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IMPRESSUM

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Would a Flat Tax Stimulate Entrepreneurship in Germany?

A Behavioural Microsimulation Analysis Allowing for Risk

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Abstract:

When possible income tax reforms are debated, the suspected impact on entrepreneurship is often used as an argument in favour or against a certain policy. Quantitative ex-ante evaluations of the effect of certain tax reform options on entrepreneurship based on microeconomic research have not been provided by the literature, however. This paper estimates the ex-ante effects of the German tax reform 2000 and of two hypothetical flat tax scenarios on entries into and exits out of self-employment in Germany. For the estimation I apply a microsimulation model which is based on the tax-benefit model STSM and on structural microeconomic models of transitions into and out of self-employment. These structural models include an estimated parameter of risk aversion. The simulation results indicate that flatter tax systems do not encourage, but rather discourage people from choosing self-employment. This is explained by the reduction of entrepreneurs' income risk through progressive taxation.

JEL classification: H24, J23, L26, D81

Keywords: Entrepreneurship, Income Taxation, Risk, Tax Reform 2000, Flat Tax

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1 Introduction

In debates about actual or potential tax reforms in various countries, the possible impact on entrepreneurship has received increasing attention among politicians and academics alike recently. One reason for the interest in establishing the right policy environment for entrepreneurs is their deemed importance for a country's future path of innovation, competitiveness and employment creation. Van Praag and Versloot (2007) provide a recent literature survey on positive spillover effects of entrepreneurial firms.

The impact of taxation on entrepreneurship is not unambiguously clear from economic theory. On the one hand, Gentry and Hubbard (2000) argued that a progressive tax schedule reduces the expected after-tax return from a risky project and thus discourages entry into entrepreneurship. On the other hand, in their classic article Domar and Musgrave (1944) demonstrated that governments may encourage entrepreneurship by sharing risk through taxation. The scarce empirical literature, which is almost exclusively limited to ex-post evaluations of certain tax reforms, is inconclusive (see Schuetze and Bruce (2004) for a survey).

In spite of the lack of evidence, the argument that a less progressive income tax would stimulate entrepreneurship is often used. Correspondingly, the promotion of small and medium sized enterprises was one of the primary reasons the German government gave for the introduction of the tax reform 2000 (see, for instance, Federal Ministry of Finance, 2004). This tax reform, which came into effect in several steps between 2001 and 2005, significantly decreased both the income tax burden and the progressivity of the German income tax schedule. It was the largest income tax reform in Germany at least after the introduction of the linear-progressive tax code in 1990.

In the current debate about a possible further income tax reform in Germany, flat tax policies have taken the centre stage. After a flat tax system was introduced in Estonia in 1994, several Eastern European countries, including Russia, have followed the example. In Germany, Kirchhof (2003), Mitschke (2004) and the council of economic advisors to the ministry of finance (2004) presented proposals for tax reforms with (almost) flat tax schedules. This raised a controversial public and academic debate, which for the time being peaked before the federal election in 2005. Speculations about the effects on entrepreneurial firms are occupying a considerable part of the debate.

Despite the weight given to entrepreneurship in the tax policy debate, quantitative ex-ante evaluations of the effects of tax reforms on self-employment based on microeconomic models are to my knowledge not available. The intention of this paper is to contribute to filling this gap. Recent microsimulation studies have analysed the effects of the tax reform 2000 and of flat tax scenarios on the income distribution and on labour supply in Germany, without considering entrepreneurship. These studies include Haan and Steiner (2005), who investigated the tax reform 2000, Fuest *et al.* (2007), who examined two flat tax scenarios, and Bönke and Corneo (2006), who analysed the tax reform 2000, a flat tax scenario, and other reform options. This paper extends these studies by estimating the impact of the tax reform 2000 and the two flat tax scenarios considered by Fuest *et al.* (2007) on self-employment.

For this estimation I apply structural microeconomic models of transition from dependent employment to self-employment and vice versa under risk. In these models of occupational choice, higher expected after-tax earnings attract people to self-employment, while more risky net earnings deter risk-averse individuals. Conceptually the models are in line with Kanbur (1982) and Kihlstrom and Laffont (1979) who modelled entrepreneurial choice as trading off risk and returns. The parameters of the structural models, which include the standard Arrow-Pratt coefficient of relative risk aversion, are estimated based on data from the German Socio-Economic Panel (SOEP).

An income tax reform, i.e. a change in the progressive tax schedule, influences both the expected value and the variance of after-tax earnings in the two alternative states dependent employment and self-employment. As these two moments of net earnings enter the structural transition models, tax policy has a direct effect on the estimated probability of choosing self-employment. Thus, the ex-ante effects of the three tax reforms considered here on self-employment can be simulated by applying these structural models on the micro data.

The complex system of taxes, social security contributions, and transfers in Germany, both in the actual and hypothetical tax systems, is modelled precisely by integrating the tax-transfer microsimulation model STSM (Steiner *et al.* 2005). The STSM has been used to estimate the ex-ante effects of tax and social reforms on the income distribution, work incentives and labour supply (e.g. Steiner and Wrohlich 2004 and 2005, Haan and Steiner 2005). Neither the STSM nor other microsimulation models have been used to estimate transition rates into or out of self-employment before.

In the following section, the three hypothetical tax reforms of interest are introduced – the tax reform 2000 and the two flat tax policies. Section 3 describes the structural transition

models between dependent employment and self-employment under risk, which are applied in this paper. It also briefly introduces the tax-benefit model STSM and new extensions with respect to the self-employed. Section 4 first provides the estimation results of the structural transition models parameters. Second, the simulated effects of the three tax reform scenarios on self-employment are presented. Section 5 gives a summary and derives policy conclusions.

2 Income Tax Reform in Germany

The German income tax is based on the comprehensive income taxation paradigm. In principle, income from different sources is summed up and taxed without differentiation between the sources. Some exceptions exist in practice, especially with regard to capital income and pensions. Nevertheless, the same progressive tax schedule applies for wages and salaries from dependent employment and for earnings (i.e. profits) from self-employment.²

The tax reform 2000, which comprises the Tax Reduction Act of October 23rd, 2000 and the Supplementary Tax Reduction Act of December 19th, 2000, reduced the general statutory income tax rates and simultaneously increased the basic tax allowance in three steps between January 1st, 2000 and January 1st, 2005 (Figure 1).³ The top marginal income tax rate dropped from 51 % in 2000 to 42 % in 2005, the lowest marginal tax rate from 22.9 % to 15 %, and the basic allowance increased from €9,902 to €7,664. Overall the tax reform 2000 reduced the progressivity of the income tax schedule (cf. Corneo 2005; Bönke and Corneo 2006; Haan and Steiner 2005 report increasing inequality). According to the financial report of the Federal Ministry of Finance (2001), the changes in the income tax schedule in sum reduced tax revenues by €45,387 million per year,⁴ which indicates the high economic significance of the reform. A business tax reform was launched simultaneously on January 1st 2001. Among other measures, it reduced the corporate income tax rate from 40 % for retained and 35 % for distributed profits to uniformly 25 %, introduced the half-income system for distributed dividends,⁵ and replaced the limitation of the top marginal personal income tax rate for tradesmen (§ 32c of ESt) with a lump sum credit of the local business tax deductible from the personal income tax liability.

² For an overview on German income taxation, see Wellisch (2002).

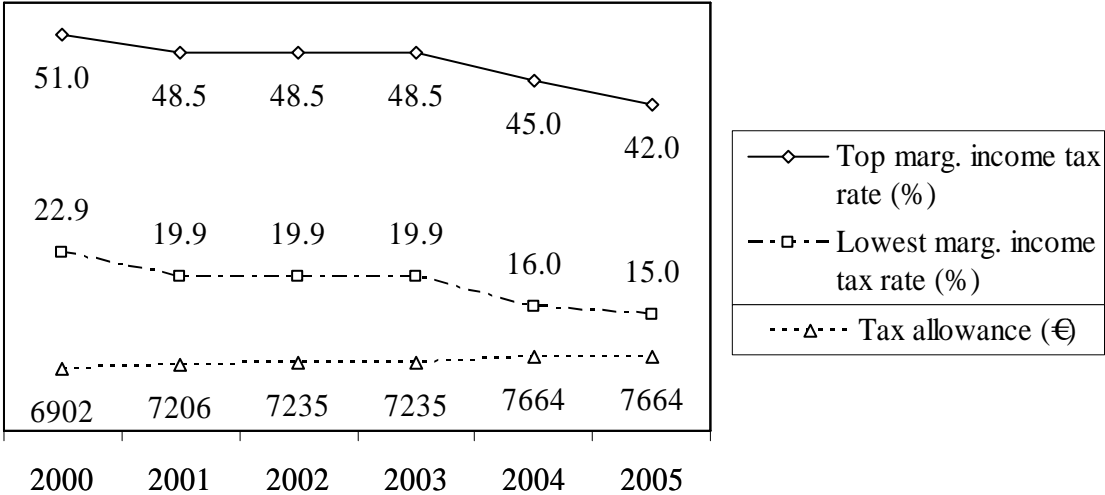
³ The first step of tax rate reductions in 2001 had already been scheduled for 2002 by the Tax Reduction Act 1999/2000/2002 of March 24th, 1999, but was pulled forward one year by the Tax Reduction Act. This step is treated as part of the tax reform 2000.

⁴ The revenue losses are estimated for the years of introduction of each of the three steps and then summed up.

⁵ Under the half-income system, only half of the dividends received by an individual shareholder are included as part of his or her taxable income. In return, shareholders can no longer credit the corporate income tax paid by the company against their personal income tax.

In this paper, I will exclusively consider the changes in the general income tax schedule, and will refer to this part of the reform as “tax reform 2000”. The possibility of analysing the effect of an explicitly defined reform and abstracting from complementary measures and shocks is an advantage of the ex-ante simulation technique used in this paper. Precisely, I will simulate transitions into and out of self-employment in a hypothetical scenario which assumes the government had repealed the change in the income tax code introduced with the tax reform 2000 in 2005 (and thus re-introduced the pre-reform tax law). I will compare this scenario with a baseline simulation of the actual law of 2005, which includes the tax reform 2000. The difference in the simulated transition rates can be attributed to the reform.

Figure 1: Changes in the German income tax schedule, 2000-2005 (“tax reform 2000”)



The other two tax reform scenarios I will consider in this paper are flat tax policies. In the strictest sense, a flat tax is a uniform tax rate on the total tax base. In practice, a flat income tax rate is usually combined with a basic tax allowance, which leads to an implicitly progressive tax schedule. Thus, if the tax base is left unchanged, a flat tax policy is defined by two parameters, the flat tax rate and the basic allowance. Fuest *et al.* (2007) examined the distributional and labour supply effects of two flat tax scenarios for Germany using a microsimulation model. The first policy is defined by a low tax rate and a low basic allowance (scenario “flat tax LL”), and the second by higher values for the two parameters (scenario “flat tax HH”). The authors chose the balance of each scenario’s two parameters such that they establish revenue neutrality in their simulation for 2007 assuming that there are no behavioural responses such as labour supply reactions. The tax base is left unchanged. Tax base broadening measures often suggested in conjunction with a flat tax are not considered in order to reveal the effect of the changed tax schedule alone. In scenario LL, the basic

allowance is left unchanged at €7,664, and the tax rate that establishes revenue neutrality is found to be 26.9 %. In scenario HH, a higher basic allowance of €10,700 and a higher revenue neutral flat tax rate of 31.9 % are chosen.⁶ The distinctive feature of this flat tax scenario is that it does not change the Gini index of inequality compared to the situation without the reform, according to the simulations of Fuest *et al.* (2007) (again without behavioural responses). This is explained by the high basic allowance, which reduces taxes for low income people.⁷ Table 1 summarises the two scenarios.

Table 1: Definition of flat tax scenarios

	Basic Allowance in Euro	Marginal Tax Rate in %
Legislation 2005	7,664	15-42
Scenario “Flat Tax LL”	7,664	26.9
Scenario “Flat Tax HH”	10,700	31.9

I will simulate the effects of these two flat tax scenarios on transitions into and out of self-employment in the year 2005, like the hypothetical repeal of the tax reform 2000 and the baseline (current law) scenario. The year 2005 is the most recent year that the required data is available for (see section 3.2).

Table 2 shows the effects of the three hypothetical reform scenarios on the individual yearly net incomes of full-time working people (the sample relevant for this analysis, see section 3.2) in 2005 by gross income deciles.⁸ These are the first round effects as calculated using the tax-benefit microsimulation model STSM, which will be described in section 3.3, before any behavioural effect is taken into account. In the flat tax scenarios the average absolute change in net income is below 0.15 % in this sample, which reflects that the scenarios are designed to be revenue neutral.⁹ Distributional effects are evident: in the flat tax scenario LL, the top decile gains 2.96 % and the 9th decile 1.35 % in comparison to the

⁶ The council of economic advisors to the ministry of finance (2004) suggested a similar (but not revenue neutral) flat tax with a basic allowance of €10,000 and a tax rate of 30%.

⁷ Davies and Hoy (2002) demonstrated that revenue neutral flat tax reforms with lower basic allowances than in the pre-reform graduated rate tax schedule result in higher inequality compared to the pre-reform situation according to any inequality index. If a higher basic allowance is chosen, a certain revenue neutral combination of the flat tax rate and the basic allowance exists which does not change a given inequality index, e.g. the Gini coefficient, in comparison to the situation without the reform. This combination is found in scenario HH.

⁸ The split-up of household net income between individuals within households is described in section 3.1.

⁹ The scenarios are not exactly revenue neutral in 2005, as Fuest *et al.* (2007) simulated the revenue neutral flat tax scenarios for the year 2007, after having updated their data using a static ageing technique. There were no major changes in income taxation between 2005 and 2007, however. The introduction of a new top tax bracket with a top marginal tax rate of 45% for people with income above €250,000 in 2007 (profit incomes are exempted in 2007) is expected to have only a minor revenue impact – estimations range from €300 million by the government down to zero by the ifo institute (German Bundestag 2006). Using the same tax parameters as Fuest *et al.* (2007) for the year 2005 has the advantages of comparability and at the same time avoidance of data ageing, which by nature would require assumptions about the growth rates of the various income components and the demographic changes.

baseline scenario, whereas the other deciles loose net income. In the more progressive scenario HH, redistribution is not as pronounced. Due to the higher marginal tax rate, net income in the top decile increases by only 0.69 %, and the two lowest deciles also gain due to the higher basic allowance. As the tax reform 2000 constituted a tax relief for income tax payers, its repeal in 2005 would have decreased net incomes by 4.5 % on average. The higher deciles, which gained most from the tax reform 2000 – not only in absolute, but also in relative terms –, would consequently loose most from its reversal.

Table 2: Mean individual yearly net income in baseline and reform scenarios by deciles

Gross Income Decile	Yearly Net Income 2005 in Baseline Scenario in Euro	Change in Comparison to Baseline Scenario in %			N
		Scenario "Repeal of Tax Reform 2000"	Scenario "Flat Tax LL"	Scenario "Flat Tax HH"	
1	7,048	-1.65	-0.95	0.60	
2	15,262	-2.95	-1.70	0.32	
3	17,851	-3.64	-1.62	-0.29	
4	21,503	-3.98	-1.34	-0.35	
5	24,000	-4.24	-1.03	-0.52	
6	26,029	-4.54	-0.86	-0.57	
7	28,997	-4.57	-0.77	-0.56	
8	30,958	-4.89	-0.03	-0.53	
9	34,621	-5.23	1.35	-0.02	
10	45,660	-5.31	2.96	0.69	
All	25,188	-4.50	0.08	-0.13	3664

Source: Own calculations based on the SOEP 2005-2006, full-time self-employed and dependently employed individuals.

3 Empirical Methodology and Data

3.1 Structural Transition Models

In this paper I apply structural microeconomic models of transition between dependent employment and self-employment and vice versa. These models are introduced in detail in Fossen (2007); this section provides an overview.

In a given period t , a dependently employed individual i can choose if he or she wants to remain dependently employed or switch to self-employment in the following period $t+1$ (entry model). I assume a random utility function with constant relative risk aversion and increasing utility for money $y > 0$. Utility in the two alternative employment states $j \in \{se, e\}$ (self-employment or dependent employment) is allowed to vary across individuals depending on observable characteristics and covariates x_i , the duration in dependent employment d_i (before a possible transition to self-employment) and an error term ε_{ij} :

$$U_j(y_{ij}, x_i, \varepsilon_{ij}) = \begin{cases} \alpha \frac{y_{ij}^{1-\rho}}{1-\rho} + \beta'_j x_i + \delta_{j1} d_i + \delta_{j2} d_i^2 + \delta_{j3} d_i^3 + \varepsilon_{ij}; & \rho \neq 1. \\ \alpha \ln y_{ij} + \beta'_j x_i + \delta_{j1} d_i + \delta_{j2} d_i^2 + \delta_{j3} d_i^3 + \varepsilon_{ij}; & \rho = 1. \end{cases}$$

where y_{ij} is agent i 's lifetime annuity of net income in state j . Both $y_{i,se}$ and $y_{i,e}$ are random variables because future income is risky. Empirically earnings of entrepreneurs are significantly more volatile than those of employees with comparable characteristics (Heaton and Lucas 2000; Borjas and Bronars 1989). The parameter $\alpha > 0$ reflects the weight of the risk adjusted income annuity in the utility function. ρ is the coefficient of relative risk aversion (Pratt 1964). It indicates risk preference for $\rho < 0$, risk neutrality for $\rho = 0$ and risk aversion for $\rho > 0$. The error term ε_{ij} captures unobservable tastes influencing utility that might be different across observations and in the two alternative employment states j . These tastes are unobservable for the researcher and thus treated as a random variable, but they are known to the individuals in the sample, in contrast to the error in future earnings y .

Expected utility with respect to the random income annuity y_{ij} is approximated by a second order Taylor series:

$$E(U_j(y_{ij}, x_i, \varepsilon_{ij})) \approx \begin{cases} \alpha \left(\frac{\mu_{y_{ij}}^{1-\rho}}{1-\rho} - \frac{1}{2} \rho \mu_{y_{ij}}^{-\rho-1} \sigma_{y_{ij}}^2 \right) + \beta'_j x_i + \delta_{j1} d_i + \delta_{j2} d_i^2 + \delta_{j3} d_i^3 + \varepsilon_{ij}; & \rho \neq 1. \\ \alpha \left(\ln \mu_{y_{ij}} - \frac{1}{2 \mu_{y_{ij}}^2} \sigma_{y_{ij}}^2 \right) + \beta'_j x_i + \delta_{j1} d_i + \delta_{j2} d_i^2 + \delta_{j3} d_i^3 + \varepsilon_{ij}; & \rho = 1. \end{cases}$$

For $\alpha > 0$, the equation implies that given expected income annuities, for risk-averse agents expected utility decreases with greater variance of income. For risk-neutral agents the variance does not matter, and for risk-loving individuals, greater variance actually increases expected utility.

As the agent chooses the employment state which gives him/her the highest utility, the probability that agent i decides to be an entrepreneur in the next period is

$$\begin{aligned} \text{Prob}(trans_i = 1 \mid y_{i,se}, y_{i,e}, x_i) &= \text{Prob}(E(U_{se}(y_{i,se}, x_i, \varepsilon_{i,se})) > E(U_e(y_{i,e}, x_i, \varepsilon_{i,e}))) \\ &= F(\alpha(V(y_{i,se}) - V(y_{i,e})) + \beta' x_i + \delta_1 d_i + \delta_2 d_i^2 + \delta_3 d_i^3) \end{aligned}$$

where $trans_i$ is a binary indicator variable that equals 1 if a transition to self-employment is observed between t and $t+1$, and 0 otherwise; $\beta = \beta_{se} - \beta_e$; $\delta_k = \delta_{se,k} - \delta_{e,k}$ for $k \in \{1;2;3\}$; F is the cumulative density function of the error terms $\varepsilon_i = \varepsilon_{i,e} - \varepsilon_{i,se}$; and

$$V(y_{ij}) = \begin{cases} \frac{\mu_{y_{ij}}^{1-\rho}}{1-\rho} - \frac{1}{2} \rho \mu_{y_{ij}}^{-\rho-1} \sigma_{y_{ij}}^2; & \rho \neq 1. \\ \ln \mu_{y_{ij}} - \frac{1}{2\mu_{y_{ij}}} \sigma_{y_{ij}}^2; & \rho = 1. \end{cases}$$

can be interpreted as the risk adjusted expected income annuity. The probability of remaining in dependent employment is the complementary probability

$$\text{Prob}(trans_i = 0 | y_{i,se}, y_{i,e}, x_i) = 1 - \text{Prob}(trans_i = 1 | y_{i,se}, y_{i,e}, x_i) = 1 - F(\cdot).$$

The log likelihood function for the sample is thus given by

$$\ln L = \sum_{i=1}^N (trans_i \ln F(\cdot) + (1 - trans_i) \ln(1 - F(\cdot))),$$

To complete the specification of the likelihood function, it remains to specify the cumulative density function F of the error terms $\varepsilon_i = \varepsilon_{i,e} - \varepsilon_{i,se}$. Following McFadden's (1974) random utility model, I assume the error terms $\varepsilon_{i,e}$ and $\varepsilon_{i,se}$ are independently and identically distributed, with the type I extreme value distribution. As McFadden showed, it follows that F is the cumulative logistic probability distribution.

The vector x_i controls for observable individual characteristics and covariates that may shift taste with respect to self-employment. It includes variables that emerged as important determinants of self-employment in prior studies: age, gender, education, work experience, unemployment experience, number of children, region, and a constant (for example, see Taylor 1996; Evans and Leighton 1989; for German data see Georgellis and Wall 2004; Holtz-Eakin and Rosen 2005). Furthermore, Brown *et al.* (2006), Parker (2005) and Bruce (1999) all find evidence that an individual's household context influences the decision to be self-employed. I account for this by controlling for the marital status, the spouse's employment type, if applicable, and the income of other household members in x_i . Year dummies are also included to ensure that possible business cycle effects are taken account of.

The model of transitions from self-employment to dependent employment (exit-model) is specified exactly analogously to the entry model. The only difference is that the coefficient α of the risk-adjusted income differential (defined as the difference between self-employment and dependent employment in all models) is expected to be negative in the exit model. In the likelihood maximisation, α is left unconstrained, so a check if α has the expected sign in all models serves as a test for the models' consistency.

Before the transition models can be estimated by maximising the likelihood function with respect to its parameters (the coefficient of the risk adjusted differential of income annuities α , the coefficient of relative risk aversion ρ , the parameters of the baseline hazard δ_1 , δ_2 and

δ_3 describing the duration dependence, and the parameter vector of the characteristics influencing taste, β), the expected value of the income annuity μ_y and the variance σ_y^2 in the two alternative employment states are required for each individual in each period, as these statistics enter the likelihood function through V .

The strategy for estimating μ_y and σ_y^2 and the estimation results are described in Fossen (2007). Gross income is estimated based on Mincer-type earnings regressions, and the variance of gross income is predicted based on estimated heteroscedasticity functions. Selection into the two employment states is controlled for using a two-step procedure. Not only one period's income, but lifetime income matters for the significant decision to enter or exit self-employment. This is taken into account by predicting the curves of future expected earnings and earnings variance over each individual's lifetime conditional on the choice to be an entrepreneur or a wage worker. The annuities of income and income variance are calculated using the capital value method; the individual horizon is assumed to be reached at the age of 65. The real interest rate is assumed to be 5 %. The study by Fossen (2007) includes a sensitivity analysis, which shows that the estimated parameters of the structural transition models are robust. Among other things, variations in the set of explanatory variables, the functional form of the hazard rate model, the definition of the outcome variable, and the real interest rate were tested.

3.2 Data

This analysis is based on the German Socio-Economic Panel (SOEP) provided by the German Institute for Economic Research (DIW Berlin). The SOEP is a representative yearly panel survey covering detailed information about the socio-economic situation of about 22,000 individuals living in 12,000 households in Germany. For a description of the SOEP see Wagner *et al.* (2007).

For the simulations conducted in this paper, retrospective income information provided by the wave following the simulation year are required. The tax scenarios are simulated for the year 2005, as the following wave 2006 is the most recent wave available. To allow for a more precise estimation of the structural transition models, they are estimated on an extended data basis constructed by pooling the waves of 2002-2005 (again using retrospective income information drawing on data from the following waves till 2006).

For the purpose of this analysis, the sample is restricted to individuals between 18 and 64 years of age and excludes farmers, civil servants, and those currently in education, vocational training, or military service. The individuals excluded presumably have a limited occupational

choice set, or they have different determinants of earnings (e.g. subsidies in the case of farmers) and of occupational choice that could distort our analysis. Family members working for a self-employed relative are also excluded from the dataset because they are not entrepreneurs in the sense of running their own business. Working individuals are classified as self-employed or dependently employed based on whether they report self-employment or dependent employment as their primary activity. A transition can be identified in the data when a person is observed in different employment states in two consecutive years t and $t+1$.

This paper focuses on the choice between full-time dependent employment and full-time self-employment, because the attention is on the comparison of earnings in the two alternative employment states here, not on the decision to work full-time or part-time or the decision to work or not to work. Thus, as in Taylor (1996) and Rees and Shah (1986), the transition models are based on full-time working individuals. Possible selectivity effects arising from selection into the full-time working categories are controlled for with a two-step procedure (see Fossen 2007).

Additionally to the estimations based on the full sample, estimations will be conducted on the sub-sample of men. Because of the small number of female entrepreneurs in the sample, I abstain from estimating the structural transition models on the sub-sample of women.¹⁰

3.3 Tax-Benefit Model STSM

To calculate net incomes based on the estimated gross incomes for each individual and year in each of the two alternative states self-employment and dependent employment, the tax-benefit microsimulation model STSM developed by Steiner *et al.* (2005) is used. It is based on the SOEP and models the complex system of taxes, social security contributions, and transfers in Germany precisely. The model computes net household incomes on the basis of information on gross household incomes, for different (hypothetical) legislations. The SOEP provides information about the relevant income components, expenses, transfers, and household characteristics required to calculate net income. Most of these items are collected retrospectively, so for the computation of year t the STSM draws on information from wave $t+1$.

In the STSM's tax-benefit model, gross income of a household is calculated as the sum of all income components of all household members. Although an individual utility function will be used in the behavioural model, precise net income must be calculated on a household

¹⁰ Only 32 women enter full-time self-employment and even only 9 exit this state in the sample of 2002-2005.

basis because married couples are taxed jointly in Germany with full income splitting.¹¹ Taxable income is derived from gross household income by deducting special expenses such as employees' social security contributions, extraordinary expenses such as sickness costs, and child and other allowances. The income tax is computed by applying the progressive income tax function to the taxable income of each unmarried person in the household or the joint income of married couples. The reform scenarios can be simulated by changing parameters of this tax schedule. Social transfers such as child benefits, child-rearing benefits, unemployment compensation, housing benefits and social assistance are added to calculate net household income.

Individual net income is relevant for the decision to enter or exit self-employment according to the individual utility function derived in section 3.1. Thus, for this analysis the calculated household net income must be allocated to the household members. It cannot be observed how net income is actually distributed between household members. A plausible assumption may be that the relevant part of net household income in the individual's utility function is the share of net household income which equals the share of his or her contribution to gross household income from dependent or self-employed work. An alternative approach could be to assume joint household utility functions (e.g. van Soest 1995; Haan and Steiner 2005). For the self-employment decision, this would however be problematic because risk attitudes are understood as individual preferences.

3.4 Extensions of the Tax-Benefit Model for the Self-Employed

In previous research, which used the STSM to estimate labour supply, the focus was on accurately calculating net incomes in different categories of working hours (in dependent employment) or unemployment, and self-employment was not considered (see for instance Haan and Steiner 2005). In contrast, in this analysis, net incomes in both states dependent employment and self-employment enter the structural transition equations, and thus net income in self-employment must be modelled accurately.

The comprehensive income taxation principle in Germany ensures that most income tax regulations are identical for the dependently employed and the self-employed. Differences are primarily found in the domains of social security and insurance contributions.¹² Employees are obliged to contribute to statutory health and long term care insurance and statutory pension insurance unless their income exceeds certain thresholds, which allows them to

¹¹ The income tax of married couples is calculated by applying the tax function to half of the sum of the spouses' taxable incomes and then doubling the resulting tax amount.

¹² For an overview on German social security law, see the Federal Ministry of Labour and Social Affairs (2006).

contract out. Furthermore, they have to contribute to unemployment insurance. These social security contributions are (largely) equally split between employees and employers. The contributions reduce net income, while they also grant benefit entitlements. In contrast, for the self-employed provisions for sickness, old age and unemployment are generally left at their own responsibility.

The self-employed in Germany can be covered by three different types of health (and long term care) insurance: private health insurance, voluntary membership in statutory health insurance, or coverage by family statutory health insurance.¹³ Voluntary membership in statutory health insurance is only possible if the person had contributed to statutory health insurance for at least the last 12 months or for at least 24 months within the last 5 years before entering self-employment. Family insurance is only available to self-employed working less than 18 hours per week, so it is irrelevant for the sample of full-time working self-employed people. In the SOEP sample used here, 60 % report that they were privately insured in 2005.¹⁴ The SOEP also provides the amount contributed by self-employed people with private health insurance per month.

In the following I will assume that the relevant health insurance costs that people take into account when considering self-employment are given by private health (and long term care) insurance contributions. To be able to estimate hypothetical private health insurance contributions for dependently employed people in the counter-factual state of self-employment, I first use the sub-sample of privately insured self-employed individuals and regress the monthly contributions on relevant individual characteristics (age and age squared, gender, marital status and the number of children), separately for each year. The estimated equation can then be used to predict counter-factual private health insurance contributions per month, which are multiplied by 12 to obtain contributions per year. Table A 1 shows the regression results for the year 2005.¹⁵ Contributions increase with higher age, as agreed by contract. They also increase with the number of children, as private health insurance has to be paid for them separately, in contrast to statutory health insurance. The mean private health insurance contributions reported by the full-time self-employed in the SOEP were €352.19 per month in 2005 (the standard deviation of the distribution is 160.42). For comparison, statutory health (and long term care) insurance contributions, as calculated by the STSM for the full-time dependently employed in 2005, amount to €433.84 per month (standard deviation of the

¹³ As an exception, artists and publicists are covered by mandatory statutory health insurance if certain requirements are met.

¹⁴ About 0.85% of the self-employed in Germany were not covered by any health insurance in 2003 (Greß *et al.* 2005). From January 1st 2009 on, health insurance will be obligatory for all self-employed.

¹⁵ The regression results for the other years are available upon request.

distribution: 149.78). This includes both the employee's and the employer's share (both contribute 50%). Self-employed people who are voluntary members in statutory health insurance have to pay the full amount. The comparison shows that on average the self-employed are better off choosing private health insurance. Self-employed persons with several children and a non-employed spouse may still opt for voluntary membership in statutory health insurance, if possible, as in this case spouse and children are covered by family insurance without additional contributions.

There are also different types of pension insurance schemes for the self-employed. The self-employed are not generally obliged to contribute to pension insurance. Specific groups of the self-employed (about a quarter of all self-employed) are obliged to contribute to statutory pension insurance (Schulze Buschoff 2007), however.¹⁶ For other self-employed people the possibility of being included in the statutory pension insurance system upon application exists; opting out later is ruled out in this case. Another possibility is voluntary membership in statutory pension insurance, which allows choosing the level of the contributions (and entitlements). More relevant in practice are private pension insurance schemes, e.g. state-aided basic (or "Rürup") pension schemes (since 2005).¹⁷ No reliable information could be obtained about actual old age provisions of the self-employed such as contributions to private pension insurance. To proceed, I assume that the yearly amount the self-employed contribute into such schemes equals the amount they would be obliged to pay into the statutory pension insurance if they were dependently employed (i.e. the employee's share). This implies that contributions increase with income from self-employment until a certain upper limit. This limit is reached when gross yearly income exceeds the threshold which allows dependently employed people to contract out of statutory pension insurance, which was €62,400 in 2005. The assumption seems plausible, as higher income first allows the self-employed to save more for old age, but with yearly income exceeding the threshold they probably do not further increase their contributions to pension insurance, which is rather restrictive, but diversify additional savings into more risky and/or flexible investments. Such savings do not reduce net income, however, as they can be consumed anytime. The assumption implies that the self-employed contribute to pension insurance only half the amount that employees and employers together contribute to an employee's statutory pension insurance. It seems realistic that the self-employed contribute less than the full amount, as the principle of statutory pension

¹⁶ Mandatory pension insurance applies for self-employed teachers without employees, nurses, midwives, artists, publicists, craftsmen (who may contract out after having contributed for 18 years), and other less frequent groups.

¹⁷ The basic pension is also available for dependently employed people who wish to supplement their statutory pension insurance.

insurance is pay-as-you-go financing, whereas private pension insurance follows the funding principle. Especially taking into account the ageing of the German population, the self-employed may expect a higher rate of return from private pension insurance. To assess the sensitivity of the results, I will additionally estimate the structural transition models assuming that the amount the self-employed contribute to private pension insurance equals the full contributions to statutory pension insurance, i.e. the sum of the employee's and the employer's share.¹⁸

Until recently there was no equivalent to unemployment insurance for the self-employed. Since February 2006 people becoming self-employed after having been dependently employed may opt to stay in unemployment insurance upon application. The precondition is that they must have been covered by mandatory unemployment insurance for at least 12 months within the last 24 months before entering self-employment. The new option is part of the so-called Hartz III reform (BGBl I 2003 No. 65, p. 2828). As it was not available in 2005, it is not relevant for the calculation of net income in the baseline or the reform scenarios analysed here. Private unemployment insurance is regarded as infeasible due to moral hazard. The self-employed may save additionally to hedge their unemployment risk. Such savings do not reduce net income, however, as they can be consumed anytime. Apart from that, even if reliable information on savings were available, it would be impossible to separate out savings for hedging unemployment risk from other savings and retentions within the firm. Thus, no additional amount is deducted from the net incomes of the self-employed.

Subtracting estimated contributions to private health insurance and assumed contributions to pension funds from the income of the self-employed establishes a concept of net income that is comparable to the situation of the dependently employed who pay into statutory health and pension insurance. For both groups, these contributions reduce disposable

¹⁸ An alternative assumption could be that the amount the self-employed contribute to pension schemes equals the upper limit of provisions deductible as special expenses from taxable income. The rationale could be that the self-employed exploit this opportunity to avoid taxes by deducting the full amount possible, while they would diversify further savings into less restrictive assets. This assumption would not lead to plausible results, however, as in the law of 2005 the upper limit of deductible provisions first falls with higher income and then remains constant. This would imply that the self-employed with low income pay almost their entire income into pension insurance, whereas self-employed people with high income would contribute only a very small share (cf. Buslei and Steiner 2006, p. 61).

income, they are connected with at least similar entitlements,¹⁹ and they can be deducted from taxable income as special expenses if certain prerequisites are met.²⁰

In this analysis start-up subsidies by the government are not explicitly incorporated in the model. The bridging allowance (*Überbrückungsgeld*), which was established in 1986, provided financial support during a maximum of the first six months in self-employment if certain prerequisites were met. Applications could be made by unemployed people with benefits entitlement, but also by employed people to avoid imminent unemployment (after dismissal or foreseeable dismissal). Thus, it is possible that the programme had an effect on transitions between dependent employment and self-employment. In 2005, a total of 160,000 people received bridging allowance (Baumgartner *et al.* 2006). It is assumed here that the effect of this programme on transitions between dependent employment and self-employment – if there is any – is the same in the baseline and in the three hypothetical tax reform scenarios; when the difference is taken to evaluate the impact of the reforms, the effect of the bridging allowance cancels out.²¹

The data do not allow observing if the self-employed have better tax avoidance and evasion opportunities than the dependently employed, and how many people exploit such opportunities. Based on data from the 1983 wave of the German income and consumption survey, Lang *et al.* (1997) found that the self-employed significantly underreported their income. Bach, Corneo, and Steiner (2005) also found a significant gap between gross income and taxable income due to tax avoidance in Germany, especially through renting and leasing, but also business activity. On the other hand, according to Parker (2003), tax avoidance and evasion opportunities do not influence the choice between self-employment and dependent

¹⁹ A difference in entitlements is that in contrast to private health insurance, statutory health insurance includes coverage of children and spouses who earn less than €400 per month (family insurance). This may induce incentives for spouses of self-employed or other privately insured persons to be dependently employed in order to be covered by statutory health insurance. I partly account for this effect in the transition models by including a dummy variable for self-employed spouses.

²⁰ The prerequisites for private pension insurance basically ensure that the funds are not consumed before old age (for details see Wellisch 2002, pp. 567ff). For all taxpayers (independently of the status as a dependently employed or self-employed person), upper limits of the provisions deductible as special expenses exist and are modelled in the STSM. The Retirement Income Act, the first step of which became effective on January 1st 2005, provides that the upper limits for old age provisions are increased in steps until 2025. During the transitional period until 2019, possible disadvantages for taxpayers are avoided as authorities check for every taxpayer if the old or the new law is more favourable. Buslei and Steiner (2006) provide a rigorous microsimulation study of the fiscal and distributional effects of the Retirement Income Act. As the legislation changes are faded in gradually and effects can thus be expected to be rather small initially (Buslei and Steiner (2006) estimate that households gain on average about €210 due to the changed regulations for the deduction of old age provisions in the year 2005), the Retirement Income Act is not taken into account in this analysis.

²¹ The so-called “Ich AG” (“Me-Incorporation”) programme, which came into effect in January 2003, was only available to the unemployed, so it is not relevant for this analysis. In August 2006, both the bridging allowance and the “Me-Incorporation” programmes were replaced by a single new start-up subsidy programme (*Gründungszuschuss*), which is only available to unemployed people receiving unemployment benefits, so again it is irrelevant for transitions between dependent employment and self-employment.

employment. In this analysis any such effect would cancel out in the comparison between the reform and the baseline scenarios, as the reform scenarios considered here only alter the tax schedule, but not the tax base and thus do not influence avoidance and evasion opportunities.

3.5 Ex-Ante Simulation of Tax Reform Scenarios

The first step to proceed is the estimation of the structural transition equations derived in section 3.1. Individual curves of the expected value and the variance of real gross income over lifetime in the alternative states self-employment and dependent employment were estimated in Fossen (2007). Based on these estimated gross incomes, I calculate net incomes by applying the STSM here.²² This is a different and more precise approach than in Fossen (2007), where the German tax-benefit system was approximated roughly by regressing an observed proxy of individual average tax rates on gross income and other variables relevant for taxation.

In the baseline scenario, the parameters in the tax-benefit model STSM are set to reflect the actual legislation in 2005. The reform scenarios are implemented by adjusting the parameters of the tax schedule. Next, I calculate annuities of the expected value and variance of net income to summarise the estimated lifetime curves, again following the procedure in Fossen (2007). Now the structural transition models can be estimated.

Finally, the probabilities of entry into and exit out of self-employment in the baseline scenario and the three alternative reform scenarios can be predicted for 2005 using the estimated structural transition equations, based on the observations in 2005. The predicted transition rates in the baseline scenario are compared to the predicted rates in the reform scenarios. The differences can be interpreted as the estimated ex-ante effects of the hypothetical tax policy reforms. I also analyse the effects of the reforms on the cumulative transition probabilities over longer time periods.

4 Results

4.1 Estimation of the Structural Transition Models

The upper panel of Table 3 shows the point estimates and robust standard errors of the structural parameters ρ (the coefficient of constant relative risk aversion) and α (the

²² All monetary variables are deflated using the Consumer Price Index (2001 = 100). The estimated real hourly gross incomes are converted into nominal yearly gross incomes before entering the STSM, and the resulting nominal yearly net incomes are converted back to real hourly net incomes afterwards, using the average number of hours worked in the sample of full-time working people.

coefficient of the differential of risk adjusted net income annuities) obtained by estimating the structural transition models. The left two columns show the models of transition from dependent employment to self-employment and from self-employment to dependent employment for the whole sample, and the right two columns for the sub-sample of men. All point estimates for ρ and α are significant at the 1 % level.

Table 3: Estimated structural parameters of the transition models

Structural Parameter	Estimated Value (Standard Error)			
	Men and Women		Men	
	Dep. Employment to Self-Employment	Self-Employed to Dep. Employment	Dep. Employment to Self-Employment	Self-Employed to Dep. Employment
<i>Net incomes calculated using the tax-benefit microsimulation model STSM</i>				
ρ	0.470 (0.114)***	0.155 (0.059)***	0.388 (0.080)***	0.183 (0.067)***
α	0.174 (0.026)***	-0.209 (0.044)***	0.199 (0.029)***	-0.202 (0.041)***
Wald χ^2	83.469	61.998	82.079	76.954
log likelihood	-579.797	-193.037	-409.726	-164.570
transitions (N)	133	81	101	72
transitions (rate)	0.008	0.052	0.009	0.061
N	16390	1555	10831	1172
<i>Sensitivity analysis: Full pension insurance contributions by the self-employed</i>				
ρ	0.470 (0.126)***	0.171 (0.067)**	0.381 (0.079)***	0.205 (0.078)***
α	0.172 (0.027)***	-0.221 (0.048)***	0.202 (0.029)***	-0.215 (0.044)***
N	16390	1555	10831	1172
<i>For reference: Net incomes calculated using an estimated tax function (Fossen 2007)</i>				
ρ	0.477 (0.050)***	0.123 (0.033)***	0.391 (0.051)***	0.168 (0.050)***
α	0.242 (0.017)***	-0.256 (0.031)***	0.262 (0.022)***	-0.234 (0.034)***
N	63441	4066	41365	3075

Stars (***) indicate significance at the 1% level, based on heteroscedasticity robust standard errors.

Source (upper panel): Own calculations based on the SOEP 2002-2006, full-time self-employed and dependently employed individuals.

The coefficient of the differential between the risk adjusted net income annuities from self-employment and from dependent employment α is positive in the models of entry into self-employment and negative in the models of exit. The four models thus consistently confirm the hypothesis that a higher risk adjusted net income in self-employment in comparison to dependent employment induces people both to become and to remain self-employed as the probability of entry is increased and the probability of exit is decreased. The estimated coefficients of constant relative risk aversion ρ are positive in all models, indicating that people are risk-averse, and lie in the range reported by the literature (e.g. Holt and Laury

2002; Binswanger 1980). The estimated degrees of risk aversion are low for the self-employed and moderate for the dependently employed.

Below, the results from the sensitivity analysis concerning the private pension insurance contributions of the self-employed are shown (see section 3.4). In the main estimation shown at the top panel of the table, it is assumed that the amount the self-employed contribute to private pension insurance equals the amount they would be obliged to contribute to statutory pension insurance if they were dependently employed (i.e. the employee's share, which is 50 % of the full contributions). In this robustness check, I alternatively assume that the self-employed contribute the equivalent of the full statutory pension insurance contributions (i.e. the sum of the employee's and the employer's shares). The estimation results are shown to be robust to the choice of these assumptions. In the models of entry into self-employment for the joint sample of men and women and for the sample of men, the point estimates for ρ and α change only slightly. In the models of exit, the somewhat higher ρ of the self-employed indicates that the self-employed must be more risk-averse to explain the data under the assumption of high pension insurance contributions. α is somewhat larger in absolute terms in the exit models, indicating that the difference in the risk adjusted net earnings annuities plays a moderately more important role in the decision to exit self-employment than under the assumption of low pension insurance contributions.

For comparison, the results obtained in Fossen (2007) are shown at the bottom panel of the table. The similarity of the estimates demonstrates that the qualitative (and to a large extent also the quantitative) estimation results are very robust with respect to the modelling of the tax-benefit system (see section 3.5) and also to the selection of observation years. The structural transition models were estimated on data covering 2002-2005 here, instead of 1984-2004 in Fossen (2007), as an extension of the STSM to the whole time period was not feasible.

Table 4 provides partial point elasticities of the transition probabilities with respect to the annuities of the expected value and variance of net earnings based on the estimated structural transition equations, evaluated at the mean values of the explanatory variables in the sample. The left two columns refer to entries into and exits out of self-employment for men and women, and the right two columns for men only. All elasticities are significant at the 1 % level and have the expected sign, indicating that higher net earnings in self-employment in comparison to dependent employment *ceteris paribus* attract people to this state, whereas a

higher relative variance deters people from choosing this option.²³ Again, the estimated elasticities are very similar to those obtained in Fossen (2007).

Table 4: Estimated partial elasticities of transition rates with respect to net μ_y and σ_y

Variable: Annuity of...	Elasticity (Robust Standard Error)			
	Men and Women		Men	
	Dep. Employment to Self-Empl.	Self-Employed to Dep. Employment	Dep. Employment to Self-Empl.	Self-Employed to Dep. Employment
Hourly net earnings from self-employment	1.2339 (0.3581)***	-2.1645 (0.7301)***	1.2070 (0.3221)***	-2.0383 (0.6972)***
Hourly net earnings from dependent employment	-0.6833 (0.2468)***	1.9947 (0.7052)***	-1.0056 (0.2859)***	1.8876 (0.6780)***
Variance of hourly net earnings from self-employment	-0.3334 (0.0640)***	0.0736 (0.0099)***	-0.1355 (0.0200)***	0.0751 (0.0111)***
Variance of hourly net earnings from dependent employment	0.0250 (0.0041)***	-0.0083 (0.0011)***	0.0315 (0.0044)***	-0.0076 (0.0011)***

The elasticities give the percentage change of the transition probabilities induced by a discrete one percent change in the annuities of expected value or variance of income from one of the two employment types, evaluated at the mean values of the explanatory variables in the sample. Stars (***) indicate significance at the 1% level.

Source: Own calculations based on the SOEP 2002-2006, full-time self-employed and dependently employed individuals.

4.2 Ex-Ante Effects of Tax Reforms in Germany

This section provides the simulated effects of the three hypothetical tax reform scenarios outlined in section 2 – the repeal of the tax reform 2000 and the flat tax scenarios LL and HH – for Germany in the year 2005. I first describe the effects of the policies on the transition rates into and out of self-employment in 2005 and on the cumulative transition probabilities over several years. Then the results are discussed by taking a closer look at the impact of the policies on net income.

Table 5 shows the predicted transition rates from dependent employment to self-employment and from self-employment to dependent employment in the baseline scenario and the three hypothetical reform scenarios, both for the combined sample of men and women and the sub-sample of men. The first line gives the observed transition rates in 2005, i.e. the shares of the respective populations in 2005 who actually make a transition between 2005 and

²³ For the interpretation of the elasticities, one has to consider that isolated changes in μ_y and σ_y as evaluated here are artificial. In practice, an increase in net μ_y will usually come along with an increase in net σ_y (but not automatically so, if the variation coefficient of income decreases at the same time). Thus, to estimate the effects of a tax reform on self-employment transitions, one must simulate its specific effect using the estimated transition equations.

2006.²⁴ The predicted transition rates in the baseline scenario (second line), which are used for comparison with the reform scenarios, are not significantly different from the observed rates.

Table 5: Transition rates in 2005, baseline and reform scenarios

	Transition Rate in %			
	(Standard Error)			
	Men and Women		Men	
	Dep. Employment to Self-Empl.	Self-Employed to Dep. Employment	Dep. Employment to Self-Empl.	Self-Employed to Dep. Employment
Baseline scenario (observed)	0.8580 (0.1587)***	4.5775 (1.2424)***	0.9400 (0.2042)***	4.1860 (1.3690)***
Baseline scenario (estimated)	0.8579 (0.1493)***	4.5774 (0.9668)***	0.9399 (0.1930)***	4.1860 (1.1546)***
Scenario "Repeal of Tax Reform 2000"	0.8767 (0.1538)***	4.2654 (0.9185)***	0.9473 (0.1948)***	3.9131 (1.0924)***
Difference (effect of repeal)	0.0188 (0.0056)***	-0.3120 (0.1008)***	0.0073 (0.0033)**	-0.2729 (0.1053)***
Scenario "Flat Tax LL"	0.8141 (0.1416)***	4.5955 (0.9530)***	0.9222 (0.1890)***	4.1770 (1.1512)***
Difference (effect of reform)	-0.0438 (0.0101)***	0.0180 (0.0336)	-0.0178 (0.0042)***	-0.0090 (0.0296)
Scenario "Flat Tax HH"	0.8361 (0.1444)***	4.5209 (0.9401)***	0.9362 (0.1916)***	4.1199 (1.1311)***
Difference (effect of reform)	-0.0218 (0.0082)***	-0.0565 (0.0437)	-0.0037 (0.0028)	-0.0662 (0.0417)
N	3380	284	2234	215

Stars (** / ***) indicate significance at the 5% / 1% level.

Source: Own calculations based on the SOEP 2005-2006, full-time self-employed and dependently employed individuals.

If the changed tax schedule introduced with the tax reform 2000 had been repealed in 2005, the models predict that the transition rate between dependent employment and self-employment would have increased by 0.0188 percentage points, which corresponds to a relative increase of 2.2 %. The transition rate from self-employment to dependent employment would have decreased by 0.312 percentage points (-6.8 %). For the sub-sample of men the effects have the same sign; all the effects are significant at the 5 %-level. In summary, the repeal would have made self-employment more attractive – in reverse this means the original tax reform 2000 deters people from choosing self-employment.²⁵

²⁴ Each (unweighted) transition rate and its standard error are obtained from a regression of the transition indicator dummy on a constant, based on the corresponding sub-sample of the cross-section 2005.

²⁵ In the sensitivity analysis concerning the private pension insurance contributions of the self-employed (see section 3.4), it turns out that the effects are very robust. If the self-employed are assumed to contribute the equivalent of the full statutory pension insurance contributions (instead of the employee's share only), a repeal of the tax reform 2000 would have increased the entry rate into self-employment by 0.0183 %-points (instead of 0.0188 %-points) and decreased the exit rate by 0.328 %-points (instead of 0.312 %-points).

The two flat tax scenarios have negative effects on the entry rate into self-employment which are significant at the 1 % level (except for the change in men's entry rate in scenario HH). The flat tax scenario with low basic allowance and tax rate (LL) would reduce the entry rate by 0.0438 percentage points (-5.1 %), whereas the scenario with higher values (HH) would reduce the entry rate by only 0.0218 percentage points (-2.5 %). The flatter the tax schedule, the more the flat tax scenarios seem to discourage people from entry. In contrast, the effects on the exit rate from self-employment are small in relative terms and statistically insignificant, both for the full sample and the sample of men.

The predicted transition rates are translated into transition numbers in Table 6, based on the population sizes of full-time dependently employed and self-employed people in Germany in 2005. In the baseline scenario, the model predicts that 172,200 people switch from dependent employment to self-employment and 129,600 the other way in 2005, which results in a net increase in the number of the self-employed of 42,600 people. If the tax reform 2000 had been repealed in 2005, the models predict that 3,800 additional people would have entered self-employment, and 8,800 less would have exited. Thus, in comparison to the baseline scenario, the number of the self-employed would have grown by an additional 12,600 people as a result of the hypothetical repeal. The net effects of the flat tax reform scenarios on the change in the number of the self-employed have the opposite sign. In the HH scenario, the number of the self-employed would have grown by 2,800 people less than in the baseline scenario, and in the LL scenario, even 9,300 less. The net effects are driven by the reduced number of entries. In scenario HH, the lower number of exits reduces the net effect. If the statistically insignificant effect on the exit rate in this scenario (see above) is interpreted as an effect of zero, the net effect is even -4,400 instead of -2,800. The absolute effect is still smaller than in scenario LL, however, so the finding that flatter tax schedules increasingly discourage people from self-employment remains valid.

Table 6: Predicted transitions in 2005 (men and women), baseline and reform scenarios

	Predicted Transition Numbers		Change in Number of the Self- Employed
	Dep. Employment to Self-Employment	Self-Employed to Dep. Employment	
Baseline scenario	172,211	129,628	42,583
Scenario "Repeal of Tax Reform 2000"	175,977	175,977	55,185
Difference (effect of repeal)	3,766	-8,836	12,602
Scenario "Flat Tax LL"	163,424	130,139	33,285
Difference (effect of reform)	-8,787	511	-9,298
Scenario "Flat Tax HH"	167,834	128,027	39,807
Difference (effect of reform)	-4,377	-1,601	-2,776
Population	20,073,678	2,831,886	

Source: Own calculations based on the SOEP 2005-2006, full-time self-employed and dependently employed individuals.

Which effects would the tax policies have over longer time periods? Table 7 provides the average cumulative transition probabilities from dependent employment to self-employment and vice versa in the baseline and the reform scenarios over 1, 5, 10, and 15 years. For each person in the sample in 2005, the individual cumulative hazard during these time spans was calculated using the estimated hazard functions (the cumulative transition probability equals 1 minus the survivor function). The table also shows the relative changes of the average cumulative transition probabilities in the reform scenarios in comparison to the baseline scenario, i.e. the relative effects of the reforms. In most cases, the relative mid- or long-term effects of the tax policies on the cumulative transition rates over several years are somewhat stronger than the relative short-term effects on the transition rates in 2005. The flat tax HH, for example, would increase the cumulative entry rate into self-employment by 3.2 % in the five-year period between 2005 and 2010, but only by 2.5 % in 2005 alone (as was reported before). A repeal of the tax reform 2000, in contrast, would have a stronger relative effect on the exit rate in 2005 (-6.8 %) than on the cumulative exit rate in the period 2005-2010 (-5.6 %). Overall, the table shows that the estimated relative effects of the reforms reported for 2005 generally also hold for longer time periods. A complete equilibrium analysis, which would require modelling the states unemployment, non-employment, and part-time employment as well, is beyond the scope of this paper.

Table 7: Cumulative transition probabilities in baseline and reform scenarios in % (men and women)

Time Period	Dep. employment to self-employment				Self-employed to dep. employment			
	2005	2005-10	2005-15	2005-20	2005	2005-10	2005-15	2005-20
Baseline Scenario	0.8579	3.2940	5.0855	6.6018	4.5774	13.6493	18.0691	21.5163
Repeal of Tax Ref. 2000	0.8767	3.3770	5.2113	6.7643	4.2654	12.8823	17.1130	20.4410
Percentage Change	2.19	2.52	2.47	2.46	-6.82	-5.62	-5.29	-5.00
Flat Tax LL	0.8141	3.1247	4.8227	6.2595	4.5955	13.5101	17.8979	21.3186
Percentage Change	-5.10	-5.14	-5.17	-5.18	0.39	-1.02	-0.95	-0.92
Flat Tax HH	0.8361	3.1878	4.9132	6.3728	4.5209	13.3186	17.6464	21.0280
Percentage Change	-2.54	-3.22	-3.39	-3.47	-1.24	-2.42	-2.34	-2.27

Source: Own calculations based on the SOEP 2005-2006, full-time self-employed and dependently employed individuals.

4.3 Discussion of the Results

Which factors drive the estimated ex-ante effects of the three hypothetical reform scenarios on the transition rates? To answer this question, in this section a closer look on the effects of the reforms on net income will be taken. Table 8 summarises the effects on net-income for the two sub-samples of the actually self-employed (left column) and the actually dependently employed (right column) in 2005. The top panel refers to the baseline (actual law 2005) scenario and the panels below to the three hypothetical alternative scenarios. Each panel provides the means of the estimated annuities of the expected value of net income μ_y and the variance of net income σ_y^2 in self-employment (se) and in dependent employment (e), one of which is the actual and the other the counter-factual state. Furthermore the means of the risk-adjusted net earnings annuities $V(y)$ and the mean differentials between the two employment states $V(y_{se}) - V(y_e)$ are shown for each scenario. $V(y)$ summarises μ_y and σ_y^2 using the values of the coefficient of relative risk aversion ρ estimated in section 4.1 (the definition of $V(y)$ is given in section 3.1). On an individual basis, the differentials between self-employment and dependent employment $V(y_{se}) - V(y_e)$ enter the structural transition probability equations.

Table 8: Earnings in self-empl. and dependent empl. in baseline and reform scenarios

		Sample	
		Self-Employed	Dependently Employed
<i>Baseline scenario</i>			
Earnings from self-employment (mean values)	Estimated annuity (net earnings) $\mu_{y,se}$ in euro/hour	12.44	14.53
	Estim. variance annuity (net earnings) $\sigma_{y,se}^2$	58.40	505.09
	Risk adjusted net earnings annuity $V(y_{se})$	9.17	5.40
Wages from dependent employment (mean values)	Estimated annuity (net earnings) $\mu_{y,e}$ in euro/hour	12.85	11.64
	Estim. variance annuity (net earnings) $\sigma_{y,e}^2$	10.34	39.05
	Risk adjusted net earnings annuity $V(y_e)$	10.08	6.55
Mean differential of risk adjusted net earnings annuities $V(y_{se})-V(y_e)$		-0.90	-1.16
<i>Scenario "Repeal of Tax Reform 2000"</i>			
Earnings from self-employment (mean values)	Estimated annuity (net earnings) $\mu_{y,se}$ in euro/hour	12.31	13.79
	Estim. variance annuity (net earnings) $\sigma_{y,se}^2$	52.52	385.01
	Risk adjusted net earnings annuity $V(y_{se})$	9.13	5.52
Wages from dependent employment (mean values)	Estimated annuity (net earnings) $\mu_{y,e}$ in euro/hour	12.25	11.10
	Estim. variance annuity (net earnings) $\sigma_{y,e}^2$	8.57	29.92
	Risk adjusted net earnings annuity $V(y_e)$	9.68	6.40
Mean differential of risk adjusted net earnings annuities $V(y_{se})-V(y_e)$		-0.55	-0.88
<i>Scenario "Flat Tax LL"</i>			
Earnings from self-employment (mean values)	Estimated annuity (net earnings) $\mu_{y,se}$ in euro/hour	13.01	14.86
	Estim. variance annuity (net earnings) $\sigma_{y,se}^2$	74.76	741.03
	Risk adjusted net earnings annuity $V(y_{se})$	9.49	4.80
Wages from dependent employment (mean values)	Estimated annuity (net earnings) $\mu_{y,e}$ in euro/hour	13.01	11.71
	Estim. variance annuity (net earnings) $\sigma_{y,e}^2$	12.96	51.07
	Risk adjusted net earnings annuity $V(y_e)$	10.17	6.54
Mean differential of risk adjusted net earnings annuities $V(y_{se})-V(y_e)$		-0.68	-1.75
<i>Scenario "Flat Tax HH"</i>			
Earnings from self-employment (mean values)	Estimated annuity (net earnings) $\mu_{y,se}$ in euro/hour	12.92	14.67
	Estim. variance annuity (net earnings) $\sigma_{y,se}^2$	68.41	649.73
	Risk adjusted net earnings annuity $V(y_{se})$	9.47	5.00
Wages from dependent employment (mean values)	Estimated annuity (net earnings) $\mu_{y,e}$ in euro/hour	12.88	11.67
	Estim. variance annuity (net earnings) $\sigma_{y,e}^2$	11.53	49.13
	Risk adjusted net earnings annuity $V(y_e)$	10.09	6.55
Mean differential of risk adjusted net earnings annuities $V(y_{se})-V(y_e)$		-0.63	-1.55
<i>Comparison with baseline scenario</i>			
Change of mean differential $V(y_{se})-V(y_e)$	Scenario "Repeal of Tax Reform 2000"	0.36	0.28
	Scenario "Flat Tax LL"	0.23	-0.59
	Scenario "Flat Tax HH"	0.28	-0.39
N		284	3380

Source: Own calculations based on the SOEP 2005-2006, full-time self-employed and dependently employed individuals.

At the bottom of the table the three reform scenarios are compared with the baseline scenario by showing the changes in the mean differentials $V(y_{se}) - V(y_e)$. For an individual, a positive change in the differential means that a reform improves his or her risk adjusted net income annuity in self-employment in comparison to dependent employment. Given the estimated values for the structural parameters α (section 4.1), a positive change due to a reform implies

a higher probability of transition from dependent employment to self-employment and a lower probability of transition in the opposite direction in comparison to the baseline scenario. Moreover, as the transition probabilities are strictly monotonous in the differential $V(y_{se}) - V(y_e)$, larger absolute changes imply a larger response in the transition probability. Because of the non-linearity of the logistic probability function, it is however not possible to infer the direction of the changes in the aggregate transition rates directly from the mean changes in the differentials shown in this table. The transition probabilities have to be predicted for each individual in both scenarios before the aggregate change can be computed, as done in Table 5. Comparing Table 8 with Table 5, it turns out that the direction and the rank order of the effects of the three reforms on the transition rates correspond to the effects the changes in the mean differentials would suggest whenever the estimated changes in the transition rates are statistically significant. Specifically, the mean differentials of the dependently employed decrease in both flat tax scenarios, and correspondingly the entry rates also decrease. Both the drop in the mean differential and in the entry rate are stronger in scenario LL than in scenario HH. Likewise, as the mean differential would have increased for both the dependently employed and the self-employed if the tax reform 2000 had been repealed in 2005, the entry rate would have increased and the exit rate decreased.

A deeper understanding of the effects is achieved by looking at the changes in mean μ_y and σ_y^2 due to the reforms that lead to the changes in the mean differentials $V(y_{se}) - V(y_e)$. In the flat tax reform scenarios the mean annuities of expected income μ_y increase in both the samples of the full-time dependently employed and self-employed in both employment states in comparison to the baseline scenario. Although the revenue neutral flat tax scenarios hardly change average net incomes in 2005 (Table 2), people expect to enter higher income deciles in the future because of rising expected real gross income over their lifetime and thus to gain from the flat tax. This expectation is reflected in the higher annuities. Simultaneously σ_y^2 increases in both samples and employment states, indicating that the less progressive tax schedules in the flat tax scenarios increase variation in net income. For the sample of the dependently employed, the risk adjusted net income annuities $V(y)$ decrease (or stay constant) in both employment states, which means that the higher σ_y^2 outweighs the higher μ_y ; for the self-employed it is the other way round.²⁶ For the dependently employed, who would have both higher μ_y and σ_y^2 if they were self-employed in all scenarios, the mean decrease in $V(y)$ is stronger in self-employment. Consequently, the change in the mean differential is negative,

²⁶ As the changes in the exit rates for the self-employed due to the flat tax scenarios are not significant, the sample of the self-employed is not discussed here further.

and entry into self-employment becomes less attractive. All the effects described here are stronger in the flatter LL scenario than in the HH scenario which is more progressive and thus more similar to the baseline scenario. In summary, one can conclude that the higher relative income risk in self-employment brought by a flat tax outweighs the higher relative net returns and discourages the risk-averse dependently employed from entry into self-employment.

The hypothetical repeal of the tax reform 2000 would decrease μ_y in both samples and both employment states, which reflects that the tax reform 2000 lowered the tax burden for income tax payers. At the same time, the repeal would also decrease σ_y^2 in both samples and states. Overall, the mean risk adjusted net income differential would increase in both samples due to the repeal and make self-employment more attractive. The income risk reduction, which is stronger in self-employment than in dependent employment, dominates this effect. In reverse, this implies that the tax reform 2000 discourages people from choosing self-employment.

After having discussed the changes in the means of the decision-relevant differentials of the risk adjusted net earnings annuities $V(y_{se}) - V(y_e)$ induced by the reforms, an analysis of the distribution of these changes by deciles may further clarify the ways the reforms take effect. Table 9 shows the changes induced by the three reforms compared to the baseline scenario by deciles of risk adjusted gross income annuities in the actual employment state. This table represents an expansion of the comparison panel at the bottom of Table 8 by deciles. The upper panel shows the sample of the self-employed and the lower panel the sample of the dependently employed. No monotonous trends of the changes by deciles become apparent. This reflects the heterogeneity in the sample together with the complex tax-benefits system in Germany. Especially in the small sample of the self-employed in 2005, where only 28-29 observations are available per decile, the changes seem to vary unsystematically between deciles. In the flat tax scenarios the differential for the self-employed increases particularly strongly in the 10th decile. Those self-employed individuals who enjoy the largest risk adjusted earnings annuities would increase extraordinarily their advantage in comparison to dependent employment if a flat tax was introduced. The top decile drives the increase in the mean differentials in the flat tax scenarios.

Table 9: Change of mean differential of risk adjusted net earnings annuities $V(y_{se})-V(y_e)$ compared to baseline scenario in 2005 by deciles

Risk Adjusted Income Decile ¹⁾	Scenario "Repeal of Tax Reform 2000"	Scenario "Flat Tax LL"	Scenario "Flat Tax HH"	N
<i>Full-time self-employed individuals</i>				
1	0.61	0.00	0.06	
2	0.35	-0.06	0.03	
3	0.45	0.18	0.25	
4	0.33	0.05	0.15	
5	0.35	0.09	0.24	
6	0.29	0.04	0.18	
7	0.43	0.20	0.35	
8	0.24	-0.09	0.05	
9	0.16	0.43	0.35	
10	0.35	1.47	1.11	
All	0.36	0.23	0.28	284
<i>Full-time dependently employed individuals</i>				
1	0.28	-0.89	-0.57	
2	0.31	-0.69	-0.49	
3	0.33	-0.68	-0.50	
4	0.34	-0.70	-0.48	
5	0.28	-0.55	-0.39	
6	0.20	-0.43	-0.31	
7	0.41	-0.78	-0.50	
8	0.19	-0.36	-0.22	
9	0.22	-0.46	-0.28	
10	0.20	-0.35	-0.17	
All	0.28	-0.59	-0.39	3380

¹⁾ Deciles are calculated with respect to risk adjusted gross earnings annuities in the actual employment state.

Source: Own calculations based on the SOEP 2005-2006, full-time self-employed and dependently employed individuals.

In combination with the non-linearity of the logit function, this may explain why the changes in the rates of exit from self-employment due to the flat tax scenarios are not significant despite the positive changes in the mean differentials. At first sight one would have expected a significant decrease in the exit rates. The analysis by deciles showed that without the top decile, the mean differentials would increase only slightly in the flat tax scenarios. As the members of the top decile have a very low probability of exiting self-employment in the baseline scenario already (because of their high risk adjusted earnings annuities), their exit probability cannot decrease much in absolute terms due to the flat tax reform scenarios. As a result, the aggregate exit rate does not change significantly.

5 Summary and Conclusion

In this paper I used a microsimulation model to simulate the effects of three hypothetical tax reform scenarios for Germany on transition rates into and out of self-employment. The underlying estimated structural transition models take into account not only expected income, but also income risk. The purpose of the first scenario was to assess the impact of the tax reform 2000. Therefore, I defined a hypothetical scenario which assumes the government had repealed the change in the income tax code introduced with the tax reform 2000 in the year 2005 (and thus re-introduced the pre-reform tax law). The other two scenarios represent revenue neutral flat tax policies, again for 2005. The first flat tax scenario defines a low basic allowance and a low flat tax rate, and the second one higher values for these parameters. The ex-ante effects of the three reform policies were calculated by comparing the estimated transition rates in these scenarios to those estimated in the baseline scenario, which represents the current law of 2005.

To calculate net incomes in the different tax reform scenarios precisely, in this paper an extended version of the tax-benefit microsimulation model STSM was used. The gross incomes in the two alternative employment states dependent employment and self-employment, which feed these calculations, were estimated in Fossen (2007). Based on the net incomes calculated by the STSM, the structural transition equations were estimated, which were then used to predict the behavioural responses of the individuals to the different tax reform scenarios. A sensitivity test showed that the results are robust to assumptions about the private pension insurance contributions of the self-employed. Additionally, a comparison of the estimated structural coefficients to those obtained in Fossen (2007) confirms that the results are robust with respect to different methods used for calculating net income and the selection of observation years included in the sample.

The simulation results indicate that a hypothetical repeal of the tax reform 2000 in 2005 would have increased the entry rate into self-employment from dependent employment by 2.2 % and decreased the exit rate by 6.8 % (relatively to the respective rates in the baseline scenario). In absolute numbers, this implies that in comparison to the baseline scenario, the number of the self-employed would have grown by an additional 12,600 people in 2005. The finding that the hypothetical repeal makes self-employment more attractive is dominated by its reduction of income risk, which is stronger in self-employment than in dependent employment. In reverse this means that the tax reform 2000, which reduced the progressivity of the tax schedule, discourages people from self-employment.

In line with this result, the flat tax reform scenarios are found to deter people from entry into self-employment; the flatter the tax schedule, the stronger this effect. The flat tax scenario with low basic allowance and tax rate reduces the entry rate by 5.1 % relatively to the baseline scenario (which implies a decrease in the number of entries by 8,800 in 2005), and the scenario with higher values reduces the entry rate by 2.5 % (4,400 entries less). The higher relative income risk in self-employment brought by a flat tax outweighs the higher relative net returns. There are no significant effects of the flat tax policies on the exit rate. The estimated effects of the three tax reforms on the mid- and long-term cumulative transition probabilities are similar in relative terms to the estimated effects on the short-term transition rates.

A flatter tax schedule is generally expected to increase incentives for labour supply for those whose marginal tax rate declines. Haan and Steiner (2000) found that the tax reform 2000 increased total labour supply, and Fuest *et al.* (2007) report the same result for the flat tax scenario LL. As expected gross income is, on average, higher in self-employment than in dependent employment (see Fossen 2007), a flatter tax schedule delivers a larger decrease (or smaller increase, if income is low) of marginal tax rates to the self-employed than to the dependently employed. With these considerations in mind, policy makers often argue that flatter taxes should increase incentives for engaging in entrepreneurship. However, this is an invalid shortcut which does not take into account appropriately that people are risk-averse. Progressive taxes reduce the variation of net income, and this is more important in self-employment than in dependent employment because entrepreneurship is considerably more risky. The microsimulation analysis conducted in this chapter shows that this insurance effect dominates behaviour in the scenarios considered here.

For policy the results somewhat surprisingly imply that reforms aiming at flattening the tax schedule are no suitable instruments to promote entrepreneurship. Hence, in the discussion of flat tax policies and of changes to the progressive tax schedule in general, the impact on income risk should receive more attention. In this respect, flat tax reform proposals lose some of their alleged attractiveness, at least if the stimulation of entrepreneurship is stated as a policy objective.

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Appendix

Table A 1: Estimation of private health insurance contributions per month, SOEP 2005

Variable	Coefficient (Robust Standard Error)
age	17.8170 (4.5149)***
age squared	-0.1106 (0.0488)**
number of children in household	21.4603 (9.3520)**
married	-11.7228 (16.1937)
male	-43.2149 (19.3662)**
constant	-195.4995 (101.4759)*
R ²	0.246
N	381
Mean private health insurance contributions (euro)	352.19
Standard deviation of contributions	160.42

Stars (* / ** / ***) indicate significance at the 10% / 5% / 1% level.

Source: Own calculations based on the SOEP 2005-2006, full-time self-employed and dependently employed individuals.