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Taxation and Labour Supply:

Evidence from a Representative Population Survey*

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Taxation and Labour Supply:

Evidence from a Representative Population Survey

Abstract We study the influence of taxation on labour supply using a specifically designed representative survey of the German population. First, we investigate whether taxes generally matter for the labour supply decisions of our respondents. Around 41 per cent report taking taxes into consideration, which implies that the majority of the German population appears unresponsive to taxation. Second, we look at self-reported labour supply adjustments following a recently enacted payroll tax change. Only around 12 per cent of all respondents report an actual labour supply response, but we find evidence of an income, as well as a substitution, effect of the tax change. Our conclusion is that effects of taxes on labour supply in Germany are likely small. We analyse the correlation with economic and socio-demographic variables, and find that the self-employed are relatively more sensitive to taxation and that low interest rates reduce incentives for an expansion of the labour supply.

Keywords Taxation · Labour supply · Representative population survey Germany

JEL Classification E62 · H30 · J22

1 Introduction

The link between taxation and labour supply is of considerable interest to both academics and policymakers. For instance, labour supply responses to taxation are important for assessing the efficiency loss associated with distortive income taxation. Currently, there is also more interest in the impact of fiscal policy changes on economic activity, and tax changes may affect output through alterations in the labour supply. These issues are commonly analysed using macroeconomic or microeconomic approaches that attempt to estimate the reaction of labour supply indirectly based on observable economic variables.[1]

In this paper, we research self-reported labour supply responses to taxation using two items from a specifically designed, representative population survey. First, we ask our respondents whether taxation commonly matters for their labour supply decisions. We then use a 2013 payroll tax change to investigate specific labour supply responses to a real-world tax policy change.

In standard models, income taxation affects labour supply by inducing changes in net wages, which implies that the wage elasticity of hours supplied is a central concept. Borjas (2005) and Saez et al. (2012) claim that the wage elasticity of hours supplied is small, whereas Keane (2011) reports a small subset of studies estimating large wage elasticities (Hausman 1981; MaCurdy 1983; Imai and Keane 2004; see also Keane and Rogerson 2012). Hours of work supplied, however, is a narrow concept of labour supply, and labour market participation and effort per hour are likely important facets of real-world labour supply decisions. For example, female labour market participation is often found to be relatively responsive to taxation (Arrufat and Zabalza 1986; Eissa et al. 2008; Keane 2011). Feldstein (1995) reports large elasticities of taxable income, roughly between 1 and 3.1, whereas Gruber and Saez (2000) estimate a considerably smaller effect of around 0.4. To sum up, the majority of studies find that labour supply is only moderately responsive to tax changes, but some research discovers large effects, especially for certain subgroups of the population and when broader concepts than hours worked are used to measure labour supply.

We contribute to this discussion by providing evidence based on a nonstandard methodological approach. Rather than relying on indirect estimates of labour supply based on observable economic data, we use novel data from a specifically designed, representative survey of the German population. In the survey, we directly ask our respondents whether taxation matters for their labour supply decisions and, if so, how they have adjusted their labour supply in response to a recent payroll tax change in Germany. Our results indicate that taxation matters for around 41 per cent of our respondents, which implies that the majority is unresponsive to taxation. Moreover, only around 12 per cent of all respondents adjusted their labour supply in response to a small real-world payroll tax change. However, further analysis shows that some individuals report having reduced, and others having increased, their labour supply. Thus, the overall net labour supply effect of tax changes appears to be small. We find no evidence of significant variation across employment status, income, and gender, but taxation generally seems to be more relevant for the self-employed. We also find that low interest rates reduce incentives for labour supply expansion.

Directly asking respondents about the consequences of economic policy for their behaviour is nonstandard in economics, but has been done successfully for other research questions. For

[1] Meghir and Phillips (2010), Keane (2011), Keane and Rogerson (2012), and Saez et al. (2012) review the literature on taxes and labour supply; Perotti (2007), Fontana (2009), and Parker (2011) survey the literature on the macroeconomic consequences of fiscal policy.

instance, Shapiro and Slemrod (1995, 2003, 2009) use survey methodology to study self-reported consumption responses to various US tax changes. Using self-reported labour supply responses to taxation allows us to make several contributions to the literature on labour supply and taxation as well as to the literature on the economic consequences of tax policy changes. First, providing estimates of the relative importance of different transmission channels of tax changes—such as labour supply, consumption, and investment—is relevant for the design of structural models of tax policy transmission. Second, aggregate time series approaches to the consequences of tax policy changes for economic activity, as well as conventional approaches to the estimation of labour supply elasticities, are based on untestable identification assumptions. Here, we circumvent this identification problem by using self-reported responses. A potential problem with our approach is that self-reported responses may be unreliable if respondents do not answer the questions accurately. However, in our view, economic research should diversify the risk that underlying untestable assumptions are false, and we regard our survey as a useful alternative approach to the extant literature. Third, policymakers are interested in the effects of tax policy shocks on labour markets and our approach provides estimates of the size of these effects. Fourth, our survey estimates labour supply responses to one specific form of taxation, namely, payroll taxation, which is in contrast to the usual approach of averaging across tax types and measures. Fifth, we can use cross-sectional variation in our survey sample to identify respondents who appear particularly sensitive to taxation. Such knowledge could allow targeting tax policy changes to specific social groups, which could make stabilisation policy more effective and would also be relevant for assessing the deadweight loss associated with different forms of taxation.

The remainder of the paper is organised as follows. Section 2 describes our survey instrument. Section 3 discusses the general importance of taxation for the labour supply decisions of our respondents and its variation across employment status, income, and gender. Section 4 analyses specific labour supply adjustments to the 2013 payroll tax change. Section 5 concludes.

2 Survey design and instrument

General information on the survey

The two questions on individual labour supply that we utilise here are from a larger research project measuring the German population's perceptions, attitudes, and reactions to fiscal policy. The background paper of Hayo et al. (2014) contains a full description of the survey. The survey, which took place between 15 February and 1 March 2013, was conducted on our behalf by GfK in the form of face-to-face interviews using pen pads. GfK is one of the largest private research companies in Germany working in the fields of market research and public opinion. The interviewers followed specific instructions described in the survey instrument. Our sample encompasses 2,042 representatively selected individuals from the German population aged 14 or above. Gfk uses quota sampling, where the sample distributions in terms of sex, age, household size, city size, occupation of head of household, and state of residence are made comparable to the population distribution. While this is a common sampling method, the resulting sample is not representative in the strict sense of being a completely random sample of the population. The correspondence between sample and population distributions is generally high (Hayo et al. 2014).

One part of our survey instrument explicitly refers to a recently enacted payroll tax change. Specifically, contribution rates to the statutory pension insurance were reduced from 19.6 per cent

to 18.9 per cent at the beginning of 2013, and we use this real-world event to study specific labour supply responses to a tax change. The German pension insurance system is a pay-as-you-go system, in which current contributions are used to finance current pension obligations. The system is financed by a proportional rate—half paid by the employer and half by the employee—on all monthly income up to €5,800 in West Germany and €4,900 in East Germany. Pension entitlements depend on the insurant's income, but not on the contribution rate. The contribution rate change was necessary because the pension insurance was generating surpluses, which is not generally allowed by law. Hence, the rate change was potentially anticipated.[2]

The German public pension insurance system is compulsory for the majority of the working-age population. Public servants, students, and retired workers are generally not subject to payroll taxation and we thus exclude these groups from our sample, meaning that it only includes the remaining working-age population. In general, all employees in the private sector are compulsorily insured in the public insurance system. All self-employed individuals can voluntarily contribute to the statutory pension insurance system and some are compulsorily insured. Insignificant employment (*Geringfügige Beschäftigung*) is a German labour market vehicle aimed at promoting certain low-income groups, and workers participating in this programme can voluntarily contribute to the statutory pension insurance. In both cases, we ask whether respondents participate in the statutory pension insurance. We also include unemployed workers in the survey, although they do not directly contribute to the statutory pension insurance, because the unemployed are expected to be subject to payroll taxation in the future and payroll taxation is likely to affect their reservation wage. Throughout the paper, we show the results using all employees, insignificantly employed, self-employed, and unemployed, but restricting the analysis to only those who contribute to the pension insurance yields similar conclusions.

In principle, it is possible that other tax changes or macroeconomic conditions around the time of implementing the payroll tax change affect the way our respondents answer the survey. At the beginning of 2013, there were some concerns about the stability of the financial system and about potential adverse consequences of the ongoing debt crisis in the euro area. Economic growth and labour market conditions, however, have been robust, and the German population has been little affected by the ongoing crisis. At the beginning of 2013, a different piece of tax legislation increased the tax-free amount from €7,834 to €8,130 to compensate for the influence of inflation in a progressive tax system.

The survey instrument and further methodological considerations

In a first step, we investigate whether taxation matters for the labour supply decisions of our respondents. Respondents could answer either ´Yes´ or ´No´.

Item 1: Does the tax burden usually matter when you determine extent and intensity of your work activities?

In our second item, we asked the subset of respondents who reported that taxation matters for their labour supply decision to state, on a five-point scale, whether they have increased or decreased

[2] In the survey, we describe the tax change and explicitly link it to our survey question, so that we are not required to find (un)anticipated, exogenous variation to cleanly identify the effects of taxation. If the respondents reacted to the rate change before its announcement, our survey item should capture this.

their overall labour supply. A descriptive analysis of federal tax law changes in Germany between 1964 and 2010 in Uhl (2013) suggests that the tax change we study is representative of normal tax changes in terms of its revenue impact.

Item 2: *What impact does the contribution rate cut have on your general job-related activities?*

There are several advantages to this two-step procedure for measuring labour supply responses. First, both items contain relevant information. Our first item allows us to study the general responsiveness of labour supply to taxation, while the second item focuses on real-world labour supply elasticities. We also aim at reducing measurement error in the survey responses. In our pre-test of the questionnaire, many respondents reported that they work in fixed-hour contracts, and that the question of taxation is irrelevant to their labour supply decisions. Hence, applying our second item to the whole population would have introduced a great deal of statistical noise in the survey responses. Second, 'general job-related activities' is a broad concept, and we explicitly refer to both extent and intensity of labour supply. Thus, we believe our items cover several dimensions of labour supply decisions.

Nevertheless, our survey strategy is not perfect. First, the responses are subjective. The answer scale, for example, may have different meaning for different respondents and this makes it difficult to compute overall net effects of taxation on labour supply. Second, we cannot discover which specific component of labour supply has been adjusted. Third, the responses are qualitative in the sense that we cannot directly measure the size of the effect by a number.

Throughout the paper, we investigate correlations of our survey responses with standard socio-demographic variables and with other survey items. These survey items are explained and introduced throughout the text. The Appendix contains a short characterisation of the survey items relevant for the present paper. A detailed description of the survey instrument can be found in Hayo et al. (2014). Throughout the paper, we use unweighted observations, which is common in the economic literature. However, the results hold when using weighted observations, where the weights are the inverse probabilities of being included in the sample.[3] Standard errors are analytically derived, linearised standard errors in the cross-tabulates and robust to heteroscedasticity in the regressions.

In analysing correlations between survey responses and our main survey items as well as other variables, we mainly use cross-tabulates and descriptive statistics. The main advantage of cross-tabulates is that they do not require many assumptions about underlying distributions and functional relationships. These unconditional correlations can be interesting for policymakers. For example, if income is correlated with labour supply responses, the potential correlation with age or other variables is not relevant for policy decisions. The disadvantage of this approach is a potential omitted variable bias and we thus test the robustness of our results with a multivariate regression approach.

[3] According to the six criteria mentioned previously—sex, age, household size, city size, occupation of head of household, and state of residence.

3 Do taxes matter for labour supply decisions?

Descriptive statistics

As shown in Table 1, around 41 per cent of respondents state that taxes are important for their labour supply decisions.

Table 1: Do taxes matter for labour supply decisions?

	Proportion	Standard error	Confidence interval	Frequency
Taxes are important	40.6	1.4	[38.2, 42.9]	494
Taxes are unimportant	59.4	1.4	[57.1, 61.8]	724

Notes: Confidence interval based on 90% level of confidence using analytically derived standard errors.

This suggests that the majority of workers are unresponsive to taxation, which is in line with extant literature reporting labour supply elasticities close to zero for the majority of (male) workers (Borjas 2005; Saez et al. 2012). Our results provide only limited support for the intertemporal maximising macroeconomic model (Baxter and King 1993; Galí 2009), in which all individuals should take taxation into account when making labour supply decisions. However, 41 per cent of respondents do seem to react to tax changes, which could still generate large aggregate labour supply elasticities. Section 4 takes up this issue and analyses labour supply adjustment to a recent real-world payroll tax change.

For which individuals do taxes matter?

In a first step, we investigate differences in the importance of taxation for labour supply decisions across employees, apprentices, unemployed, self-employed, and insignificantly employed respondents (see Table 2).

Table 2: The importance of taxation by occupation

		Do taxes matter for your labour supply decision?		
		Yes	No	Total
Occupational status	Employee	37.5	62.5	100.0
		[34.8, 40.2]	[59.8, 65.2]	N = 883
	Apprentice	35.9	64.1	100.0
		[23.1, 48.7]	[51.3, 76.9]	N = 39
	Unemployed	39.3	60.7	100.0
		[30.5, 48.1]	[51.9, 69.5]	N = 84
	Self-employed	61.2	38.9	100.0
		[54.7, 67.6]	[32.4, 45.3]	N = 157
	Insignificantly employed	36.4	63.6	100.0
		[25.6, 47.1]	[52.9, 74.4]	N = 55
	Total	40.6	59.4	100.00
		[38.2, 42.9]	[57.1, 61.8]	N = 1,218
	Fisher's exact test for independence: p-value = 0.00			

Notes: The table shows the importance of taxation for labour supply decisions (Item 1, see Appendix) by occupation. Cells show row-normalised proportions in per cent, 90% confidence interval [in brackets], and frequency. Proportions may not sum to one due to rounding errors.

We expect self-employed respondents to react relatively more to taxation, as they are more independent in making labour supply decisions. Fisher's exact test for independence suggests a significant difference in the proportion of respondents attaching importance to taxation across occupation. This result, however, is entirely driven by self-employed respondents, 61 per cent of whom report that taxes matter for their labour supply decisions. This suggests that taxing the self-employed is potentially associated with particularly large efficiency costs. Unemployed respondents do not report a significantly different importance of taxation and, hence, our survey evidence does not provide support for the view that taxation is more relevant at the extensive margin.

Differences in the disincentive effect of taxation for individuals at different levels of income receive a great deal of attention in the labour supply literature (Hausman 1985). One reason for this is that progressive taxation induces a differential burden across income groups, which has implications for the deadweight loss associated with certain forms of taxation. Another reason is that taxation is a potentially relevant policy instrument for fostering job market activity by low-income groups. Table 3 investigates the general importance of taxation across three levels of household income—low income (up to €1,499 net of taxes), middle income (€1,500 to €3,499), and high income (more than €3,500).

Table 3: The importance of taxation by income

		Do taxes matter for your labour supply decision?		
		Yes	No	Total
Income	Low income (up to €1,499€)	34.6	65.4	100.0
		[29.1, 40.1]	[59.9, 70.9]	N = 205
	Middle income (€1,500 to €3,499)	42.3	57.8	100.0
		[38.9, 45.6]	[54.4, 61.1]	N = 587
	High income (more than €3,500)	36.1	63.9	100.0
		[30.4, 41.9]	[58.1, 69.6]	N = 191
	Total	39.5	60.5	100.00
		[36.9, 42.0]	[58.0, 63.1]	N = 983
	Fisher's exact test for independence: p-value = 0.09			

Notes: The table shows the importance of taxation for labour supply decisions (Item 1, see Appendix) by income groups. Cells show row-normalised proportions in per cent, 90% confidence interval [in brackets], and frequency. Proportions may not sum to one due to rounding errors.

Taxes matter for 42 per cent of the middle-income group, which is higher than the proportion in the low-income group, where less than 35 per cent of all respondents report that taxes matter, and higher than the proportion in the high-income group (36 per cent). Fisher's exact test for independence is rejected, which suggests that the importance of taxation increases with income. However, the proportion of respondents stating that taxes matter does not increase monotonically. Moreover, when we investigate the robustness of our conclusions in a regression framework (see below), we no longer find a significant impact of income.

Borjas (2005), Keane (2011), and others report that women are more sensitive to taxation, particularly at the extensive margin. We investigate whether the self-reported importance of taxation for labour supply differs across gender, but find no significant difference (see Table 4).

Table 4: The importance of taxation by gender

	Do taxes matter for your labour supply decision?		
	Yes	No	Total
Male	41.7	58.3	100.0
	[38.3, 45.0]	[55.0, 61.7]	N = 588
Female	39.5	60.5	100.0
	[36.3, 42.7]	[57.3, 63.7]	N = 630
Total	40.6	59.4	100.00
	[38.2, 42.9]	[57.1, 61.8]	N = 1,218
Fisher's exact test for independence: p-value = 0.45			

Notes: The table shows the importance of taxation for labour supply decisions (Item 1, see Appendix) by gender. Cells show row-normalised proportions in per cent, 90% confidence interval [in brackets], and frequency. Proportions may not sum to one due to rounding errors.

In fact, the proportion of respondents attaching importance to taxes is somewhat larger for males (42 per cent) than it is for females (40 per cent). The labour supply literature predicts that subgroups of females will be particularly tax sensitive, such as the unemployed or females in relationships or with children (see, e.g., Eissa et al. 2008). However, looking at these subgroups does not change our conclusion (results available on request).

Robustness in a regression framework

We now estimate a multivariate logit regression model as a robustness check. The dependent variable measures the general importance of taxation for labour supply and is coded as 1, taxes are important, or 0, taxes are unimportant. In the empirical model, we include dummies indicating membership in specific occupational groups, household income in €1,000s, sex, whether the respondent is in a relationship, and number of children. Finally, we control for other socio-economic variables, namely, age, union membership, and whether the respondent has obtained higher education in the form of at least a university-entry diploma. Table 5 contains the estimation results.

The coefficients in the third column of Table 5 are average marginal effects. Our previous conclusions derived in the cross-tabulates hold, with the exception of income. Self-employed respondents have a 31 percentage point (pp) higher probability of stating that taxes are important for their labour supply decisions than do employees, which is a very large value. In addition, we estimate that union members have a 13 pp greater likelihood of finding taxes important. More educated respondents are 7 pp less likely to consider taxation relevant than are less-educated respondents. Finally, with each 10-year increase in age, the probability of answering that taxes are important declines by 3 pp. Note that the last two effects are significant only at a 10 per cent level.

Table 5: For whom do taxes matter?

		Coefficient	Marginal effect
Base category 'Employees'			
In apprenticeship		-0.19	-0.04
Unemployed		0.10	0.02
Self-employed		1.36***	0.31***
Insignificantly employed		-0.17	-0.04
Household income		-0.05	-0.01
Female		-0.04	-0.01
In relationship		0.19	0.04
Number of children		0.04	0.01
Highly educated		-0.31*	-0.07*
Age		-0.01*	-0.003*
Union member		0.58***	0.13***
Constant		-0.08	
Pseudo-R^2	0.04	Log pseudolikelihood	-634.89
Significance of the model (p-value)	0.00		

Notes: The table shows results of logistic regression with dependent variable measuring the general importance of taxation for labour supply, coded as: 1, taxes are important, or 0, taxes are unimportant. Statistical tests based on robust standard errors. Marginal effects are average marginal effects. Based on 981 observations. *, **, *** indicates statistical significance at the 10%, 5%, 1%, respectively.

4 Labour supply adjustment to a tax change

Descriptive statistics

We asked the subset of respondents who reported that taxation matters for their labour supply decisions to state, on a five-point scale, whether they increased or decreased their labour supply in response to the recent 2013 payroll tax change. Table 6 shows that 17 per cent increased, and 12 per cent decreased, their labour supply.

Table 6: Labour supply response to the 2013 payroll tax change

	Proportion	Standard error	Confidence interval	Frequency
Strongly increased labour supply	3.2	0.8	[1.7, 4.8]	16
Increased labour supply	13.6	0.02	[10.5, 16.6]	67
Unchanged labour supply	70.9	2.0	[66.8, 74.9]	350
Reduced labour supply	8.9	1.5	[6.4, 11.4]	44
Strongly reduced labour supply	3.4	0.8	[1.8, 5.1]	17

Notes: Confidence interval based on 90% level of confidence using analytically derived standard errors.

These results suggest that both income and substitution effects of tax changes appear to be of empirical relevance, which matches the consensus estimate for a wage elasticity of -0.1 reported in

Borjas (2005); note that the negative sign implies that income effects are slightly dominant. Taken together, about 30 per cent of those respondents indicating that taxation is important for their labour supply decisions—and 12 per cent of all respondents—report an actual labour supply adjustment, but because income and substitution effects seem to balance out, the overall response of labour supply to the tax change is small.

Determinants of labour supply adjustment

Table 7 shows how labour supply responses vary across employment status and occupation.

Table 7: Labour supply responses by occupation

		Impact on general job-related efforts			
		Reduced labour supply	Unchanged	Increased labour supply	Total
Occupation	Employee	14.2	68.6	17.2	100.0
		[11.0, 17.4]	[64.4, 72.8]	[13.8, 20.6]	N = 331
	Apprentice	7.1	71.4	21.4	100.0
		[-4.6, 18.9]	[50.8, 92.1]	[2.7, 40.2]	N = 14
	Unemployed	24.2	69.7	6.1	100.0
		[11.8, 36.7]	[56.3, 83.1]	[-0.9, 13.0]	N = 33
	Self-employed	3.1	77.1	19.8	100.0
		[0.2, 6.1]	[70.0, 84.2]	[13.1, 26.5]	N = 96
	Insignificantly employed	10.0	80.0	10.0	100.0
		[-1.3, 21.3]	[64.9, 95.1]	[-1.3, 21.3]	N = 20
	Total	12.4	70.9	16.8	100.0
		[9.9, 14.8]	[67.5, 74.2]	[14.0, 19.6]	N = 494
	Fisher's exact test for independence: p-value = 0.02				

Notes: The table shows labour supply responses to the 2013 payroll tax change (Item 2, see Appendix) by occupation. Cells show row-normalised proportions in per cent, 90% confidence interval [in brackets] and frequencies. Proportions may not sum to one due to rounding errors.

Although Fisher's exact test for independence is rejected, in most cases the proportion of the total population reporting reduced, unchanged, or increased labour supply falls well within the confidence region reported for the respective proportions per occupation. It is hence unclear in what way these deviations are statistically meaningful individually. It appears, however, that the self-employed avoid reducing their labour supply, a result confirmed in the regression approach (see below).

Table 8 investigates the influence of income on labour supply responses. We find no significant differences across the three income groups.

Table 8: Labour supply responses by income

		Impact on general job-related efforts			Total
		Reduced labour supply	Unchanged	Increased labour supply	
Income	Low income (up to €1,499)	19.7 [11.9, 27.6]	67.6 [58.4, 76.8]	12.7 [6.1, 19.2]	100.0 N = 71
	Middle income (€1,500 to €3,499)	12.1 [8.7, 15.5]	68.6 [63.7, 73.4]	19.4 [15.2, 23.5]	100.0 N = 248
	High income (more than €3,500)	10.1 [4.1, 16.2]	72.5 [63.5, 81.4]	17.4 [9.8, 25.0]	100.0 N = 69
	Total	13.1 [10.3, 16.0]	69.1 [65.2, 72.9]	17.8 [14.6, 21.0]	100.0 N = 388
	Fisher's exact test for independence: p-value = 0.37				

Notes: The table shows labour supply responses to the 2013 payroll tax change (Item 2, see Appendix) by income. Cells show row-normalised proportions in per cent, 90% confidence interval [in brackets] and frequencies. Proportions may not sum to one due to rounding errors.

Borjas (2005) and Meghir and Phillips (2010) conclude that the effect of tax changes on women's hours worked is slightly stronger than it is for men. Table 9 indicates, however, that gender does not have a significant influence on labour supply responses in our data.

Table 9: Labour supply responses by gender

		Impact on general job-related efforts			Total
		Reduced labour supply	Unchanged	Increased labour supply	
Gender	Male	9.8 [6.7, 12.9]	71.4 [66.7, 76.2]	18.8 [14.7, 22.9]	100.0 N = 245
	Female	14.9 [11.1, 18.6]	70.3 [65.5, 75.1]	14.9 [11.1, 18.6]	100.0 N = 249
	Total	12.4 [9.9, 14.8]	70.9 [67.5, 74.2]	16.8 [14.0, 19.6]	100.0 N = 494
	Fisher's exact test for independence: p-value = 0.16				

Notes: The table shows labour supply responses to the 2013 payroll tax change (Item 2, see Appendix) by gender. Cells show row-normalised proportions in per cent, 90% confidence interval [in brackets] and frequencies. Proportions may not sum to one due to rounding errors.

Again, this continues to hold when considering interactions of female with employment status, number of children, and an indicator for whether the woman is in a relationship.

Table 10 focuses on whether perceiving the tax change as permanent or only temporary matters for labour supply reactions of our respondents. Life-cycle models predict that permanent and temporary tax changes will have different impacts and the matter is also of practical interest because many business cycle stimulus measures are temporary. We measure the respondents' perception of the tax change using two items from the survey. First, we ask whether respondents expected the current rate cut to be reversed in the future and, second, whether respondents expect lower pensions as a consequence of the payroll reduction. Respondents answering either question affirmatively are viewed as perceiving the tax change to be temporary.

Table 10: Do temporary tax changes have a different impact?

		Impact on general job-related efforts			
		Reduced labour supply	Unchanged	Increased labour supply	Total
Perception of tax change	Permanent	12.2 [5.9, 18.5]	63.5 [54.2, 72.8]	24.3 [16.1, 32.6]	100.0 N = 74
	Temporary	12.5 [9.5, 15.6]	71.0 [66.8, 75.1]	16.5 [13.1, 19.9]	100.0 N = 327
	Total	12.5 [9.7, 15.2]	69.6 [65.8, 73.4]	18.0 [14.8, 21.1]	100.0 N = 401
	Fisher's exact test for independence: p-value = 0.28				

Notes: The table shows labour supply responses to the 2013 payroll tax change (Item 2, see Appendix) by perception of the tax change as either temporary or permanent (Items 3 and 4, see Appendix). Cells show row-normalised proportions in per cent, 90% confidence interval [in brackets] and frequencies. Proportions may not sum to one due to rounding errors.

We find no statistically significant differences between respondents perceiving the tax change as permanent and those who view it as temporary. Note that the result also holds when studying each of the two items separately.

Table 11 investigates the importance of interest rates for labour supply adjustment.

Table 11: Labour supply responses by assessment of savings' profitability

		Impact on general job-related efforts			
		Reduced labour supply	Unchanged	Increased labour supply	Total
Assessment of savings' profitability	Less than 10 years ago	13.6 [10.2, 17.0]	72.0 [67.6, 76.5]	14.3 [10.9, 17.8]	100.0 N = 279
	Unchanged	11.0 [5.6, 16.4]	64.8 [56.5, 73.1]	24.2 [16.7, 31.6]	100.0 N = 91
	More than 10 years ago	6.5 [-0.9, 13.8]	61.3 [46.6, 76.0]	32.3 [18.2, 46.3]	100.0 N = 31
	Total	12.5 [9.7, 15.2]	69.6 [65.8, 73.4]	18.0 [14.8, 21.1]	100.0 N = 401
	Fisher's exact test for independence: p-value = 0.05				

Notes: The table shows labour supply responses to the 2013 payroll tax change (Item 2, see Appendix) by assessment of savings' profitability (Item 5, see Appendix). Cells show row-normalised proportions in per cent, 90% confidence interval [in brackets] and frequencies. Proportions may not sum to one due to rounding errors.

We asked our respondents how they perceive current returns to savings relative to a benchmark (see Item 5 in Appendix). Fisher's exact test lends some credibility to the view that individual perception of the current attractiveness of savings is related to differential labour supply responses. Respondents who find savings relatively unattractive are more likely to reduce labour supply than to increase labour supply. This suggests that returns on savings provide an incentive for labour supply expansion. One potential explanation for this is that in a life-cycle perspective, interest rates determine the marginal benefits of expanding or reducing labour supply.

Robustness in a regression framework

To analyse the robustness of our previous conclusions in a regression framework, we run an ordered logistic regression using as a dependent variable the answers to our second item collapsed into a three-point-scale. As explanatory variables, we include dummies for different occupational groups, household income in €1,000s, and indicator variables for sex and whether the respondent is in a relationship. Additionally, we include the respondent's age, the number of children, an indicator variable for whether the respondent has achieved at least a university-entrance diploma, and dummy variables indicating union membership, perception of the tax change as temporary, and assessment of savings' return as currently low. Table 12 contains the results.

Table 12: Covariates of labour supply adjustments

	Odd ratio	Marginal effects		
		Decreased labour supply	Unchanged	Increased labour supply
Base category 'All employees'				
In apprenticeship	1.03	-0.003	-0.001	0.004
Self-employed	1.69*	-0.058	-0.019	0.077*
Insignificantly employed	1.36	-0.033	-0.011	0.045
Household income	1.14	-0.014	-0.005	0.019
Female	0.82	0.022	0.007	-0.029
In relationship	0.55*	0.065*	0.022	-0.087*
Number of children	1.31*	-0.030*	-0.010	0.040*
Perceiving tax change as temporary	0.90	0.012	0.004	-0.016
Perceiving current returns on savings as low	0.49**	0.078**	0.026	-0.104**
Highly educated	1.67	-0.056	-0.019	0.075
Age	0.98	0.002	0.001	-0.003
Union member	0.89	0.012	0.004	-0.017
Pseudo-R^2	0.04	Log pseudolikelihood		-256.31
Significance of the model (p-value)	0.04			

Notes: The table shows results of an ordered logistic regression with dependent variable coded as: 1, reduced labour supply; 2, unchanged labour supply; and 3, increased labour supply. Statistical tests based on robust standard errors. Based on 317 observations. *, **, *** indicates statistical significance at the 10%, 5%, 1% level, respectively.

The second column of Table 12 shows coefficients in the form of odd ratios, whereas columns 3 to 5 contain average marginal effects. Our results indicate that respondents who perceive interest rates as low and those who are in a relationship are 10 pp and 9 pp, respectively, less likely to increase their labour supply. The self-employed and those with two children have an 8 pp greater likelihood of exhibiting a more expansionary labour supply reaction.

5 Conclusion

We study self-reported labour supply responses to taxation using two questions from a specifically designed, representative survey of the German population. First, we investigate the extent to which the German population is sensitive to taxation. Around 41 per cent of our respondents state that

taxation is generally relevant for their labour supply decisions. This suggests that taxation appears to be unimportant in the everyday labour supply decisions of the majority of the German population. Second, we use a recently enacted payroll tax change to study specific labour supply responses to a real-world tax change. Around 12 per cent of all respondents report a labour supply adjustment. However, income and substitution effects of the tax change nearly cancel each other out, so that the net effect on labour supply is likely small.

We use our representative survey data to analyse the influence of socio-demographic and economic variables on labour supply responses to taxation. Around 61 per cent of the self-employed state that taxation is relevant for their labour supply decisions, which is significantly higher than the corresponding share of the total working population. However, responses do not vary significantly across employment status, gender, and income. Using our second research item, we find that around 12 per cent of all respondents report an actual labour supply adjustment to the 2013 payroll tax change. Again, this share does not vary across employment status, gender, and income. Instead, we find that respondents perceiving current interest rates as relatively low have a significantly reduced probability of expanding their labour supply.

Our results have several implications for economic modelling and policy making. First, we conclude that labour supply responses to tax changes are not a central element of the transmission mechanism of tax policy shocks in Germany. This is compatible with aggregate time series evidence from Hayo and Uhl (2014a), who, despite discovering a strong reaction of aggregate economic activity, do not find effects of tax changes on employment or hours worked over the medium term. Hence, consumption and investment responses to tax changes appear more important in the transmission of tax policy shocks (Hayo and Uhl 2014a, 2014b) and this result could guide future empirical and theoretical research. Our results also imply that the deadweight loss associated with taxation of labour income is low for all the income brackets covered by our survey data and that normal-sized tax policy changes have limited effects on labour markets.[4] However, we find self-employed respondents to be relatively more responsive to taxation. Hence, taxation of the self-employed appears to be associated with relatively large efficiency costs. Finally, if respondents perceive the current interest rates in Germany as low, they tend to reduce their labour supply.

Using self-reported responses to economic policy could supplement extant quantitative, econometric approaches in other applications, too. For example, investment is likely to be much more responsive to taxation than is labour supply (Mertens and Ravn 2012; Hayo and Uhl 2014a), and thus studying self-reported responses to tax changes at the firm level seems a promising endeavour.

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[4] Note that very high incomes are not properly represented in our survey data.

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Appendix: Summary of the survey instrument

No	Item
Intro	At the beginning of 2013, contribution rates to the statutory pension system have been reduced. In effect, this reduces the overall tax burden. We are interested in your responses to the rate cut.
1	Does the tax burden usually matter when you determine extent and intensity of your work activities? Reply: 'Yes', 'No'
2	What impact does the contribution rate cut have on your general job-related activities? Reply: 'I substantially reduced my job-related activities' (–2) to 'I substantially expanded my job-related activities' (+2)
3	Will the recent cut in pension insurance contribution rates lead to higher contribution rates in the future? Reply: 'Yes', 'No'
4	Will the recent cut in pension insurance contribution rates lead to lower pension payments? Reply: 'Yes', 'No'
5	How profitable do you think savings are in Germany today compared with ten years ago? Reply: 'Much less than ten years ago' (–2) to 'Much more than ten years ago' (+2)

Notes: The table provides information on our main survey items. Items 2 and 5 have a five-point scale. Hayo et al. (2014) contains a full documentation of the survey instrument, as well as the original version of the questionnaire in German.