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The dynamics of solo self-employment: persistence and transition to employership

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The dynamics of solo self-employment: persistence and transition to employership

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Abstract: This study examines dynamics of solo self-employment. In particular, we investigate the extent of true state dependence and cross state dependence, i.e., whether experiencing solo self-employment causally affects the probability of becoming an employer in the future. We use data from the German Socio-Economic Panel to estimate dynamic multinomial logit models. Our results show that the extent of true (cross) state dependence is rather small. The observed persistence in solo self-employment as well as transitions from solo self-employment to employership can largely be explained by observed and unobserved heterogeneity.

Zusammenfassung: Diese Studie untersucht die Dynamik der Solo-Selbständigkeit (Verbleib, Zu- und Abgänge). Wir berechnen das Ausmaß genuiner Zustandsabhängigkeit für den Verbleib in Solo-Selbständigkeit und schätzen den kausalen Effekt der Solo-Selbstständigkeit auf die Wahrscheinlichkeit, Arbeitgeber zu werden. Die Berechungen basieren auf dynamischen multinomialen Logit-Modellen, die mit Daten des Sozio-oekonomischen Panels geschätzt wurden. Unsere Ergebnisse deuten auf eine nur geringe genuine Zustandsabhängigkeit hin: Sowohl die beobachtete Persistenz in Solo-Selbständigkeit als auch die Übergänge zum Arbeitgeber-Status lassen sich größtenteils durch (beobachtete und unbeobachtete) individuelle Merkmale erklären.

Keywords: state dependence, dynamic multinomial logit, solo self-employment, own-account worker, stepping stone

JEL Classification: J23, J62

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1 Introduction

In many countries, policy makers stimulate self-employment to create jobs (see, e.g., Congregado et al. 2010, European Commission 2013, Kritikos 2014). More often than not, self-employment starts with *solo* self-employment. That is, entrepreneurs usually start as own-account workers who do not employ other workers. For instance, in Germany, Europe's biggest economy, two thirds of all start-ups are launched by solo self-employed (cf. Metzger 2014). Among subsidized start-ups, this share is even higher. About 70% of founders who received a start-up subsidy still have not employed other workers 19 months after start up (cf. Caliendo et al. 2012). Not surprisingly then, solo self-employment is the dominant form of self-employment in many countries. In Germany, about 57% of all self-employed were solo self-employed in 2012 (cf. Brenke 2013), and this share is even higher in the US, the UK, and Canada, where it is between 70 and 80% (cf. Parker 2009, p. 293).

Although solo self-employment is a common form of self-employment, the literature does not yet provide a clear understanding of the dynamics of solo self-employment. In consequence, there is a gap in knowledge about what are the effects of experiencing solo self-employment in the past on future labor market outcomes. Such knowledge is important for policy makers aiming at stimulating job creation. In general, the literature distinguishes between two mechanisms that may explain individuals' transitions between labor market states, both of which have different policy implications (see, e.g., Prowse 2012). First, if the past experience of solo self-employment has a causal effect on the probability of solo self-employment in the future, then policy measures such as start-up subsidies will have lasting effects even after the subsidies ended. This mechanism is termed true (or genuine) state dependence in the literature (see, e.g., Heckman and Borjas 1980, Heckman 1981). However, if persistence in solo self-employment can fully be explained by individual characteristics that determine both solo self-employment in the past and in the

future alike, such policies will hardly have long-term effects. The literature refers to this second mechanism as spurious state dependence.

Subsidizing self-employment often brings individuals in solo self-employment initially. Such policies may have further advantageous effects when the subsidized self-employed become employers and create jobs for others in the future (the so-called "double dividend", see, e.g., Caliendo and Kritikos 2010). Such a double dividend is likely to occur in the presence of true cross state dependence, i.e., if experiencing solo self-employment in the past increases the probability of becoming an employer in the future, for instance because individuals acquire entrepreneurial knowledge and skills while working in solo self-employment (see, e.g., Minniti and Bygrave 2001).

Previously, only few studies have empirically investigated state dependence in self-employment and we are not aware of any paper studying (cross) state dependence in *solo* self-employment. Among the few studies analyzing state dependence in self-employment, Henley (2004) and Caliendo and Uhlendorff (2008) find evidence for state dependence in the UK and Germany, respectively. Millán et al. (2014) using ECHP data from 1994 to 2001 estimate competing risks models. They distinguish between own-account workers and job creators and find persistence in entrepreneurship. Congregado et al. (2010) investigate the determinants of transitions between solo self-employment and other labor market states but do not address state dependence in solo self-employment and whether it may be a stepping-stone to employership. Buschoff and Schmidt (2005) provide descriptive evidence on transitions from solo self-employment in five European countries. There is, thus, a clear lack of evidence on whether solo self-employment exhibits true state dependence and on its role as a stepping-stone to employership.

This paper fills this research gap by making the following contributions. First, we contribute to the international literature by estimating the extent of true state dependence in solo

self-employment, an issue which, to the best of our knowledge, has not yet been investigated by prior research. Second, we contribute a comprehensive picture of the dynamics of solo self-employment by modeling transitions between four different labor market states: solo self-employment, employership, paid employment, and non-employment. This four-state categorization allows us to differentiate alternative pathways into, within, and out of solo self-employment. In particular, we examine to what extent solo self-employment serves as a stepping-stone to employership by identifying cross state dependencies between these states. Finally, we provide evidence on how dynamics of solo self-employment differ between men and women.

The analysis proceeds as follows. In section 2, we introduce our estimation strategy. Section 3 provides information on the data set used and shows descriptively that there is, for both men and women, pronounced persistence in solo self-employment and that solo self-employed are much more likely to become employers than paid employees are. Section 4 presents the results of a dynamic multinomial logit models and provides evidence that the extent of *true* (cross) state dependency is rather small. We discuss our findings and draw some policy implications in section 5.

2 Estimation strategy

We apply a dynamic multinomial logit model to estimate the determinants of transitions between four labor market states. The model assumes that in every time period an individual chooses the labor market state (solo self-employment, employership, paid employment, non-employment) that yields the highest utility. We specify a random utility function for individual i in state j at time t as follows:

$$U_{ijt} = \boldsymbol{\beta}'_j \mathbf{x}_{it} + \boldsymbol{\gamma}'_j \mathbf{y}_{i,t-1} + \alpha_{ij} + \varepsilon_{ijt}. \tag{1}$$

The utility function includes a vector of observed individual characteristics, $\mathbf{x}_{it}$, and a set of previous state indicator variables, represented by the vector $\mathbf{y}_{i,t-1}$. The vectors $\boldsymbol{\beta}_j$ and $\boldsymbol{\gamma}_j$ represent alternative-specific coefficients. $\boldsymbol{\gamma}_j$ captures the effect of the previous state on the current state utility and measures true state dependence in labor market states. The random error component α_{ij} models individual-specific unobserved heterogeneity.[1] The model assumes that the unobserved part ε_{ijt} is independently distributed with a type I extreme value distribution.

Including the lagged labor market state in the model brings the difficulty to deal with the initial conditions problem. We observe only labor market choices over the period of time covered by the data, but we generally do not observe individuals' choices in the preceding periods. In consequence, the initially observed labor market state is likely to be correlated with the random error component, leading to inconsistent estimates. To solve this endogeneity problem, we apply the conditional maximum likelihood estimator suggested by Wooldridge (2005).

Taking up the Wooldridge approach, we model the unobserved heterogeneity α_{ij} as a function of the initial state $\mathbf{y}_{i0}$, individual-specific explanatory variables $\bar{\mathbf{x}}_i$, and a new random error, a_{ij}, that is assumed to be uncorrelated with the initial state. In an alternative specification, we additionally include initial-period explanatory variables to allow for a more flexible model for the unobserved heterogeneity (Rabe-Hesketh and Skrondal 2013). Both specifications lead to identical results in our application, suggesting that the parsimonious model is not overly restrictive.[2] We assume a_{ij} to be normally distributed with zero mean and variance σ_a^2. Hence, the probability that individual i is in state j at time t conditional on observed and unobserved characteristics and the labor market state in $t-1$ can be written as (for a general derivation of choice probabilities,

[1] Including α_{ij} in the utility function also relaxes the restrictive independence of irrelevant alternatives (IIA) assumption of the conventional multinomial logit model by capturing correlations in individual random effects across alternatives (for further discussion, see Skrondal and Rabe-Hesketh 2003).

[2] Wooldridge (2005) includes a vector of all explanatory variables across all periods in the model for the unobservables. This approach can, however, only be applied to a balanced panel data set. A common approach in the literature is, therefore, to use within-means of time-varying explanatory variables (for a discussion, see Rabe-Hesketh and Skrondal 2013).

see Train 2009).

$$P(Y_{it} = j|\mathbf{x}_{it}, \mathbf{y}_{i,t-1}, \mathbf{y}_{i0}, \boldsymbol{a}_i) = \frac{\exp(\boldsymbol{\beta}'_j \mathbf{x}_{it} + \boldsymbol{\gamma}'_j \mathbf{y}_{i,t-1} + \boldsymbol{\delta}'_{1j} \mathbf{y}_{i0} + \boldsymbol{\delta}'_{2j} \bar{\mathbf{x}}_i + a_{ij})}{\sum_{k=1}^{4} \exp(\boldsymbol{\beta}'_k \mathbf{x}_{it} + \boldsymbol{\gamma}'_k \mathbf{y}_{i,t-1} + \boldsymbol{\delta}'_{1k} \mathbf{y}_{i0} + \boldsymbol{\delta}'_{2k} \bar{\mathbf{x}}_i + a_{ik})}. \quad (2)$$

We estimate the coefficients in equation 2 using a dynamic multinomial logit model with random effects, which includes additional covariates for the auxiliary model for the unobserved heterogeneity. Estimation is carried out with the command -gsem- available in Stata 14.

We use average predicted probabilities to calculate state dependence in transitions, using the observed covariate values of each individual. The prediction is calculated by integrating the unobserved heterogeneity out of the likelihood. Standard errors are calculated using the delta method. We report 95% confidence intervals to assess the uncertainty of the prediction.

Following Immervoll et al. (2015), we define true state dependence in solo self-employment as the difference between the probability of being solo self-employed at time t conditional on being in that state in $t-1$ and the probability of being solo self-employed at time t conditional on being in an alternative state in $t-1$. In doing so, true state dependence can be interpreted as the causal effect of experiencing solo self-employment in the past on the probability of experiencing solo self-employment in the future. Formally, we calculate true state dependence (TSD) in solo self-employment as

$$\begin{aligned} \text{TSD} = & P(\text{solo self-employment}_t | \text{solo self-employment}_{t-1}) \quad (3) \\ & - P(\text{solo self-employment}_t | \text{alternative status}_{t-1}). \end{aligned}$$

Likewise, we calculate cross state dependence (CSD) between solo self-employment and employership as

$$\begin{aligned} \text{CSD} = & P(\text{employership}|\text{solo self-employment}_{t-1}) \\ & - P(\text{employership}|\text{alternative status}_{t-1}). \end{aligned} \tag{4}$$

3 Data and descriptive evidence

This study uses data from the Socio-Economic Panel (SOEP) (2013). The SOEP is a representative annual panel survey started in 1984 (for details, see Wagner et al. 2007, 2008). Our estimation sample covers the waves 2000 to 2012 for which information on the existence (and number) of employees for all self-employed workers (including freelancers and so-called "academic self-employed") is available. Restricting the sample to individuals aged 20 to 65 and dropping observations with missing information on key variables, our data set includes 10,371 individuals with 80,645 person-year observations.

We consider transitions between four different labor market states. First, we distinguish between two types of self-employment (excluding farmers), self-employment with employees and self-employment without other employees. We refer to these states as employership and solo self-employment, respectively. The two alternative states are paid employment (excluding civil service) and non-employment, i.e., unemployment or non-working (but excluding pensioners and individuals in education). Table 1 shows the distribution of labor market states. On average, 4.6% (3%) of men (women) are solo self-employed while about 6.2% (1.6%) of men (women) are employers. Almost 80% of men and 68% of women are paid employees. The share of men (women) in non-employment is decreasing from about 10% (32%) to about 8% (19%) over the observed period, mirroring among others the favorable labor market performance in Germany in recent years. The distribution of states differs considerably between men and women, with

women having lower labor market participation and self-employment rates than men. Since labor market participation differs between men and women, we perform separate analyses by gender.

Figure 1 illustrates the distribution of labor market states over time for the male subsample conditional on being in a specific initial status. While persistence can be observed in all states, it is most pronounced in paid employment. About 95% of men who were in paid employment in the previous year are still paid employees in the current year (cf. Figure 1, Panel C). Even after five years, about 85% are still in paid employment while about 11% are non-employed and just about 4% have become solo self-employed (2%) or employers (2%). Transitions to self-employment are somewhat more likely from non-employment where persistence is not that distinct (cf. Figure 1, Panel D). After five years, only 25% of those initially non-employed are still non-employed, while 66% have taken up paid employment, and around 5% and 3% have become solo self-employed and employers, respectively. Interestingly, persistence in solo self-employment, similar to persistence in non-employment, is clearly less pronounced than persistence in paid employment (cf. Figure 1, Panel A). Only a third of those in solo self-employment five years ago are currently solo self-employed. About the same percentage, namely 30%, moves to employership. This share is much higher than the respective shares when initially paid employed (2%) or non-employed (3%). Finally, 52% of employers are still employers after five years, and additionally 22% are still self-employed but do not have other employees anymore (cf. Figure 1, Panel B).

For women, persistence in solo self-employment is of similar magnitude (32% are still solo self-employed after five years, cf. Figure 2, Panel C). However, they are much less likely to become employers. Only 14% of solo self-employed women are employers after five years, compared to 30% of men. That said, this probability is still much higher than the corresponding probability of becoming an employer when initially in paid employment (1% after five years, cf. Figure 2, Panel A) or non-employment (1% after five years, cf. Figure 2, Panel D). Unsur-

prisingly, women in all four states are generally more likely to become and stay non-employed, respectively, than men.

In sum, we observe that solo self-employment exhibits substantial persistence, albeit considerably less than paid employment. Even more important, the transition probability to employership is much higher from solo self-employment than from paid employment and non-employment, respectively, which may indicate that solo self-employment is a stepping-stone to employership. However, it is unclear up to now whether it is really solo self-employment that increases the likelihood of being self-employed (solo or with other employees) in the future or just individual characteristics that influence both the decision to become solo self-employed and to stay solo self-employed or to become an employer later on. To answer this question, we need to take account of unobserved and observed individual characteristics in multivariate analyses.

Table 2 displays the variables we use in the multivariate analysis. Consistent with the previous literature (see, e.g., the survey by Parker 2009, chs. 4 and 10.1.3), the self-employed in our sample are older and better educated than paid employees and more willing to take risks. Also, the share of those with a self-employed father is higher among the self-employed than among paid employees or non-employed, and this particularly applies to employers. Employers are more often married and have more children on average than do solo self-employed. By controlling for (lagged) household income, we also take account of income shocks that may promote the transition from solo self-employment to employership.[3]

4 Results

Table 3 reports the estimation results of the multivariate model for males (Table 4 shows the estimation results for females). The estimates indicate positive and statistically significant state dependence for all labor market states. In particular, the parameter of state dependence in solo

[3] We do not take control for sector of industry because this variable is not available for non-employed.

self-employment, estimated to be 3.312 (S.E.=0.239), shows a clear increase in the probability of solo self-employment relative to the probability of non-employment (i.e., an increase in the log odds) when the individual was solo self-employed in the previous year. Furthermore, the parameter of cross state dependence, estimated to be 2.665 (S.E.=0.278), points to a stepping stone effect, as the probability of employership increases relative to the probability of non-employment when the previous state is solo self-employment. We provide a more detailed quantitative interpretation of the results below.

The coefficients of the socioeconomic control variables show interesting patterns. The estimates of the equations for solo self-employment and employership tend to have the same sign and magnitude.[4] Therefore, solo self-employment and employership appear to be similar states with correspondingly similar determinants. That said, father's self-employment appears to play a more important role for employership than for solo self-employment.

The results for the random part of the model show that the variances of the random effects for solo self-employment and employership are larger than the variance for paid employment. This implies that unobserved factors are more important for explaining tastes for solo self-employment or for employership than for explaining tastes for paid employment. In addition, there is a positive correlation between the random effects for solo self-employment and employership, suggesting that those who prefer solo self-employment to non-working also tend to prefer employership to non-working.

Table 5 displays the predicted transition probabilities (along with 95% confidence intervals) between the four labor market states in consecutive years, separately for men and women, based on the estimates of our multionmial logit models. Conditional on being solo self-employed in a given year, the probabilities of being solo self-employed in the next year amount to about 15.6% (95%-CI: 12.5% - 18.7%) and 10.7% (95%-CI: 8.3% - 13.0%) for men and women, respectively.

[4] For example, the coefficient on the variable measuring risk attitude is 0.218 and 0.286 in the equations for solo self-employment and employership, respectively. Thus, we conclude that a change in risk attitude is related to equivalent changes in the log odds of solo self-employment and the log-odds of employership.

Interestingly, these probabilities are considerably lower than the observed probability of about 77%, which does not account for individual characteristics (see Panel A in Figures 1 and 2 for men and women, respectively). Hence, the persistence observed in the raw data can, to a large extent, be explained by observed and unobserved individual characteristics that are controlled for in our dynamic multinomial logit models. Likewise, the model-based predictions for transitions from solo self-employment to employership in two consecutive years amount to about 9.0% (95%-CI: 7.5% - 10.4%) and 3.0% (CI: 1.8% - 4.2%) for males and females, respectively, as compared to about 13% and 7% when individual characteristics are not controlled for.

Next, we calculate the extent of true state dependence from these probabilities, as explained in section 2. Table 6 shows that true state dependence in solo self-employment appears to be small. For men, being solo self-employed in the last year increases the probability of being solo self-employed in this year (i.e. true state dependence) by about 13.3 (9.6) percentage points compared to being in paid employment (non-employment) in the last year. The effect of solo self-employment on transitioning to employership (i.e. cross state dependence) is not big either, amounting to a 5.1 (4.9) percentage points increase compared to paid employment (non-employment).[5] For women, state dependence and cross state dependence appear to be even lower.

Next, we illustrate how choices of labor market states respond to temporary, exogenous shifts in employment states. For instance, a person may be selected for a program that subsidizes start-ups. We assume that the program lasts for 1 year. Since our model controls for observed and unobserved individual characteristics, the model-based predictions are indicative of the effect of being in the subsidized state for one year on the labor market choices in subsequent years.

Figures 3 and 4 show how the small degree of state dependencies reported above affects subsequent labor market choices after the program ended. The calculations show that the temporary

[5] Caliendo and Uhlendorff (2008) estimate the extent of true state dependence in self-employment for men in Germany to be around 22 percentage points. However, we are not able to make direct comparisons because their study uses (i) a different categorization of labor market states, particularly it does not distinguish between solo self-employment and employership, and (ii) a different window of observation (i.e. SOEP data from 1984 to 2005).

shift has only short-run effects. For men, having been in solo self-employment instead of paid employment has practically zero effect on the probability of being an employer already three years later and the effect on solo self-employment fully disappears after four years (cf. Figure 3, Panel A). From a policy perspective, it is probably more important to look at the effect of bringing someone in solo self-employment instead of non-employment. Here, the effect approaches practically zero after two years for all four states (cf. Figure 3, Panel B). For women, the effect of solo self-employment on future solo self-employment or employership is also only discernible for one year, regardless whether paid employment or non-employment is the alternative status (cf. Figure 4, Panels A and B). There are, however, some adverse effects of solo self-employment instead of paid employment for women as their hazard of being non-employed increases for some years. Conversely, having been solo self-employed instead of non-employed seems to increase the likelihood of paid employment in the future for women.

All in all, these results show that the substantial persistence in solo self-employment and its ostensible stepping-stone effect visible in the descriptive statistics are mainly due to observed and unobserved individual characteristics. When controlling for characteristics, the effect of solo self-employment appears to be small and generally not lasting longer than one year.[6]

5 Conclusions

This paper studied the dynamics of solo self-employment using data from the German SOEP 2000 to 2012. Looking at actual transitions, we found considerable persistence in solo self-employment, albeit much lower than in paid employment. After five years, about a third of those initially solo self-employed are still solo self-employed. In addition, transition rates to employership are much higher from solo self-employment than from paid employment or non-employment.

[6] As a robustness check, we also calculated impulse response functions based on a model where we include an additional lag (i.e., the labor market state two periods ago) but still obtained only short run effects.

Multivariate analyses using dynamic multinomial logit models with random effects showed, however, that these dynamics are primarily due to spurious rather than true state dependence, i.e., they are mainly caused by selection into self-employment based on observed and unobserved individual characteristics. The genuine effect of experiencing solo self-employment on future solo self-employment or employership is small and generally not lasting longer than one year.

These findings are consistent with the view that individuals predominantly enter entrepreneurship on a small scale, i.e., as solo self-employed, in order to learn about their aptitude for entrepreneurship (see, e.g., Jovanovic 1982). After having discovered their entrepreneurial talent, they either expand their business, moving to employership, or switch back to paid employment accordingly. On the other hand, individuals may also increase their entrepreneurial ability by working in self-employment (cf., e.g., Minniti and Bygrave 2001) but if "learning by doing" played a major role, the extent of true (cross) state dependence should probably be higher.

The fact that we find little true state dependence in solo self-employment also implies that policy measures that bring individuals into solo self-employment, like the German *Gründungszuschuss*, a start-up subsidies for the unemployed, may have predominantly short-run effects. They might incentivize individuals to work in self-employment as long as these subsidies are paid. However, the incentive is expected to disappear after the program ended. As true cross state dependence from solo self-employment to employership is also low, expectations for yielding a "double dividend" by turning unemployed into self-employed who later become employers and create jobs for others seem unfounded. This should be kept in mind when weighing up the costs and benefits of such programs.

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Tables and Figures

Table 1
Observed distribution of labor market states by year

	Labor market status			
Year	Solo self-employed	Employership	Paid employment	Non-employment
A. Males				
2001	4.27	5.62	79.69	10.42
2002	3.72	6.26	78.58	11.44
2003	4.21	6.20	77.36	12.24
2004	4.82	6.12	77.38	11.69
2005	4.66	6.18	77.28	11.87
2006	5.31	6.26	76.85	11.58
2007	4.68	6.65	78.87	9.80
2008	4.56	6.17	79.39	9.88
2009	4.74	6.04	79.36	9.86
2010	5.33	5.85	79.84	8.99
2011	5.14	6.32	80.24	8.30
2012	5.32	6.50	79.74	8.44
Total	4.61	6.15	78.51	10.72
B. Females				
2001	2.58	1.77	63.92	31.73
2002	2.63	1.60	64.43	31.34
2003	2.81	1.37	64.86	30.95
2004	2.70	1.66	65.54	30.11
2005	3.10	1.67	65.83	29.40
2006	3.68	1.62	66.83	27.87
2007	3.44	1.51	69.45	25.59
2008	3.08	2.03	71.33	23.56
2009	3.65	1.48	72.32	22.55
2010	3.31	1.49	73.18	22.02
2011	3.21	1.86	73.89	21.03
2012	2.88	1.85	75.83	19.45
Total	3.03	1.64	67.72	27.61

Note: Percentage of individuals.
Source: SOEP (2013), 2000-2012.

Table 2
Descriptive statistics by gender and labor market state

	Solo self-employment		Employership		Paid employment		Non-employment		All states	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Males										
Age	47.43	9.29	46.69	8.97	44.88	9.20	48.16	10.25	45.46	9.38
Education (years)	13.27	2.81	13.34	2.92	12.16	2.51	11.14	2.17	12.18	2.57
Risk attitude (0=low to 10=high)	5.37	1.75	5.65	1.61	4.82	1.61	4.59	1.77	4.87	1.66
Immigrant (0/1)	0.11	0.31	0.12	0.32	0.17	0.38	0.25	0.44	0.17	0.38
Father self-employed: no	0.80	0.40	0.72	0.45	0.81	0.39	0.76	0.43	0.80	0.40
Father self-employed: yes	0.10	0.31	0.17	0.38	0.05	0.23	0.04	0.19	0.06	0.24
Father self-employed: missing	0.10	0.30	0.11	0.31	0.14	0.34	0.20	0.40	0.14	0.35
Married (0/1)	0.64	0.48	0.73	0.44	0.73	0.44	0.63	0.48	0.72	0.45
No. of children	0.56	0.87	0.81	1.06	0.77	1.01	0.56	0.94	0.74	1.00
Lagged net household income (in Euro)	2929	1667	3974	2708	2848	1247	1605	868	2786	1453
Lagged household size	2.72	1.20	3.05	1.30	3.02	1.31	2.74	1.35	2.97	1.31
IC: Solo self-employment (0/1)	0.49	0.50	0.08	0.28	0.01	0.10	0.02	0.14	0.04	0.19
IC: Employership (0/1)	0.15	0.36	0.68	0.47	0.01	0.10	0.01	0.11	0.06	0.23
IC: Paid employment (0/1)	0.30	0.46	0.22	0.41	0.95	0.22	0.57	0.50	0.83	0.37
IC: Non-employment (0/1)	0.06	0.24	0.01	0.12	0.03	0.18	0.40	0.49	0.07	0.26
No. of person-year observations	1,744		2,326		29,684		4,055		37,809	
B. Females										
Age	46.06	9.12	45.88	8.75	44.63	9.09	45.85	11.2	45.03	9.73
Education (years)	13.22	2.71	14.15	2.96	11.96	2.24	11.18	2.16	11.82	2.31
Risk attitude (0 = low to 10=high)	5.00	1.56	4.80	1.78	4.06	1.58	3.73	1.68	4.01	1.63
Immigrant (0/1)	0.07	0.26	0.12	0.32	0.16	0.36	0.24	0.43	0.18	0.38
Father self-employed: no	0.81	0.39	0.66	0.47	0.81	0.39	0.76	0.43	0.79	0.41
Father self-employed: yes	0.09	0.29	0.11	0.32	0.05	0.23	0.06	0.23	0.06	0.23
Father self-employed: missing	0.10	0.30	0.23	0.42	0.14	0.34	0.19	0.39	0.15	0.36
Married (0/1)	0.67	0.47	0.72	0.45	0.70	0.46	0.82	0.39	0.73	0.44
No. of children	0.70	0.97	0.74	0.99	0.63	0.88	1.02	1.18	0.74	0.99
Lagged net household income (in Euro)	2790	1692	4088	2443	2751	1305	2311	1332	2652	1377
Lagged household size	2.77	1.24	2.89	1.21	2.85	1.16	3.27	1.37	2.96	1.24
IC: Solo self-employment (0/1)	0.45	0.50	0.18	0.39	0.01	0.09	0.01	0.11	0.03	0.16
IC: Employership (0/1)	0.08	0.27	0.57	0.49	0.00	0.06	0.01	0.07	0.02	0.13
IC: Paid employment (0/1)	0.28	0.45	0.18	0.39	0.84	0.37	0.30	0.46	0.66	0.47
IC: Non-employment (0/1)	0.19	0.39	0.06	0.23	0.15	0.36	0.68	0.47	0.3	0.46
No. of person-year observations	1,296		704		29,007		11,829		42,836	

Source: SOEP (2013), 2000-2012. IC: denotes initial conditions.

Table 3
Estimation results for males

Variable	Solo self-employment		Employership		Paid employment	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Fixed part						
Solo in t-1	3.312***	0.239	2.665***	0.278	-1.637***	0.221
Employer in t-1	2.755***	0.349	3.702***	0.351	-0.821*	0.326
Non-employment in t-1	0.311	0.211	-0.911*	0.365	-2.148***	0.083
Ln HH income in t-1	-0.372	0.208	-0.005	0.233	-0.556***	0.114
Ln HH size in t-1	0.656*	0.285	0.608*	0.309	0.653***	0.146
Age	0.233**	0.072	0.308***	0.088	0.232***	0.030
Age squared	-0.003***	0.001	-0.004***	0.001	-0.003***	0.000
Education (years)	0.194***	0.038	0.133**	0.046	0.033	0.020
Married (0/1)	-0.164	0.336	0.014	0.363	-0.253	0.173
Children (0/1)	-0.088	0.142	-0.024	0.154	-0.164*	0.067
Immigrant (0/1)	-0.117	0.272	-0.098	0.343	-0.309**	0.113
Father SE: YES	0.389	0.343	1.315***	0.390	-0.201	0.193
Father SE: MV	-0.200	0.280	0.194	0.355	-0.086	0.111
Avg. risk attitude	0.218***	0.055	0.286***	0.070	-0.011	0.024
Solo in t=0	5.400***	0.547	4.733***	0.610	-1.679***	0.311
Employer in t=0	4.604***	0.560	8.081***	0.708	-1.559***	0.345
Non-working in t=0	-0.449	0.347	-0.713	0.562	-2.095***	0.144
M: Ln HH inc in t-1	3.204***	0.334	4.615***	0.398	3.511***	0.171
M: Ln HH size in t-1	-2.188***	0.464	-3.839***	0.566	-2.626***	0.221
M: Married	0.366	0.440	0.702	0.516	0.839***	0.214
M: Children	0.288	0.214	0.841***	0.248	0.515***	0.098
Random part						
$Var(a_{ij})$	5.404	0.867	9.131	1.408	2.139	0.209
$Cov(a_{i,Solo}, a_{i,Empl.})$	5.249	0.938				
$Cov(a_{i,Solo}, a_{i,Paid})$	-0.052	0.322				
$Cov(a_{i,Empl.}, a_{i,Paid})$			-0.104	0.460		
log likelihood			-10369.915			
No. of person-year observations			37,809			

Note: Dynamic multinomial logit model with random effects. The reference category of the dependent variable is non-employment. Additional dummy variables for the year of the survey and for the federal state are included. Dependent variable: labor market state (solo self-employment, employership, paid employment). M: denotes individual-specific averages of a variable. Significance level: *<0.1, **<0.05, ***<0.01.
Source: SOEP (2013), 2000-2012.

Table 4
Estimation results for females

Variable	Solo self-employment		Employership		Paid employment	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Fixed part						
Solo in t-1	2.906***	0.228	2.274***	0.343	-1.593***	0.194
Employer in t-1	3.038***	0.401	4.731***	0.443	-1.180**	0.376
Non-employment in t-1	-0.366	0.191	-0.748*	0.340	-2.642***	0.056
Solo in t=0	4.994***	0.507	3.238***	0.663	-1.731***	0.296
Employer in t=0	2.885***	0.591	4.459***	0.821	-2.029***	0.417
Non-working in t=0	-0.746**	0.266	-1.346***	0.399	-2.244***	0.099
Ln HH income in t-1	-0.219	0.228	-0.155	0.308	-0.776***	0.088
Ln HH size in t-1	1.317***	0.350	1.575***	0.467	1.523***	0.127
Age	0.373***	0.075	0.210*	0.094	0.425***	0.025
Age squared	-0.005***	0.001	-0.003**	0.001	-0.005***	0.000
Education (years)	0.211***	0.039	0.211***	0.045	0.001	0.016
Married (0/1)	0.127	0.289	-1.071**	0.379	-0.800***	0.110
Children (0/1)	-0.523***	0.145	-0.525**	0.201	-0.689***	0.050
Immigrant (0/1)	-0.522	0.282	-0.081	0.328	-0.103	0.089
Father SE: YES	0.761*	0.336	0.436	0.409	0.160	0.142
Father SE: MV	0.131	0.278	0.729*	0.316	-0.216*	0.094
Avg. risk attitude	0.277***	0.056	0.262***	0.068	0.035	0.020
M: Ln HH inc in t-1	0.825*	0.339	2.029***	0.418	2.011***	0.130
M: Ln HH size in t-1	-1.700**	0.535	-1.552*	0.668	-1.960***	0.193
M: Married	-0.578	0.406	0.452	0.511	0.095	0.151
M: Children	0.268	0.221	0.099	0.280	0.368***	0.076
Random part						
$Var(a_{ij})$	5.720	0.810	4.727	1.097	2.554	0.172
$Cov(a_{i,Solo}, a_{i,Empl.})$	3.787	0.769				
$Cov(a_{i,Solo}, a_{i,Paid})$	1.137	0.513				
$Cov(a_{i,Empl.}, a_{i,Paid})$			0.451	0.304		
log likelihood			-14173.247			
No. of person-year observations			42,836			

Note: Dynamic multinomial logit model with random effects. The reference category of the dependent variable is non-employment. Additional dummy variables for the year of the survey are included. Dependent variable: labor market state (solo self-employment, employership, paid employment). M: denotes individual-specific averages of a variable. Significance level: *<0.1, **<0.05, ***<0.01.
Source: SOEP (2013), 2000-2012.

Table 5
Average predicted probabilities of labor market transitions

State at time $t-1$	State at time t											
	Solo self-employment			Employership			Paid employment			Non-Employment		
	Mean	95%-CI		Mean	95%-CI		Mean	95%-CI		Mean	95%-CI	
A. Males												
Solo	0.156	0.125	0.187	0.090	0.075	0.104	0.610	0.564	0.657	0.144	0.113	0.175
Employer	0.079	0.062	0.097	0.124	0.104	0.144	0.693	0.648	0.738	0.104	0.068	0.140
Paid	0.023	0.018	0.028	0.038	0.033	0.044	0.858	0.849	0.866	0.081	0.075	0.086
Non-Employed	0.060	0.048	0.072	0.041	0.030	0.052	0.671	0.651	0.692	0.228	0.210	0.246
B. Females												
Solo	0.107	0.083	0.130	0.030	0.018	0.042	0.563	0.514	0.612	0.300	0.257	0.343
Employer	0.077	0.051	0.102	0.124	0.060	0.189	0.560	0.464	0.657	0.238	0.165	0.312
Paid	0.015	0.011	0.018	0.006	0.003	0.009	0.802	0.792	0.813	0.177	0.168	0.186
Non-Employed	0.028	0.023	0.033	0.009	0.005	0.013	0.487	0.471	0.504	0.475	0.459	0.492

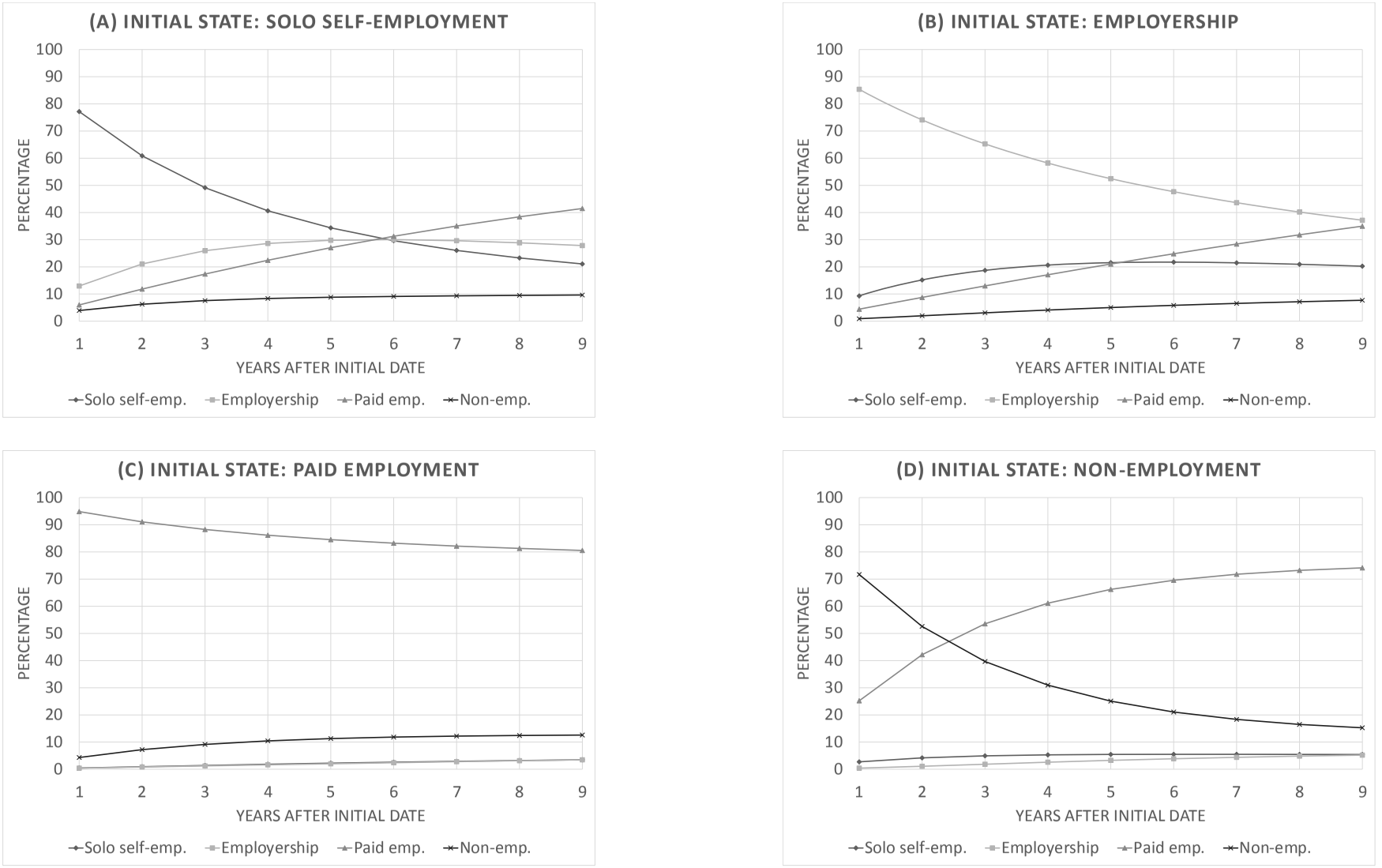
Note: The table shows marginal probabilities that are obtained by integrating over the distribution of the individual-specific random intercept. Confidence intervals are based on standard errors calculated using the Delta method.

Table 6
True state dependence and cross state dependence in solo self-employment

Alternative state	True state dependence	Cross state dependence
A. Males		
Paid employment	0.133	0.051
	[0.098, 0.166]	[0.034, 0.069]
Non-employment	0.096	0.049
	[0.062, 0.129]	[0.030, 0.067]
B. Females		
Paid employment	0.092	0.024
	[0.067, 0.117]	[0.010, 0.038]
Non-employment	0.079	0.021
	[0.054, 0.103]	[0.008, 0.034]

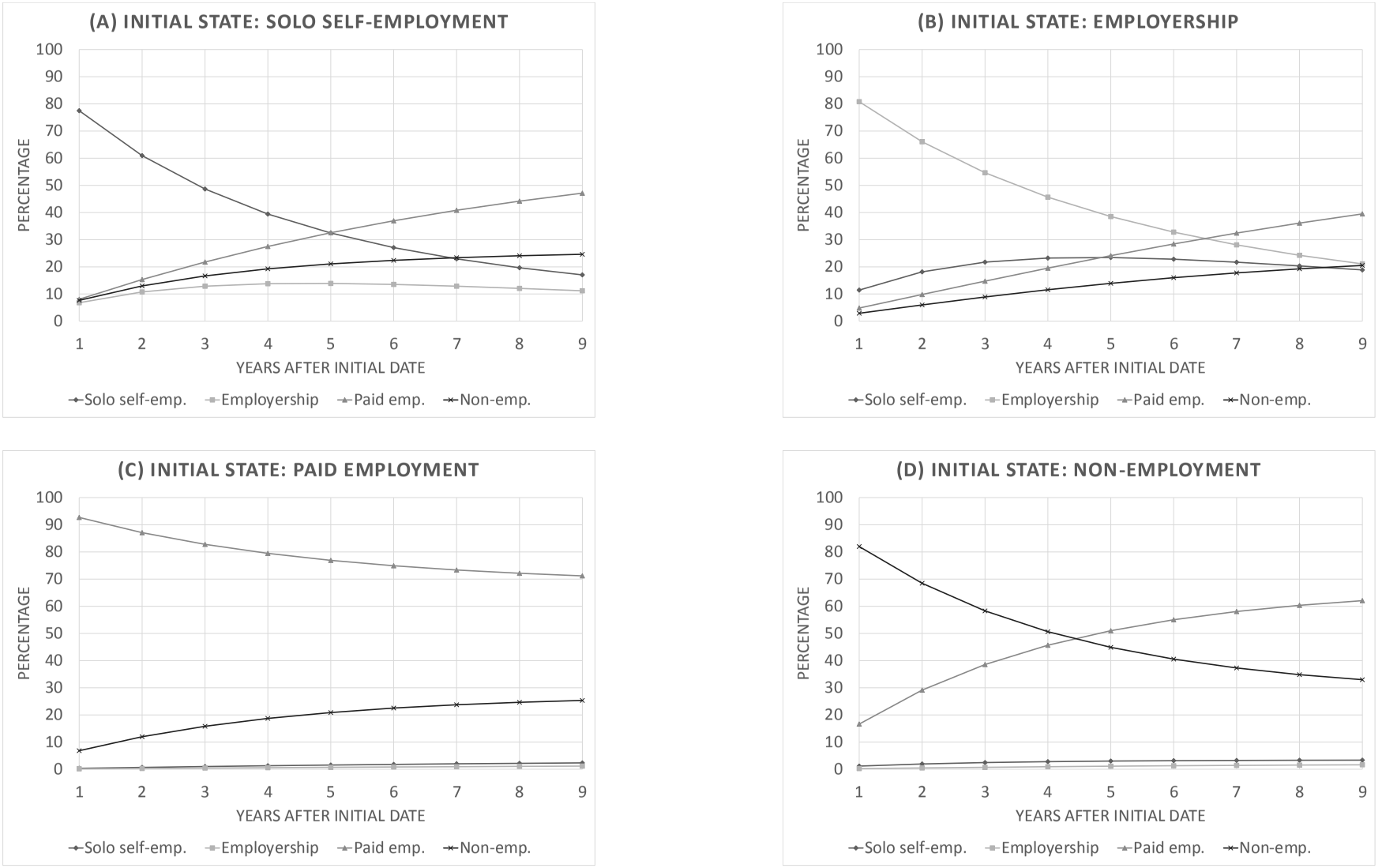
Note: SOEP v29, 2000-2012. N=37,809. 95% confidence intervals in brackets are based on delta-method standard errors.

Figure 1
Observed probabilities of labor market state conditional on labor market state t years ago for males



Source: SOEP (2013), 2000-2012.

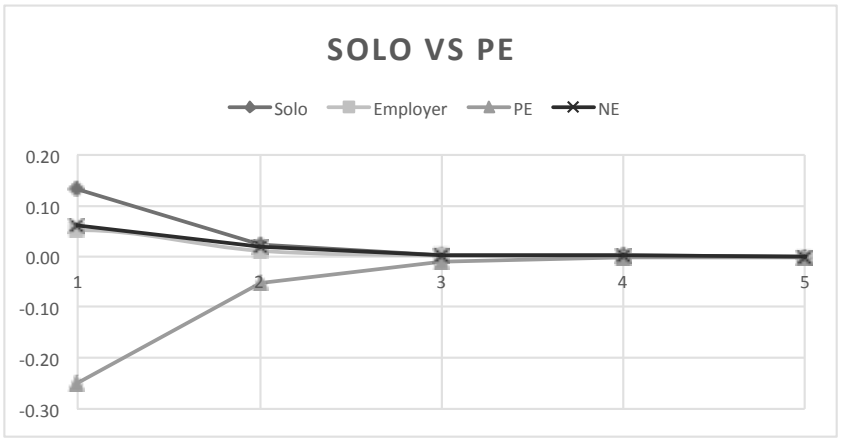
Figure 2
Observed probabilities of labor market state conditional on labor market state t years ago for females



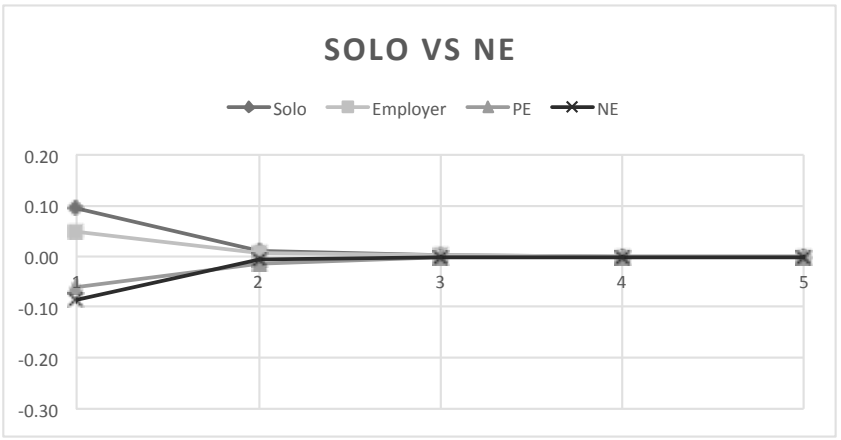
Source: SOEP (2013), 2000-2012.

Figure 3
Impulse response functions: Effect of a temporary shock moving individuals into solo self-employment on subsequent labor market state for males

Panel A



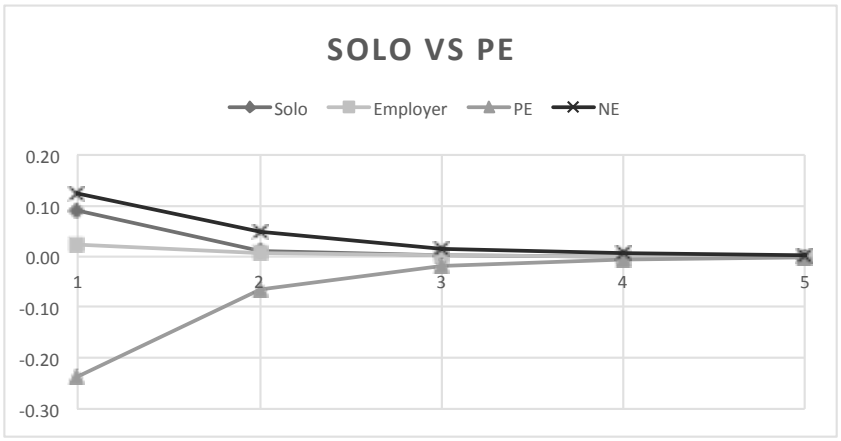
Panel B



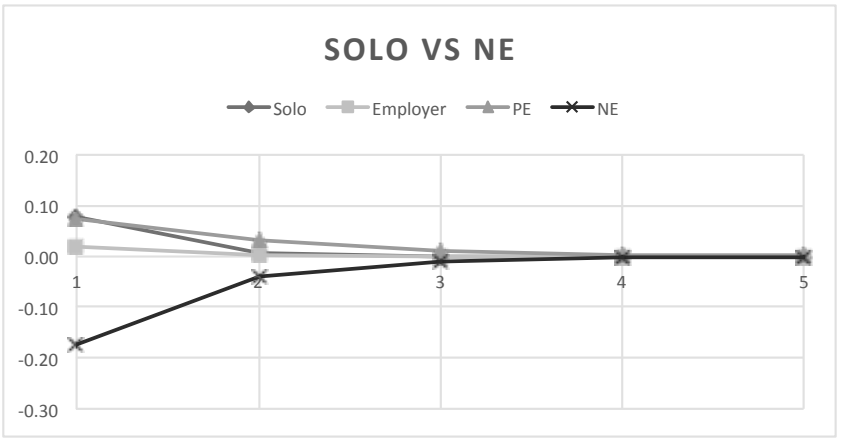
Source: SOEP (2013), 2000-2012.

Figure 4
Impulse response functions: Effect of a temporary shock moving individuals into solo self-employment on subsequent labor market state for females

Panel A



Panel B



Source: SOEP (2013), 2000-2012.

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