes. Institutional factors include policy choices around eligibility for the publicly funded age pension, and changes to tax and transfer policies. Though a causal interpretation is not possible, the evidence is consistent with the changes identified as contributing to increased participation in paid employment by older females. Indeed, many of the changes have been instituted in response to perceived challenges presented by an ageing population and have been designed to enhance labour supply over the life-cycle. The second set of factors considered are those relating to changes in the demand for labour induced by industry change. Using a similar approach to that of Katz and Murphy (1992), we find evidence consistent with an increase in the demand for older female paid-employment.

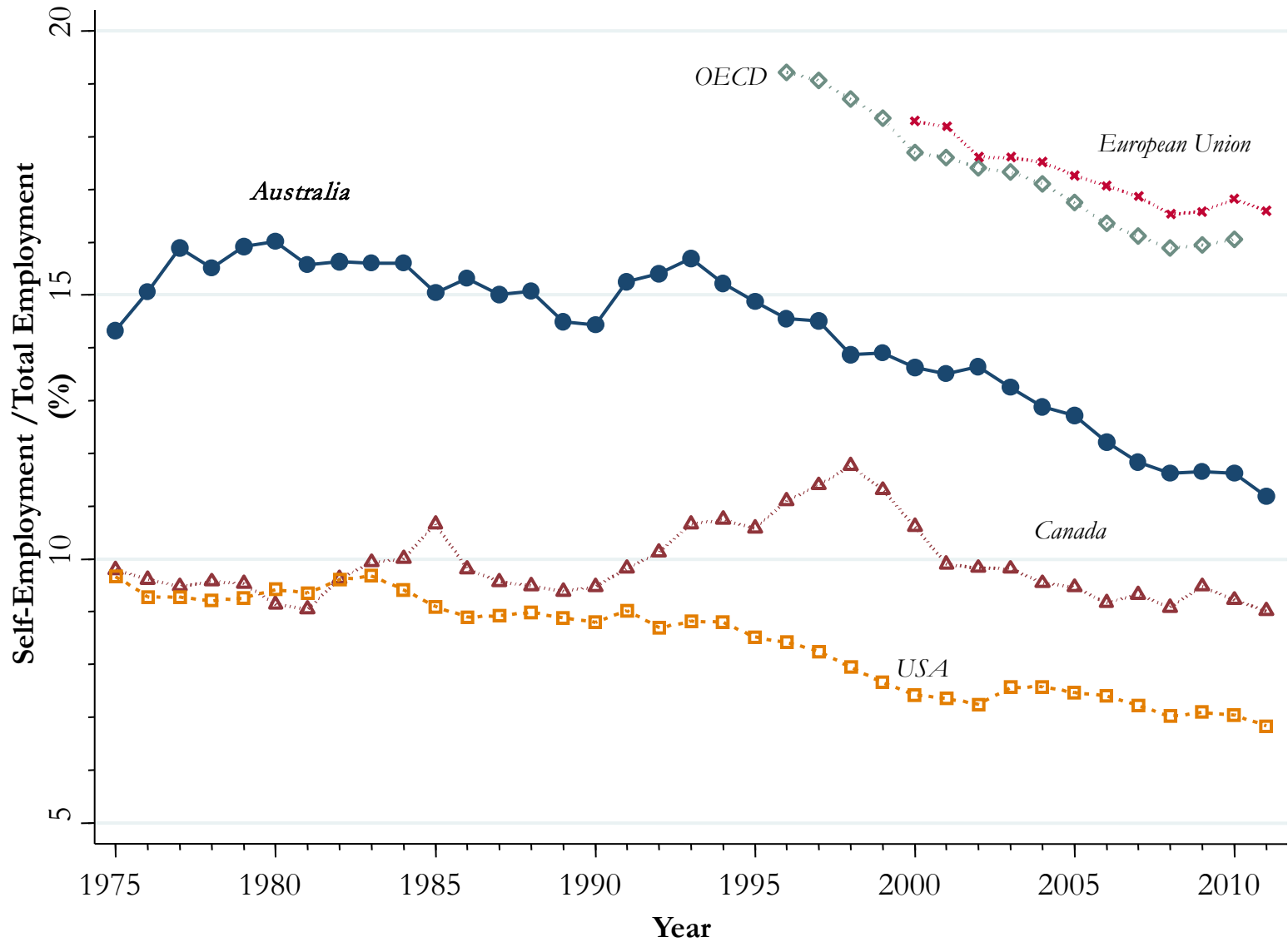
The analysis in this paper has highlighted the need to understand the underlying reasons for the observed decreased in self-employment rates in Australia. Of central importance is the behavior of older females. More specifically, to understand the aggregate behaviour of self-employment it is important to understand the labour supply decision, especially around participation, of older female workers. A range of institutional and economic factors were canvassed as playing a role in influencing the stylized patterns observed in the data. The discussion highlighted that institutional considerations, especially around changes to eligibility for the age pension are likely to be important in explaining the observed patterns. Indeed, a useful next step would be a more detailed analysis of the behavior of individuals in response to changes in the eligibility rule for the age pension. Such an analysis is likely to provide insight for countries other than Australia which are experiencing similar trends, and more importantly, instituting similar policies designed to enhance labour supply over the life cycle.

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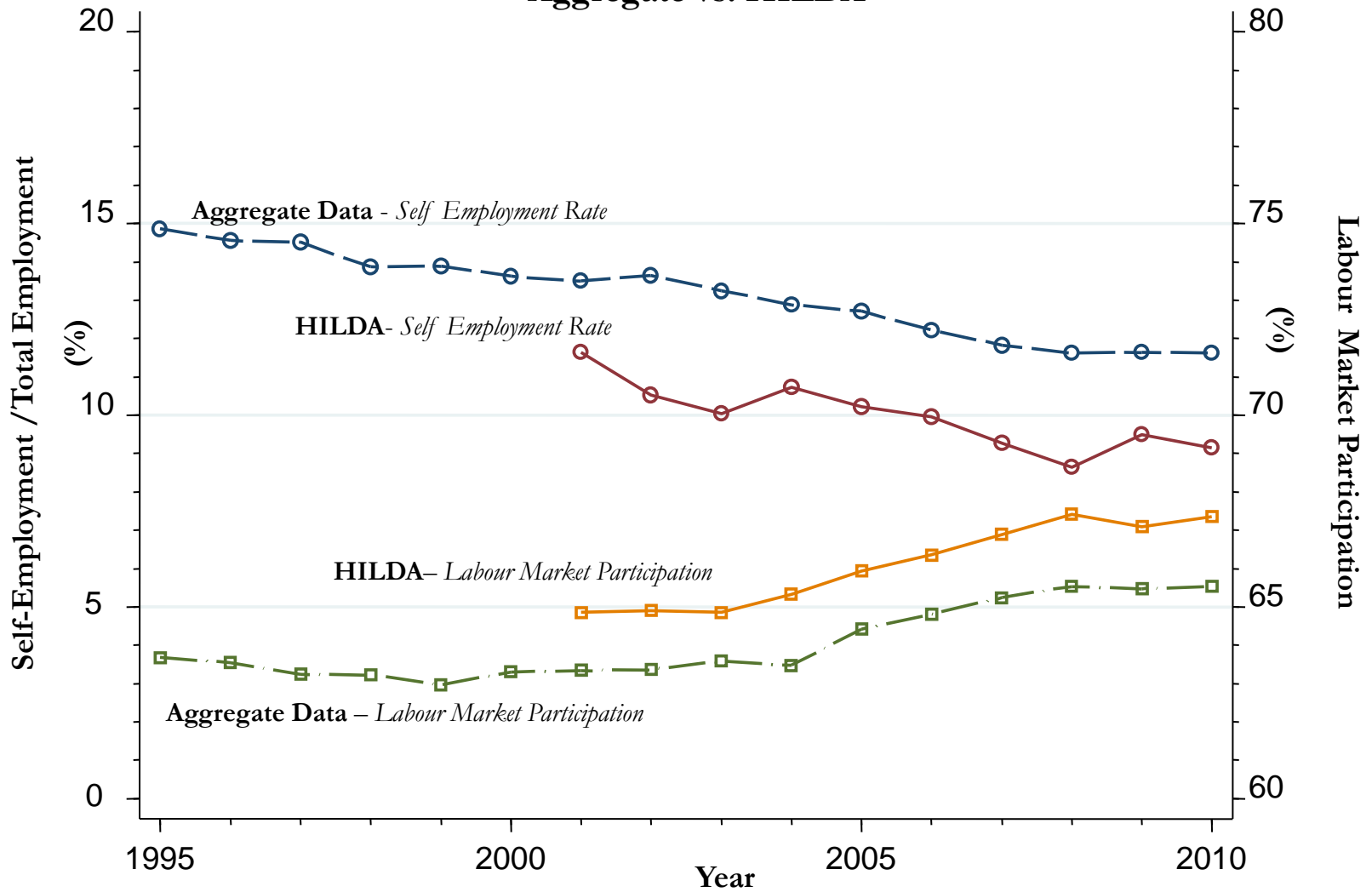
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Figure 1: Self-Employment as a Proportion of All Employed



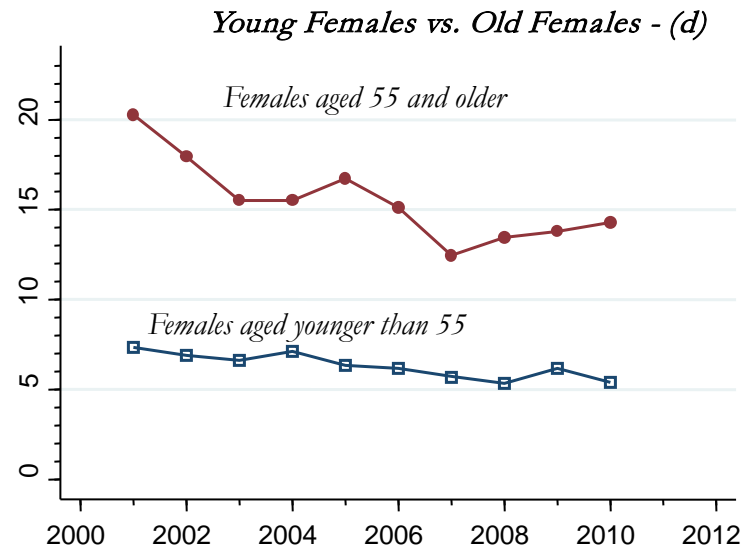
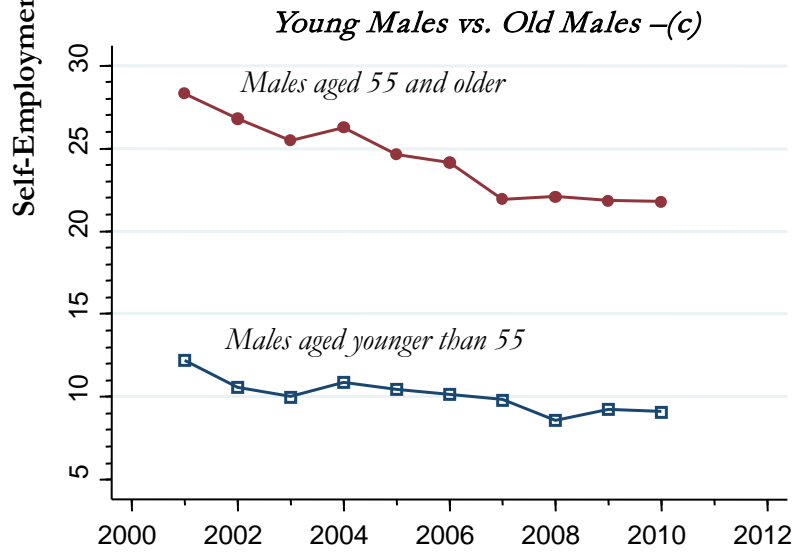
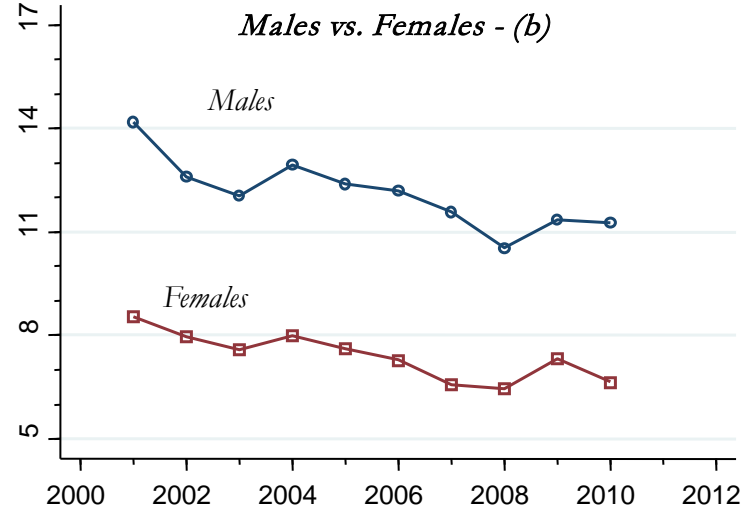
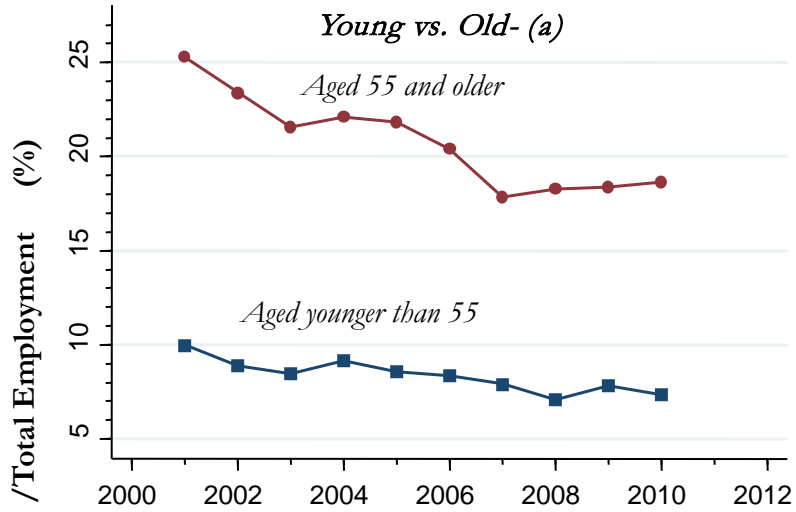
Source : OECD comparative tables: <http://stats.oecd.org/>

**Figure 2: Self-Employment as a Proportion of All Employed:
Aggregate vs. HILDA**



Sources: Aggregate Data.:ABS Labour Market Statistics. HILDA (2001-10) authors calculations.

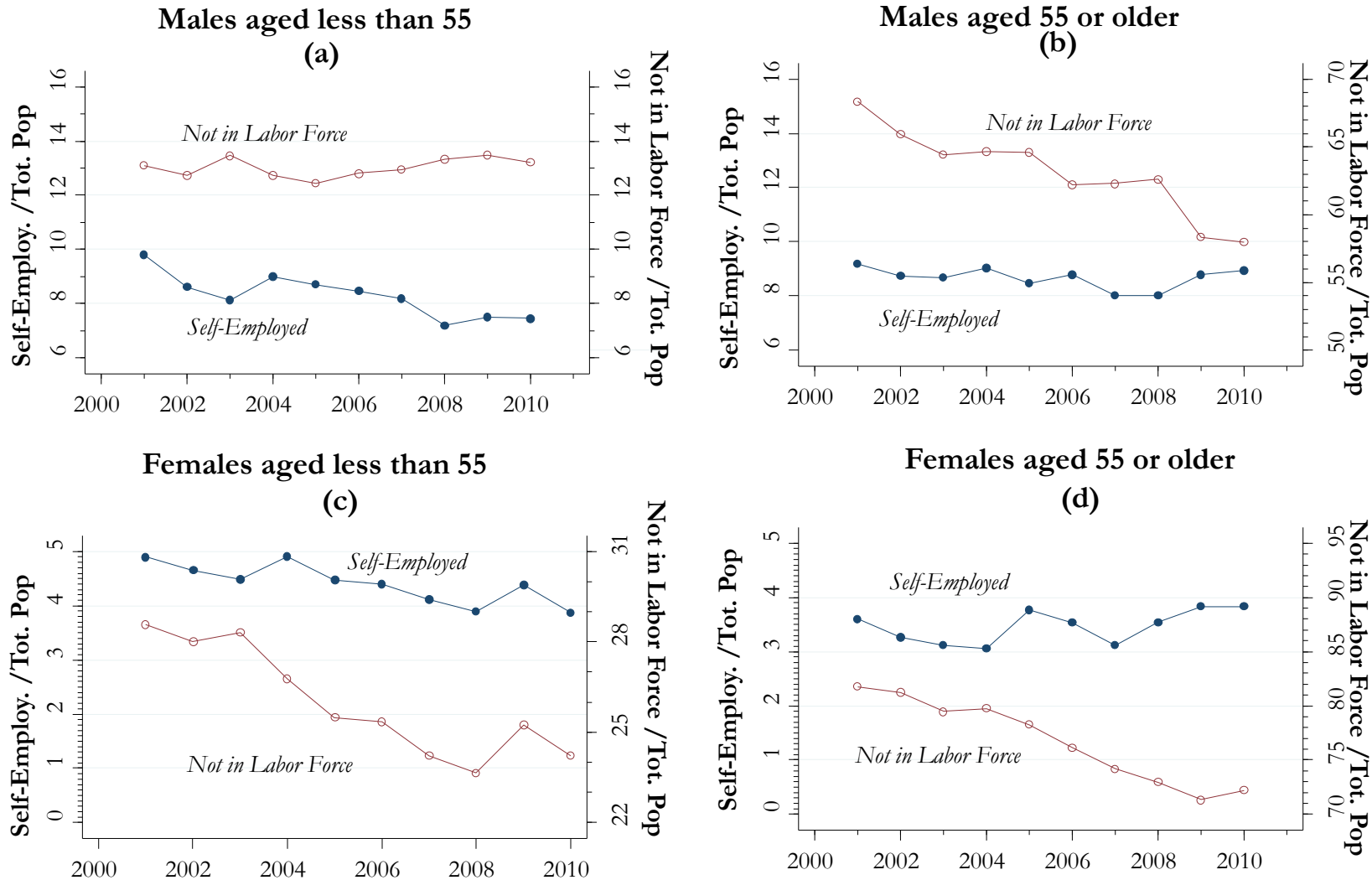
Figure 3: Self-Employment rates by gender and age



Year

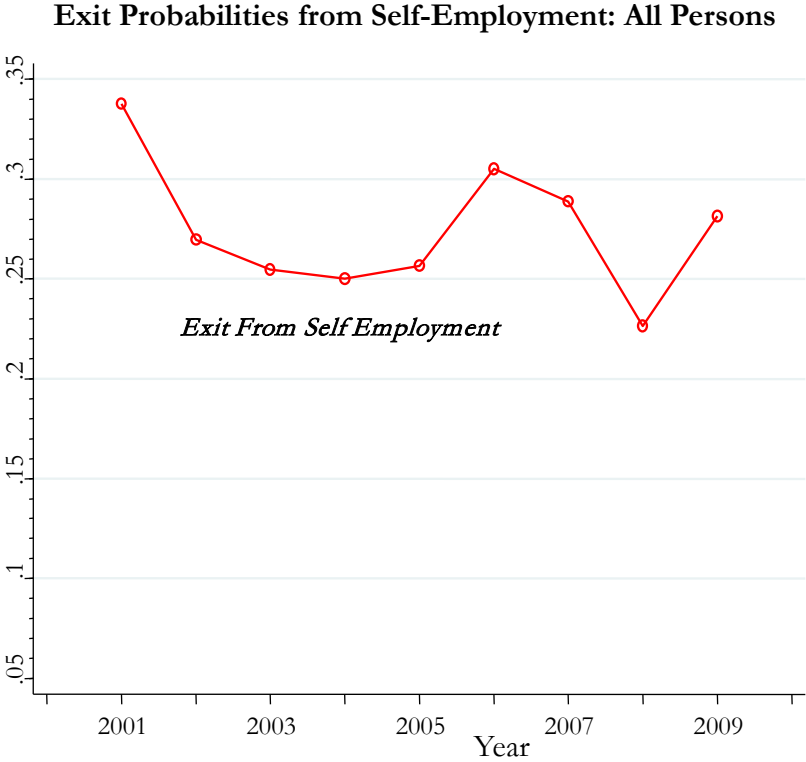
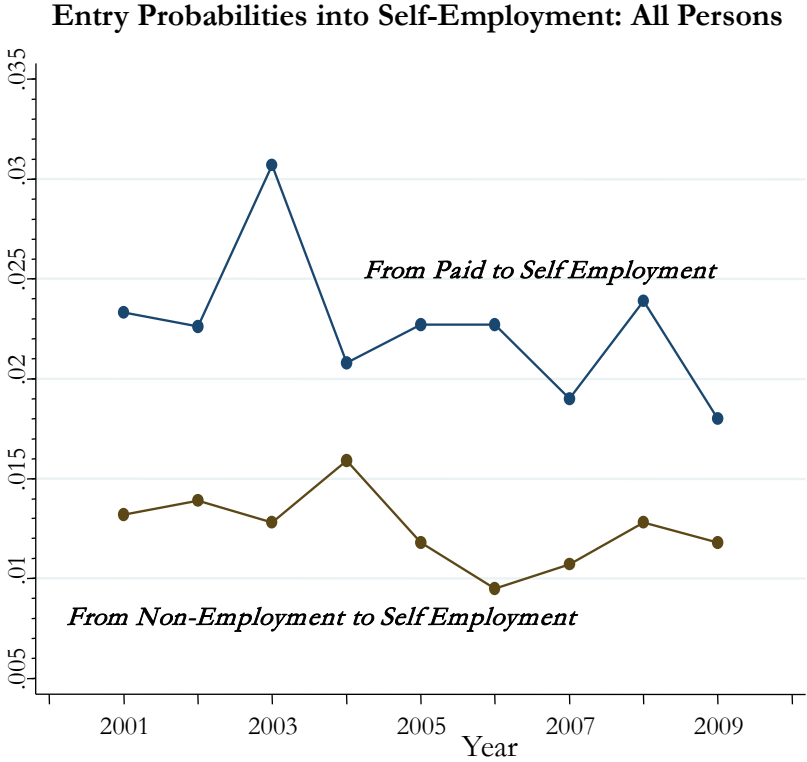
Note: Authors calculations from HILDA (2001-10).

Figure 4: Self-Employment as a Proportion of Population and Labour Force Participation Rates: 2001-2010



Note: Authors calculations from HILDA (2001-10).

Figure 5: Entry and Exit Probabilities of Self-Employment (2001-2010)



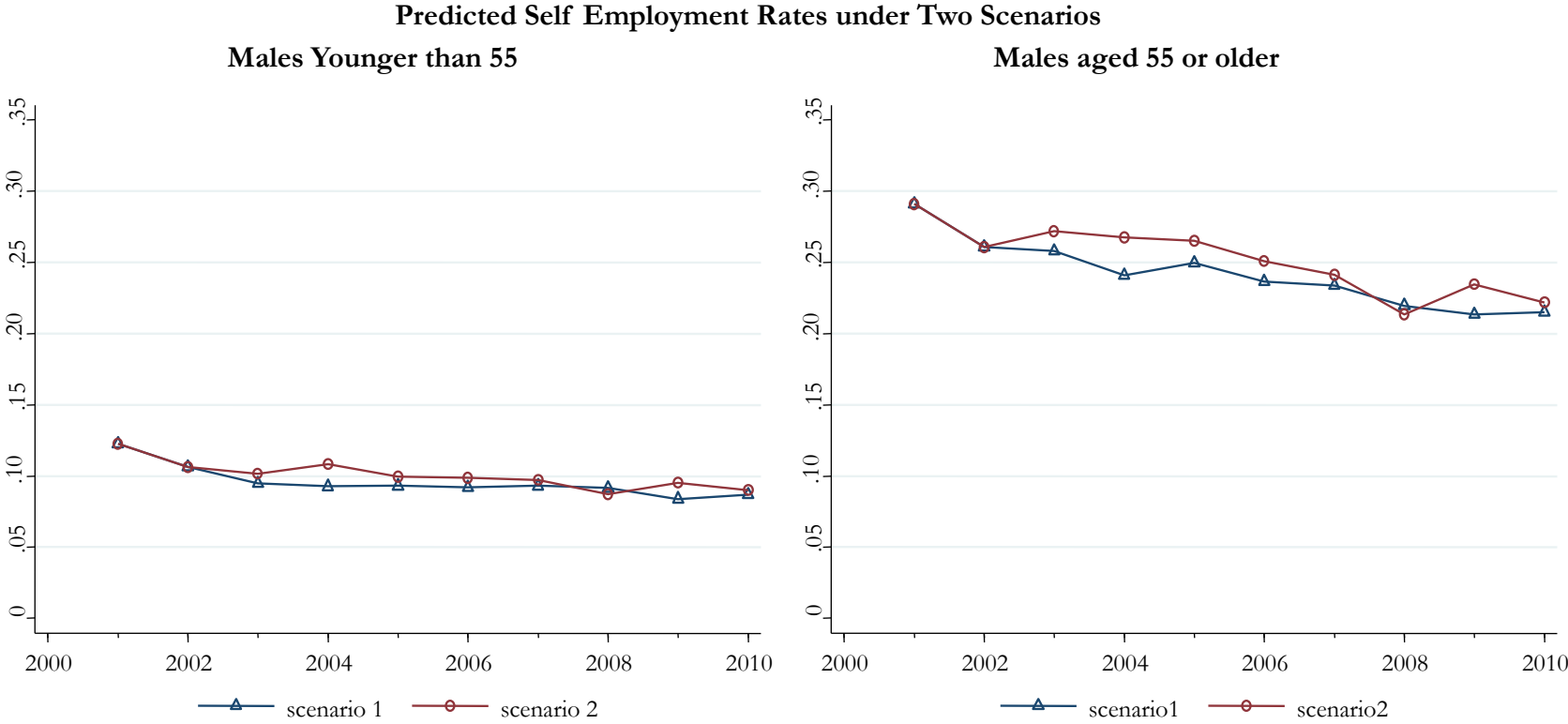
Note: Authors calculations from HILDA (2001-10). Transition probabilities are calculated using two-year longitudinal weights.

Figure 6: Entry and Exit Probabilities of Self-Employment by Gender and Age



Note: Authors calculations from HILDA (2001-10). Transition probabilities are calculated using two-year longitudinal weights.

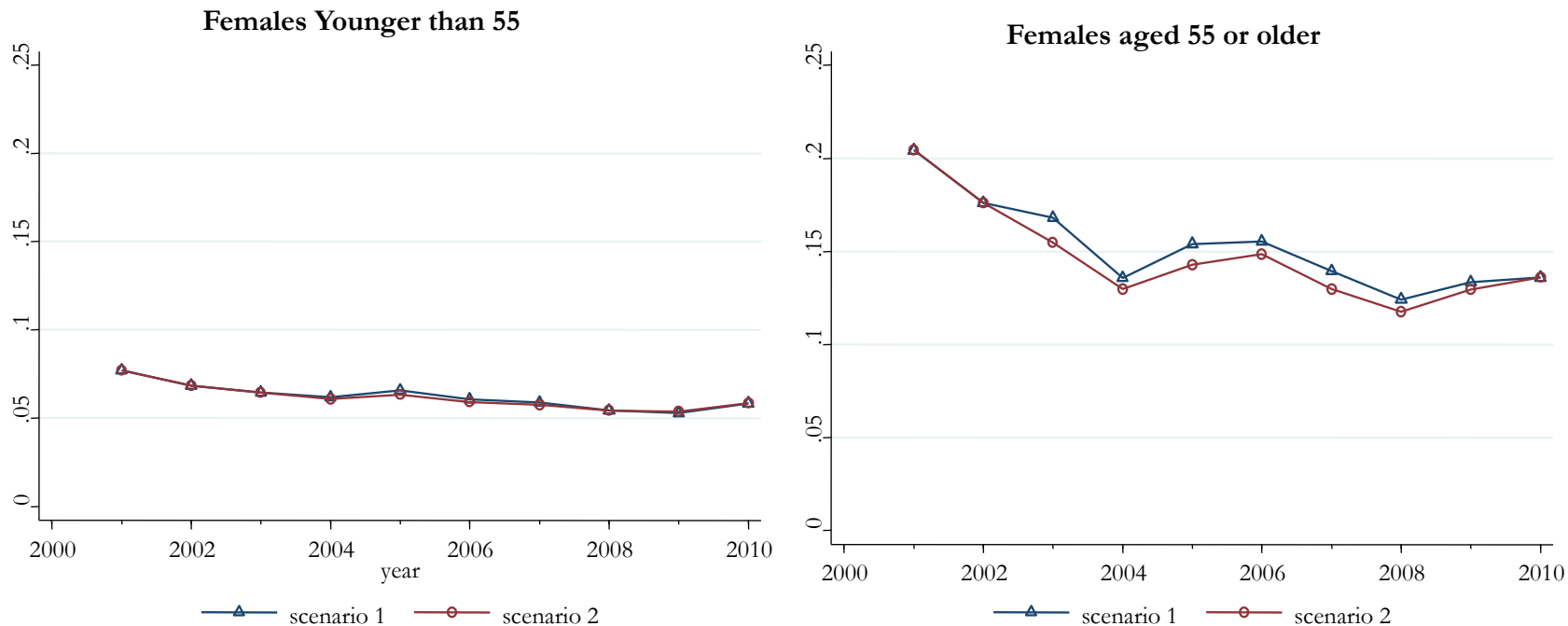
Figure 7: Predicted Self-Employment Rates of Males by Age Groups (2001-2010)



Note: Authors calculations from HILDA (2001-10). Predicted self-employment rates are calculated using Eq (4)-(6). See also footnote 16 for detailed explanations.

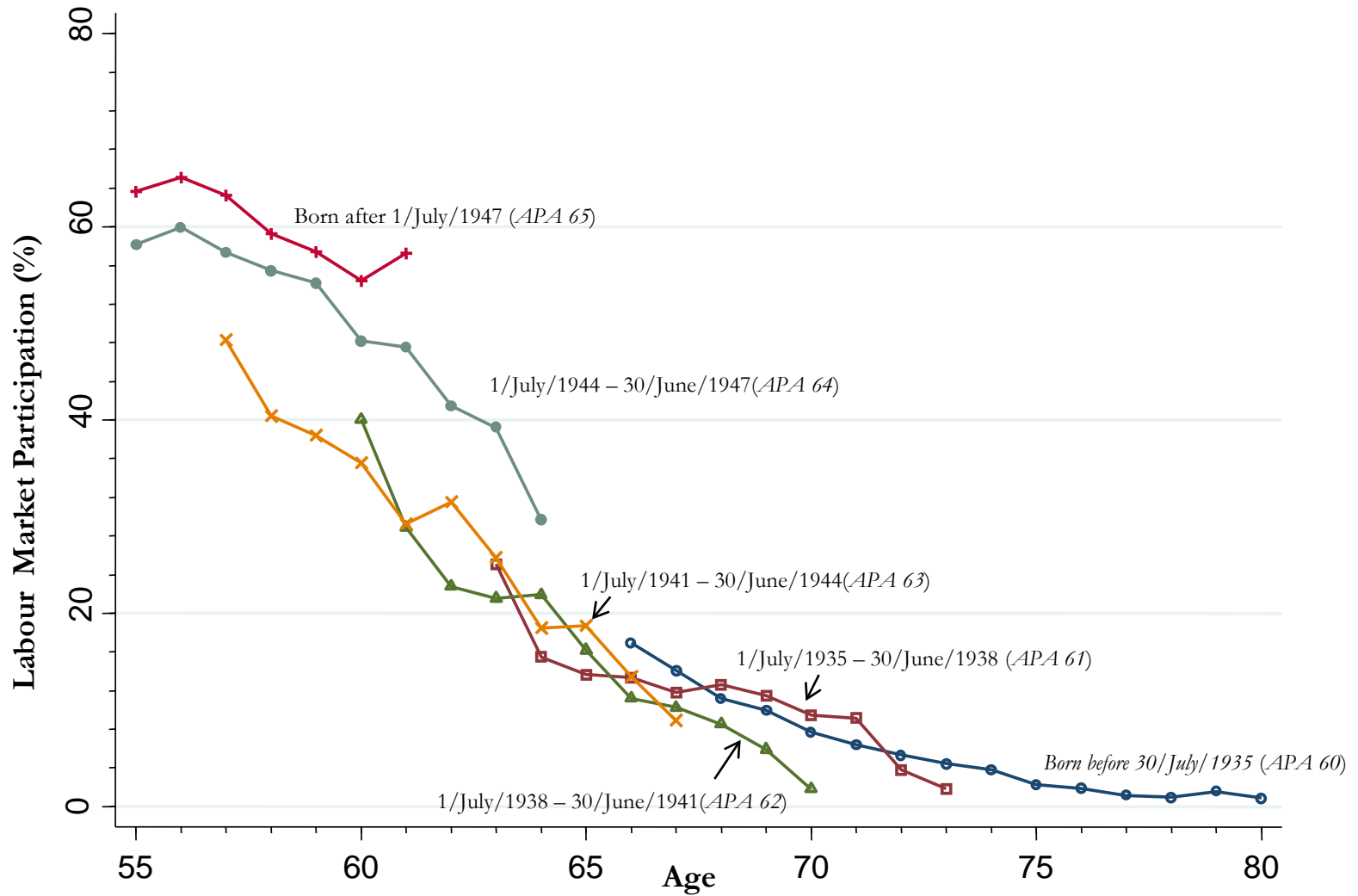
Figure 8: Predicted Self-Employment Rates of Females by Age Groups (2001-2010)

Predicted Self Employment Rates under Two Scenarios



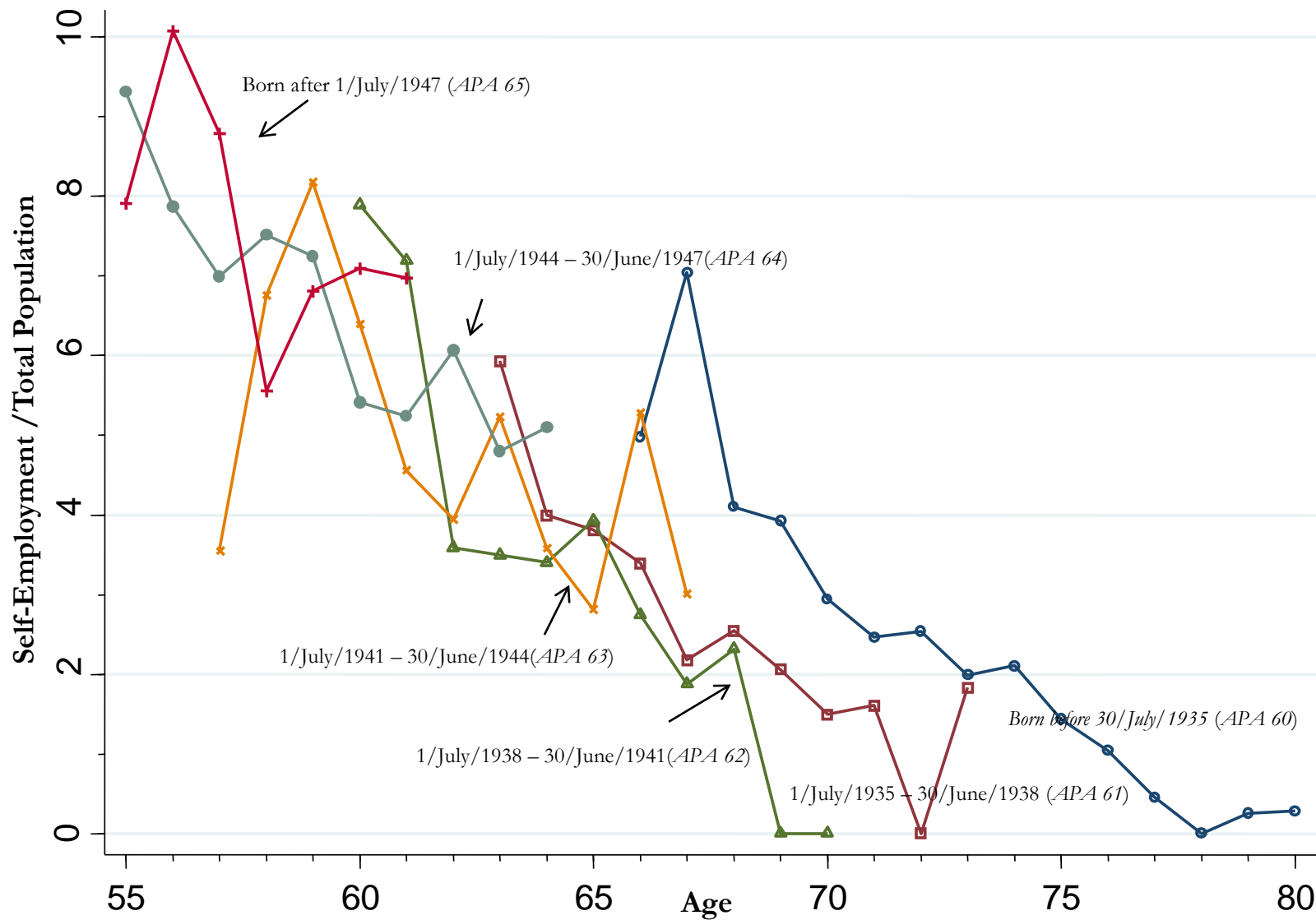
Note: Authors calculations from HILDA (2001-10). Predicted self-employment rates are calculated using Eq (4)-(6). See also footnote 16 for detailed explanations.

Figure 9: Participation Rates of Females, by cohort and age



Note: Authors calculations from HILDA (2001-10).

Figure 10: Self Employment out of Population Rates for Females, by cohort and age



Note: Authors calculations from HILDA (2001-10)

TABLE 1: Means of the Variables by Gender for the Whole Sample Period (2001-2009)

	Males	Females	Definition
age55ov	0.273	0.292	=1 if age is greater than or equal to 55, 0 otherwise
risktake	0.095	0.041	=1 if person takes above average financial risk, 0 otherwise
c0_4	0.154	0.172	Number of children aged between 0 and 4
c5_9	0.137	0.163	Number of children aged between 5 and 9
c10_14	0.144	0.168	Number of children aged between 10 and 14
married	0.617	0.601	=1 if married, 0 otherwise
spdvwd	0.080	0.171	=1 if divorce , separated, widowed, 0 otherwise
bachelor	0.185	0.200	=1 if holds bachelor, 0 otherwise
diploma	0.083	0.085	=1 if holds diploma, 0 otherwise
cert	0.267	0.140	=1 if holds certificate, 0 otherwise
yeartwlv	0.157	0.167	=1 if years of education is equal to 12, 0 otherwise
yearelev	0.309	0.408	=1 if years of education is less than or equal to 11, 0 otherwise
aussi01	0.733	0.736	=1 if born in Australia, 0 otherwise
realhvalue	0.378	0.375	Real value of house owned (million dollars in 2010)
fmanager	0.226	0.237	=1 if father's occupation is manager, 0 otherwise
mmanager	0.063	0.076	=1 if mother's occupation is manager, 0 otherwise
NSW	0.329	0.337	=1 if reside in NSW, 0 otherwise
VIC	0.252	0.252	=1 if reside in Victoria, 0 otherwise
QLD	0.194	0.192	=1 if reside in Queensland, 0 otherwise
SA	0.077	0.077	=1 if reside in South Australia, 0 otherwise
WA	0.100	0.095	=1 if reside in Western Australia, 0 otherwise
TAS	0.024	0.023	=1 if reside in Tasmania, 0 otherwise
NT	0.006	0.008	=1 if reside in Northern Territory, 0 otherwise
ACT	0.016	0.016	=1 if reside in Australian Capital Territory, 0 otherwise
unsexreg	5.32	5.45	Gender-region specific unemployment rates (%)
SR	11.97	7.47	Percent of self-employed out of total employed (%)
Sample size	49,453	55,710	

Note: All means are obtained using 2 year panel weights. Gender-region specific unemployment rates are obtained from the Australian Bureau of Statistics publications. Information on "risktake" is not available for years 2005 and 2007-2009. We use 2004 values for 2005 and 2006 for 2007-2009.

TABLE 2: Means of Variables for Selected Years

	2001	2003	2006	2009
female	0.508	0.508	0.507	0.505
age55ov	0.267	0.277	0.289	0.295
c0_4	0.165	0.161	0.159	0.158
c5_9	0.156	0.152	0.148	0.146
c10_14	0.158	0.159	0.155	0.147
aussi	0.717	0.725	0.729	0.744
bachelor	0.178	0.182	0.200	0.209
diploma	0.081	0.083	0.084	0.084
certificate	0.187	0.195	0.205	0.215
yeartwlv	0.155	0.158	0.163	0.169
unsexreg	6.729	5.969	4.820	5.592
SR	0.117	0.101	0.099	0.094
No. of observations	13,844	12,648	12,834	12,276

Note: female =1 if female, 0 otherwise, and age55ov =1 if age is greater than or equal to 55, 0 otherwise. The definition of other variables is the same as in Table 1.

Table 3: Estimation Results of Transition Probabilities (Males)

	From Paid-employment		From Self-employment		From Non-employment	
	Self (p_{ps})	Non (p_{pn})	Paid (p_{sp})	Non (p_{sn})	Paid (p_{np})	Self (p_{ns})
age55ov	0.699 (0.279)**	1.479 (0.211)**	-0.409 (0.264)	1.206 (0.377)**	-2.836 (0.237)**	-1.492 (0.442)**
risktake	0.197 (0.120)*	-0.115 (0.104)	0.320 (0.122)**	0.066 (0.233)	0.443 (0.138)**	0.619 (0.277)**
c0_4	-0.139 (0.077)*	-0.002 (0.077)	0.020 (0.085)	-0.149 (0.202)	0.116 (0.095)	0.390 (0.211)*
c5_9	0.019 (0.073)	-0.160 (0.091)*	-0.183 (0.082)**	-0.035 (0.175)	-0.087 (0.101)	-0.152 (0.205)
c10_14	-0.111 (0.082)	-0.110 (0.094)	-0.192 (0.082)**	-0.131 (0.167)	-0.096 (0.098)	0.303 (0.163)*
married	0.556 (0.145)**	-0.866 (0.084)**	-0.103 (0.151)	-0.643 (0.234)**	-0.277 (0.102)**	0.871 (0.273)**
spdvwd	0.651 (0.184)**	-0.588 (0.127)**	0.059 (0.195)	-0.477 (0.300)	-0.916 (0.133)**	0.192 (0.333)
bachelor	-0.411 (0.129)**	-0.844 (0.099)**	0.385 (0.140)**	0.286 (0.217)	0.928 (0.129)**	1.387 (0.256)**
diploma	-0.238 (0.160)	-0.651 (0.118)**	0.148 (0.171)	0.222 (0.259)	0.472 (0.149)**	1.177 (0.261)**
certificate	0.045 (0.114)	-0.559 (0.087)**	-0.117 (0.117)	-0.183 (0.185)	0.315 (0.101)**	0.655 (0.240)**
yeartwlv	-0.140 (0.161)	-0.539 (0.099)**	0.082 (0.171)	0.153 (0.273)	0.516 (0.111)**	0.166 (0.300)
aussi	-0.157 (0.116)	-0.164 (0.087)*	0.147 (0.107)	0.199 (0.171)	0.344 (0.100)**	0.808 (0.200)**
fmanager	0.409 (0.092)**	-0.056 (0.086)	-0.257 (0.104)**	-0.620 (0.160)**	-0.030 (0.098)	0.316 (0.199)
mmanager	-0.047 (0.140)	-0.236 (0.135)*	0.056 (0.153)	-0.066 (0.267)	0.315 (0.140)**	-0.233 (0.317)
realhsvalue	0.152 (0.104)	-0.226 (0.099)**	-0.234 (0.115)**	-0.150 (0.179)	0.108 (0.089)	0.243 (0.114)**
unsexreg	-0.009 (0.073)	-0.018 (0.056)	-0.024 (0.076)	-0.076 (0.120)	-0.070 (0.059)	-0.096 (0.151)
year2002	-0.012 (0.185)	0.021 (0.156)	-0.393 (0.192)**	-0.921 (0.432)**	-0.014 (0.145)	-0.176 (0.381)
year2003	0.322 (0.222)	-0.245 (0.171)	-0.442 (0.209)**	-0.256 (0.399)	0.019 (0.173)	-0.349 (0.454)
year2004	-0.284 (0.233)	-0.176 (0.193)	-0.747 (0.245)**	-0.513 (0.492)	-0.067 (0.183)	0.255 (0.452)

Table 3: Estimation Results of Transition Probabilities (Males), cont.

year2005	-0.059 (0.257)	-0.213 (0.211)	-0.420 (0.256)*	-0.506 (0.499)	-0.212 (0.205)	0.187 (0.535)
year2006	0.009 (0.263)	-0.272 (0.215)	-0.169 (0.277)	-0.264 (0.494)	-0.121 (0.208)	-0.334 (0.548)
year2007	-0.297 (0.311)	-0.174 (0.254)	-0.080 (0.313)	-0.423 (0.595)	-0.078 (0.237)	-0.545 (0.672)
year2008	0.042 (0.293)	-0.017 (0.250)	-0.526 (0.323)	-0.809 (0.611)	-0.547 (0.245)**	-0.503 (0.751)
year2009	-0.324 (0.212)	-0.040 (0.178)	-0.504 (0.237)**	-0.511 (0.436)	-0.362 (0.184)**	-0.187 (0.470)
age55ov_year2002	-0.201 (0.416)	-0.386 (0.299)	0.251 (0.448)	0.960 (0.573)*	-0.198 (0.386)	0.463 (0.569)
age55ov_year2003	-0.562 (0.433)	0.248 (0.299)	-0.069 (0.445)	0.032 (0.510)	-0.067 (0.347)	0.335 (0.622)
age55ov_year2004	-0.061 (0.448)	-0.318 (0.296)	0.478 (0.418)	0.014 (0.580)	0.014 (0.340)	-0.488 (0.563)
age55ov_year2005	-0.216 (0.384)	-0.248 (0.299)	-0.374 (0.408)	0.087 (0.548)	0.387 (0.394)	-0.784 (0.663)
age55ov_year2006	-0.696 (0.428)	0.274 (0.288)	-0.175 (0.401)	0.247 (0.520)	-0.078 (0.335)	-0.463 (0.738)
age55ov_year2007	-0.294 (0.433)	0.013 (0.302)	-0.481 (0.428)	-0.147 (0.581)	-0.091 (0.365)	-0.473 (0.735)
age55ov_year2008	-0.204 (0.382)	-0.356 (0.290)	-0.468 (0.452)	0.223 (0.614)	0.745 (0.348)**	0.464 (0.664)
age55ov_year2009	-0.172 (0.430)	-0.366 (0.314)	0.186 (0.410)	0.293 (0.532)	0.313 (0.355)	0.207 (0.616)
constant	-3.814 (0.598)**	-1.530 (0.443)**	-0.618 (0.588)	-1.576 (0.957)*	-0.703 (0.440)	-4.547 (1.104)**
Chi2 (8) statistic for time dummies (p-value)	14.02 (0.081)*	7.50 (0.484)	20.68 (0.008)**	6.31 (0.613)	14.09 (0.079)*	6.05 (0.641)
Chi2 (8) statistic for interactions (p-value)	3.93 (0.863)	12.72 (0.122)	7.90 (0.443)	4.24 (0.835)	10.15 (0.255)	8.19 (0.415)
Log-pseudo-likelihood	-13,943,169		-3,909,743		-7,982,901	
No. of Obs.	29,929		4,581		14,066	

Note: All equations include 7 regional dummies. Standard errors are adjusted for repeated observations on the same individuals across waves using Huber correction. Base categories are single, education less than 11 years and father's and mother's occupations other than manager and professionals. ** and * indicate statistical significances at the 5% and 10% levels, respectively.

Table 4: Estimation Results of Transition Probabilities (Females)

	From Paid-employment		From Self-employment		From Non-employment	
	Self (p _{ps})	Non (p _{pn})	Paid (p _{sp})	Non (p _{sn})	Paid (p _{np})	Self (p _{ns})
age55ov	0.921 (0.382)**	0.915 (0.188)**	-0.525 (0.465)	1.062 (0.416)**	-2.783 (0.252)**	-2.186 (0.476)**
risktake	0.647 (0.231)**	-0.097 (0.117)	0.130 (0.241)	0.195 (0.367)	0.123 (0.150)	-0.229 (0.338)
c0_4	0.402 (0.095)**	0.514 (0.045)**	0.083 (0.116)	0.414 (0.124)**	-0.162 (0.041)**	-0.155 (0.106)
c5_9	0.110 (0.095)	-0.086 (0.054)	0.104 (0.099)	0.147 (0.132)	-0.052 (0.046)	0.227 (0.102)**
c10_14	-0.041 (0.090)	-0.237 (0.059)**	0.171 (0.105)	0.102 (0.134)	-0.181 (0.051)**	0.027 (0.109)
married	0.453 (0.196)**	-0.088 (0.068)	-0.567 (0.220)**	-0.742 (0.262)**	-0.678 (0.066)**	0.713 (0.216)**
spdvwd	0.231 (0.236)	-0.161 (0.101)	-0.367 (0.281)	-0.725 (0.342)**	-0.832 (0.104)**	0.198 (0.289)
bachelor	0.523 (0.147)**	-0.546 (0.072)**	0.198 (0.184)	-0.706 (0.213)**	1.199 (0.086)**	1.168 (0.184)**
diploma	0.547 (0.183)**	-0.585 (0.099)**	0.214 (0.207)	-0.876 (0.270)**	0.692 (0.103)**	0.717 (0.234)**
certificate	0.443 (0.161)**	-0.204 (0.090)**	0.128 (0.180)	-0.522 (0.224)**	0.546 (0.091)**	0.336 (0.193)*
yeartwlv	0.048 (0.191)	-0.232 (0.078)**	0.073 (0.208)	-0.073 (0.223)	0.518 (0.078)**	0.240 (0.210)
aussi	-0.207 (0.149)	-0.185 (0.074)**	0.002 (0.157)	-0.005 (0.209)	0.423 (0.073)**	0.592 (0.176)**
fmanager	0.057 (0.131)	-0.131 (0.062)**	-0.194 (0.141)	-0.366 (0.163)**	0.015 (0.072)	0.384 (0.147)**
mmanager	0.153 (0.179)	-0.087 (0.097)	-0.326 (0.213)	-0.424 (0.239)*	0.060 (0.102)	-0.162 (0.243)
realhsvalue	0.032 (0.129)	-0.214 (0.093)**	0.053 (0.121)	0.008 (0.167)	0.229 (0.058)**	0.454 (0.074)**
unsexreg	0.125 (0.112)	0.069 (0.055)	0.003 (0.132)	0.203 (0.157)	0.024 (0.056)	0.019 (0.139)
year2002	0.031 (0.237)	0.120 (0.111)	-0.386 (0.259)	-0.062 (0.325)	-0.002 (0.113)	0.001 (0.265)
year2003	0.416 (0.247)*	-0.022 (0.114)	-0.297 (0.266)	-0.203 (0.344)	0.097 (0.109)	-0.072 (0.281)
year2004	0.263 (0.301)	0.019 (0.126)	-0.168 (0.282)	0.190 (0.432)	0.303 (0.120)**	0.054 (0.306)

Table 4: Estimation Results of Transition Probabilities (Females), continued.

year2005	0.121 (0.285)	0.040 (0.131)	-0.465 (0.316)	0.236 (0.382)	0.227 (0.134)*	-0.464 (0.374)
year2006	0.138 (0.309)	-0.024 (0.144)	-0.057 (0.325)	0.060 (0.442)	0.178 (0.139)	-0.402 (0.400)
year2007	-0.019 (0.322)	-0.009 (0.161)	-0.169 (0.341)	-0.037 (0.617)	0.015 (0.151)	-0.273 (0.393)
year2008	0.100 (0.336)	0.175 (0.159)	-0.715 (0.380)*	0.354 (0.490)	-0.171 (0.158)	-0.139 (0.427)
year2009	-0.137 (0.325)	0.084 (0.149)	-0.137 (0.322)	0.448 (0.374)	-0.008 (0.123)	-0.512 (0.406)
age55ov_year2002	-0.476 (0.660)	-1.188 (0.324)**	0.199 (0.667)	-0.017 (0.601)	0.003 (0.343)	0.290 (0.609)
age55ov_year2003	-0.759 (0.599)	-0.378 (0.280)	-1.507 (0.906)*	-0.302 (0.585)	-0.278 (0.365)	0.253 (0.706)
age55ov_year2004	-0.855 (0.590)	-0.523 (0.292)*	-0.872 (0.740)	-0.804 (0.665)	0.014 (0.336)	0.741 (0.578)
age55ov_year2005	-0.327 (0.565)	-0.252 (0.267)	0.168 (0.624)	-0.364 (0.572)	-0.222 (0.362)	0.730 (0.658)
age55ov_year2006	-0.331 (0.528)	-0.707 (0.284)**	-0.145 (0.664)	-0.052 (0.596)	-0.110 (0.359)	0.004 (0.782)
age55ov_year2007	-0.044 (0.569)	-0.602 (0.417)	-0.114 (0.639)	-0.330 (0.755)	-0.110 (0.368)	0.587 (0.663)
age55ov_year2008	-0.864 (0.594)	-0.415 (0.287)	-1.237 (0.802)	-0.954 (0.634)	0.505 (0.619)	0.207 (0.654)
age55ov_year2009	-0.279 (0.570)	-0.004 (0.304)	-0.082 (0.645)	-0.275 (0.612)	-0.558 (0.390)	0.487 (0.673)
constant	-5.526 (0.820)**	-2.178 (0.372)**	-0.498 (0.918)	-2.384 (1.093)**	-1.631 (0.383)**	-5.449 (0.969)**
Chi2 (8) statistic for time dummies (p-value)	5.98 (0.649)	5.20 (0.736)	9.22 (0.325)	4.39 (0.821)	22.38 (0.004)**	5.02 (0.756)
Chi2 (8) statistic for interactions (p-value)	4.64 (0.796)	19.48 (0.013)**	8.31 (0.404)	4.01 (0.856)	4.74 (0.785)	3.18 (0.923)
Log-pseudo-likelihood		-13,841,277		-2,294,937		-10,806,489
No. of Obs.		28709		2536		23,368

Note: All equations include 7 regional dummies. Standard errors are adjusted for repeated observations on the same individuals across waves using Huber correction. Base categories are single, education less than 11 years and father's and mother's occupations other than manager and professionals. ** and * indicate statistical significances at the 5% and 10% levels, respectively.

TABLE 5: Growth of labour demand, 2001-10

	<55 years	> 55 years
Employees and self-employed		
<i>All</i>	0.2205	0.1902
<i>Males</i>	0.1848	0.1487
<i>Females</i>	0.2805	0.2669
Employees only		
<i>All</i>	0.2643	0.2651
<i>Males</i>	0.2370	0.2295
<i>Females</i>	0.3070	0.3229

APPENDIX TABLE A1: EVOLUTION OF SELF-EMPLOYMENT RATES: SELECTED COUNTRIES

Self-employment rates												
<i>As a percentage of total employment by gender</i>												
	Total Men								Women			
	1990	2000	2005	2010	1990	2000	2005	2010	1990	2000	2005	2010
Australia	14.4	13.6	12.7	11.6	16.4	16.1	15.2	13.9	11.6	10.4	9.7	8.9
Austria	14.2	13.1	13.3	13.8	..	13.9	15.3	16.0	..	12.2	10.9	11.3
Belgium	18.1	15.8	15.2	14.4	18.5	17.5	17.5	17.3	17.5	13.5	12.3	10.8
Canada	9.5	10.6	9.5	9.2	10.8	11.8	10.6	10.2	7.8	9.2	8.2	8.1
Denmark	11.7	8.7	8.7	8.8	..	11.7	11.6	11.7	..	5.5	5.3	5.5
Finland	15.6	13.7	12.7	13.5	19.5	17.8	16.7	17.7	11.3	9.2	8.5	9.0
France	13.2	9.3	9.1	..	15.0	11.0	10.9	..	10.9	7.3	6.9	..
Germany	..	11.0	12.4	11.6	..	13.4	14.9	14.4	..	7.9	9.4	8.4
Italy	28.7	28.5	27.0	25.5	31.1	32.3	31.2	30.3	24.1	22.0	20.6	18.5
Japan	22.3	16.6	14.7	12.3	18.9	15.5	14.5	12.9	27.4	18.3	14.9	11.4
Netherlands	12.4	11.2	12.4	..	11.8	12.6	14.6	..	13.4	9.4	9.7	..
New Zealand	19.8	20.6	18.3	..	24.7	25.6	22.7	..	13.4	14.5	13.3	..
Norway	11.3	7.4	7.4	7.7	14.6	9.8	10.2	10.8	7.4	4.8	4.4	4.4
Portugal	29.4	26.0	25.1	22.9	..	27.4	26.7	25.3	..	24.4	23.3	20.1
Spain	25.8	20.2	18.2	16.9	25.8	22.2	20.8	20.5	25.9	16.6	14.5	12.4
Sweden	9.2	10.3	9.8	10.9	12.9	14.5	14.0	15.0	5.2	5.7	5.3	6.4
Switzerland	..	13.2	11.2	..	..	13.9	11.7	..	..	12.3	10.6	..
United Kingdom	15.1	12.8	12.9	13.9	19.9	16.7	17.4	18.2	8.9	8.3	7.7	8.9
United States	8.8	7.4	7.5	7.0	10.5	8.6	8.8	8.3	6.7	6.1	5.9	5.6
EU27 total	..	18.3	17.3	..	..	20.9	20.5	..	..	14.8	13.2	..
OECD total	..	17.7	16.8	..	..	19.1	18.4	..	..	14.8	13.5	..

Source:OECD Factbook 2011: Economic, Environmental and Social Statistics - ISBN 978-92-64-11150-9 - © OECD 2011

APPENDIX TABLE A2: PROPORTION OF LABOUR MARKET STATES FOR MALES UNDER 2 SCENARIOS

Year	Scenario 1								Scenario 2							
	Male Younger than 55 years old				Male aged 55 and older				Male Younger than 55 years old				Male aged 55 and older			
	Paid	Self Emp.	Non Emp.	SE rate	Paid	Self Emp.	Non Emp.	SE rate	Paid	Self Emp.	Non Emp.	SE rate	Paid	Self Emp.	Non Emp.	SE rate
2001	0.711	0.099	0.190	0.122	0.222	0.091	0.686	0.291	0.711	0.099	0.190	0.122	0.222	0.091	0.686	0.291
2002	0.752	0.089	0.159	0.106	0.211	0.075	0.714	0.261	0.752	0.089	0.159	0.106	0.211	0.075	0.714	0.261
2003	0.766	0.080	0.154	0.095	0.221	0.077	0.701	0.258	0.759	0.086	0.155	0.101	0.216	0.081	0.703	0.272
2004	0.764	0.078	0.158	0.093	0.234	0.074	0.691	0.241	0.752	0.091	0.157	0.108	0.226	0.083	0.691	0.267
2005	0.773	0.079	0.148	0.093	0.233	0.078	0.689	0.250	0.764	0.084	0.151	0.099	0.226	0.081	0.693	0.265
2006	0.777	0.079	0.145	0.092	0.236	0.073	0.691	0.236	0.764	0.084	0.153	0.099	0.228	0.076	0.696	0.251
2007	0.775	0.079	0.145	0.093	0.254	0.078	0.668	0.234	0.768	0.082	0.150	0.097	0.250	0.079	0.671	0.241
2008	0.780	0.078	0.141	0.091	0.255	0.072	0.673	0.220	0.781	0.075	0.144	0.087	0.255	0.069	0.675	0.214
2009	0.787	0.072	0.141	0.084	0.260	0.071	0.669	0.213	0.761	0.080	0.159	0.095	0.246	0.075	0.679	0.235
2010	0.773	0.073	0.154	0.087	0.279	0.076	0.644	0.215	0.757	0.075	0.168	0.090	0.271	0.077	0.652	0.222

Note: Scenario 1 assumes transition probabilities are fixed at 2001-2002 levels. Scenario 2 assumes transition probabilities vary according to estimates in table 3 in the text. Paid-, Self-, Non-employment proportions and self-employment rates are calculated according to equations (4)-(6)

APPENDIX TABLE A3: PROPORTION OF LABOUR MARKET STATES FOR FEMALES UNDER 2 SCENARIOS

Year	Scenario 1								Scenario 2							
	Female Younger than 55 years old				Female aged 55 and older				Female Younger than 55 years old				Female aged 55 and older			
	Paid	Self Emp.	Non Emp.	SE rate	Paid	Self Emp.	Non Emp.	SE rate	Paid	Self Emp.	Non Emp.	SE rate	Paid	Self Emp.	Non Emp.	SE rate
2001	0.615	0.051	0.333	0.077	0.141	0.036	0.823	0.204	0.615	0.051	0.333	0.077	0.141	0.036	0.823	0.204
2002	0.646	0.047	0.306	0.068	0.132	0.028	0.840	0.176	0.646	0.047	0.306	0.068	0.132	0.028	0.840	0.176
2003	0.652	0.045	0.303	0.064	0.135	0.027	0.837	0.168	0.652	0.045	0.303	0.064	0.152	0.028	0.820	0.155
2004	0.657	0.043	0.299	0.062	0.158	0.025	0.817	0.136	0.663	0.043	0.294	0.061	0.168	0.025	0.807	0.130
2005	0.663	0.047	0.290	0.066	0.147	0.027	0.827	0.154	0.681	0.046	0.273	0.063	0.162	0.027	0.811	0.143
2006	0.674	0.044	0.282	0.061	0.157	0.029	0.814	0.155	0.687	0.043	0.270	0.059	0.167	0.029	0.804	0.149
2007	0.677	0.042	0.280	0.059	0.177	0.029	0.795	0.139	0.687	0.042	0.271	0.058	0.196	0.029	0.775	0.130
2008	0.689	0.040	0.272	0.054	0.193	0.027	0.780	0.124	0.689	0.040	0.271	0.054	0.209	0.028	0.763	0.118
2009	0.694	0.039	0.267	0.053	0.197	0.030	0.772	0.133	0.686	0.039	0.275	0.054	0.207	0.031	0.762	0.129
2010	0.680	0.042	0.277	0.058	0.207	0.033	0.761	0.136	0.680	0.042	0.278	0.058	0.207	0.033	0.761	0.136

Note: Scenario 1 assumes transition probabilities are fixed at 2001-2002 levels. Scenario 2 assumes transition probabilities vary according to estimates in table 3 in the text. Paid-, Self-, Non-employment proportions and self-employment rates are calculated according to equations (4)-(6)

APPENDIX TABLE A4: AVERAGE RATE OF INCOME TAX (2001-10)

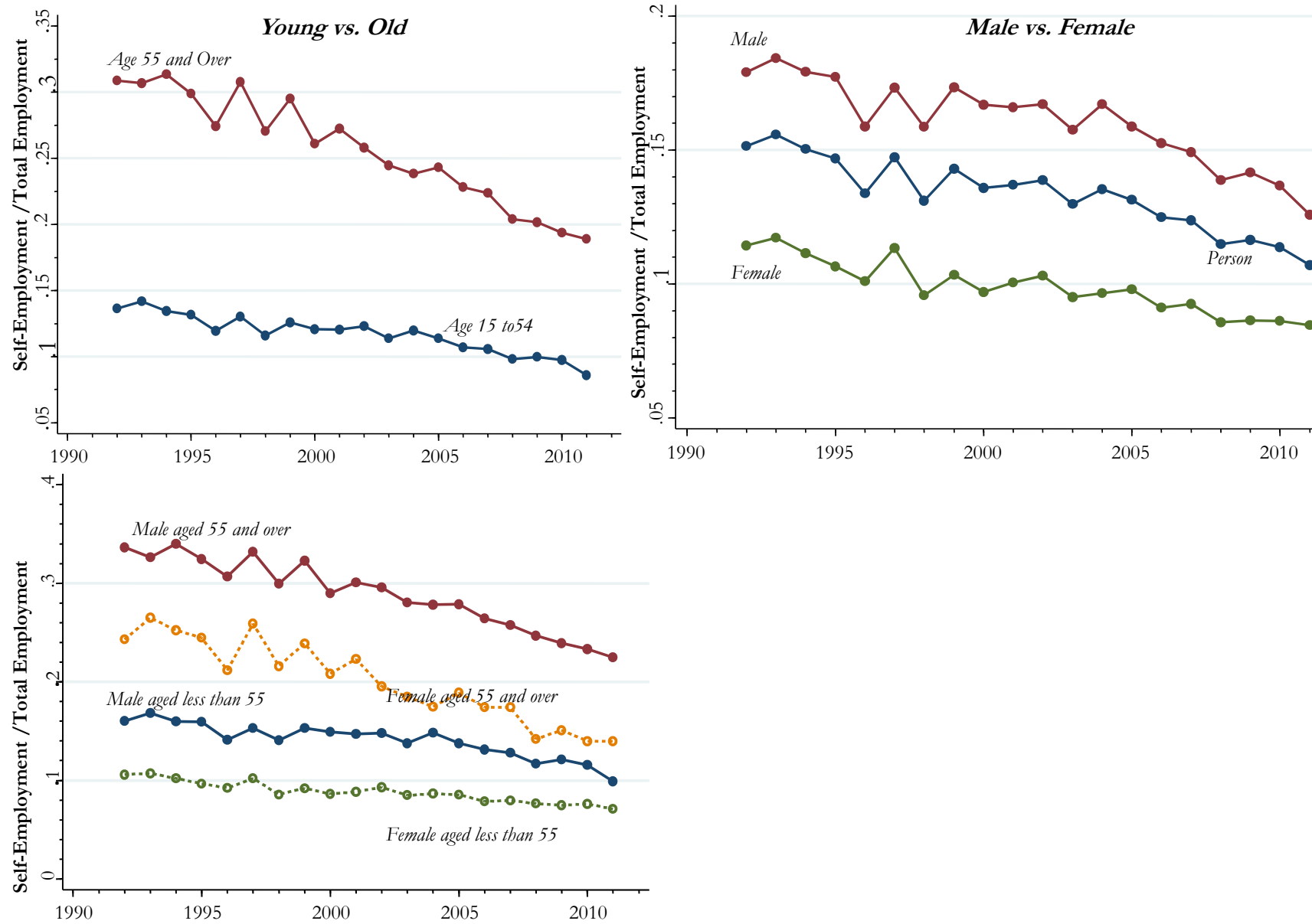
Average rate of income tax and employees' social security contributions (%)

Family type	Year									
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Single person at 67% of average earnings, no child	18.86	19.51	20.16	20.08	20.58	20.22	19.09	17.22	15.67	15.94
Single person at 100% of average earnings, no child	23.07	23.51	23.94	23.88	24.22	23.98	23.36	22.55	22.06	22.28
Single person at 167% of average earnings, no child	30.87	31.78	32.69	32.75	32.19	30.75	28.74	28.67	28.28	28.22
Single person at 67% of average earnings, with two children	18.83	19.28	20.05	20.21	20.46	20.22	18.81	17.13	13.90	14.19
One-earner married couple at 100% of average earnings, 2 children	23.07	23.51	23.94	23.88	24.22	23.98	23.36	22.55	20.88	21.11
2-earner married couple, one at 100% of average earnings and the other at 33 %, 2 children	19.69	20.13	20.66	20.66	21.00	20.56	19.60	18.96	17.31	17.43
2-earner married couple, one at 100% of average earnings and the other at 67 %, 2 children	21.39	21.91	22.43	22.36	22.76	22.47	21.65	20.42	18.80	19.05
2-earner married couple, one at 100% of average earnings and the other at 33 %, no child	19.69	20.13	20.66	20.66	21.00	20.56	19.60	18.96	18.19	18.31
Real Hourly Minimum Wages										
Real Hourly Minimum Wage (\$US – 2011 Base Year)	7.41	7.86	9.5	10.97	11.45	11.16	12.8	12.54	11.87	13.9

Source : OECD comparative tables: <http://stats.oecd.org/>

Appendix Figure A1:

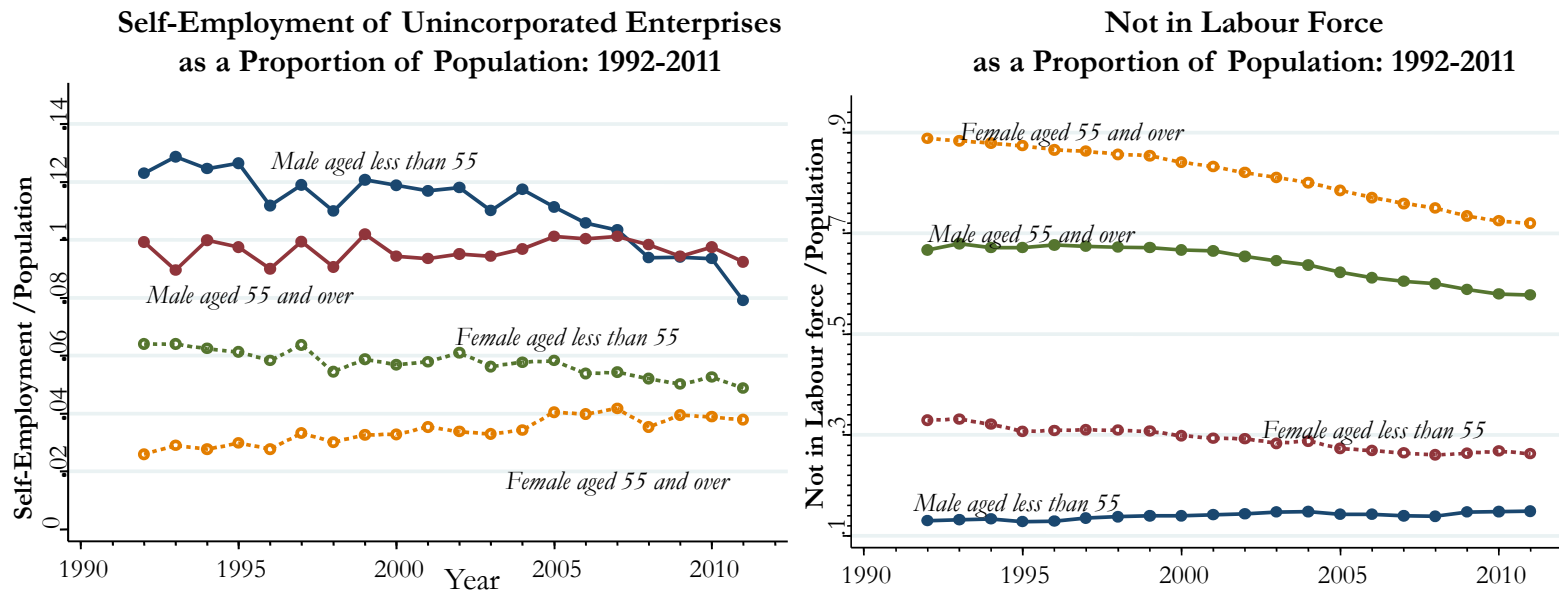
Self-Employment of Unincorporated Enterprises as a Proportion of All Employed: 1992-2011



Source: ABS 6105.0 Australian Labour Market Statistics

Appendix Figure A2:

Self-Employment and Labour Force as a Proportion of Population: 1992-2011



Source: ABS 6105.0 Australian Labour Market Statistics