

Sexual orientation, competitiveness and income*

Thomas Buser *University of Amsterdam*

Lydia Geijtenbeek *University of Amsterdam*

Erik Plug *University of Amsterdam*

November, 2017

Abstract

Do gays earn less than other men because they are less competitive? Do lesbians earn more than other women because they are more competitive? To answer these questions, we conduct an experiment on a Dutch online survey panel to measure the competitive preferences of gay, lesbian and straight panel members. We find that gay men compete less than straight men, while lesbians compete as much as straight women. Linking our experimental measure of competitiveness to earnings and education data, we find that competitiveness predicts earnings and education levels and that differences in competitive preferences can partially explain the gay earnings penalty but not the lesbian premium.

*All authors: Amsterdam School of Economics, University of Amsterdam, Roeterstraat 11, 1018WB Amsterdam, The Netherlands. Buser and Plug are also affiliated with the Tinbergen Institute, Gustav Mahlerplein 117, 1082 MS Amsterdam, The Netherlands. Corresponding author: Erik Plug (Mailing address: PO Box 15867, 1001 NJ Amsterdam, The Netherlands. Phone: +31 020 525 69 64. E-mail: e.j.s.plug@uva.nl). We thank seminar and conference participants in Amsterdam, Izmir and Maastricht for their comments and suggestions. We also thank the University of Amsterdam through the Speerpunt Behavioural Economics for their financial support. Data in this article are taken from the Longitudinal Internet Studies for the Social Sciences (LISS). The LISS panel data are collected by CentERdata (Tilburg University, The Netherlands) through its MESS project funded by the Netherlands Organization for Scientific Research. Data and documentation from the LISS panel are available at <http://www.lissdata.nl/>. Thomas Buser gratefully acknowledges financial support from the Netherlands Organisation for Scientific Research (NWO) through a personal Veni grant.

1 Introduction

In this paper we investigate sexual orientation differences in taste for competition. In particular, we introduce a short version of the seminal competition experiment of Niederle and Vesterlund (2007) to measure the competitiveness of gay, lesbian and straight panel members in a representative Dutch online survey.¹ We then match this experimental competitiveness measure with realized labour market outcomes and investigate whether sexual orientation differences in competitiveness can explain sexual orientation differences in earnings.

Sexual orientation differences in earnings are well documented but not well understood. While most empirical studies find that gay men earn less than straight men and lesbian women earn more than straight women (see Klawitter, 2015 for a recent meta-analysis on the topic), it has proven difficult to distinguish between the typical explanations for differences in earnings, including differences in productivity, differences in tastes, and a discriminating labour market. In the case of taste for competition, however, we have a better chance of doing so. If taste for competition drives the typical income differences for gays and lesbians, we should find that in a competition experiment gays are less competitive than straight men and lesbians are more competitive than straight women.

Our study is also of broader interest. Gender differences in willingness to compete are well established inside the laboratory and widely believed to have important effects outside the laboratory. While many experimental studies show that women shy away from competition and men compete too much (Niederle and Vesterlund, 2007, 2011; Croson and Gneezy, 2009), only a few empirical studies have linked gender differences in willingness to compete to gender differences in education or labour markets (Buser, Niederle, and Oosterbeek, 2014; Flory, Leibbrandt, and List, 2015; Zhang, 2012; Reuben, Wiswall, and Zafar, 2015; Berge et al., 2015; Reuben, Sapienza, and Zingales, 2015; Buser, Peter, and Wolter, 2017a,b). If important economic decisions – including educational and occupational choices – are indeed influenced by someone’s willingness to compete, we should find that differences in willingness to compete predict differences in earnings for different groups of workers.

The main results of our competition experiment indicate that gays compete

¹Throughout the paper, we use gays in reference to homosexual men and lesbians in reference to homosexual women.

less than straight men, whereas lesbians compete at similar levels as straight women. When we link our experimental measure of competitiveness to real world outcomes, we find that competitiveness has a positive, sizable and statistically significant correlation with earnings. Thus, differences in competitiveness can account for a significant portion of the gay gap, but cannot explain the lesbian premium. Additionally, we find that gender differences in competitiveness, which are comparable to those found in most other experimental studies, are significantly related to the gender gap in earnings.

The remainder of the paper proceeds as follows. Section II discusses possible explanations for sexual orientation differences in earnings. Section III introduces the online experiment. Section IV briefly describes the experimental and survey data. Section V reports the main results on sexual orientation differences in competitiveness and their implications for sexual orientation differences in labour market earnings. Section VI highlights the implications and conclusions of this study.

2 Background

In this section, we briefly discuss why sexual orientation may affect earnings in the observed way; that is, gay men earn less than straight men, whereas lesbian women earn more than straight women. We follow a standard framework outlined in most economic studies on earnings differentials and distinguish three potential origins of differences in pay: differences in treatment (in particular labour market discrimination), differences in skills, and differences in preferences.

Labour market discrimination

Perhaps the most studied explanation for sexual orientation differences in earnings is labour market discrimination. We speak of labour market discrimination when firms (including their employers, employees and clients) treat gays and lesbians differently than straight men and women with similar productive skills. Economists distinguish two models of discrimination. In taste-based discrimination models (Becker, 1971), firms dislike gays and lesbians. In information-based discrimination models (Arrow, 1973; Phelps, 1972), firms use observable characteristics of gays and lesbians to assess their unobservable productivity skills. Both models have the potential to explain part of

the sexual orientation differences in earnings. On the one hand, gay workers may earn less than straight male workers if firms hold more hostile attitudes against gays than against lesbians. On the other hand, lesbian workers may earn more than straight female workers if firms believe that the stereotypical lesbian worker is more career driven, is less likely to have children, or has more productive skills.

With conventional labour market surveys and registers, it is difficult to cleanly demonstrate whether gays and lesbians earn differently because of discrimination (taste-based or information-based). There are, however, alternative empirical approaches. One approach, which takes a taste-based discrimination perspective, relies on subjective attitude questions to measure the discriminatory intentions of employers and employees directly. Some studies in social psychology, for example, compare self-reported measures of homophobic attitudes and find that discriminatory tastes are much more pervasive against gays than against lesbians (Herek, 2000; Kite and Whitley, 1996). Some studies in economics link homophobic attitudes to labour market behavior. Black et al. (2002) show that gay and lesbian couples in the US are more likely to live in richer and more tolerant cities. Hammarstedt, Ahmed, and Andersson (2015) show that Swedish gays, but not lesbians, earn more in more gay and lesbian friendly neighborhoods. And Plug, Webbink, and Martin (2014) show that gays and lesbians sort into more gay and lesbian tolerant occupations using a sample of Australian twins.

Another approach relies on field experiments to measure the extent of labour market discrimination. In these experiments, fake resumes with manipulated indications of sexual orientation (while holding all other resume characteristics constant) are sent to firms that advertised jobs. Firms are said to discriminate if fake applicants who appear gay or lesbian are less likely to receive a callback. Examples of these so-called correspondence test studies are Weichselbaumer (2003, 2015), who finds that lesbians receive fewer callbacks than straight women in Vienna and Munich, but not in Berlin; Tilcsik (2011), who observes lower callback rates for gays among male applicants in the US, with the lowest callback rates in those states that are perceived as gay unfriendly; Drydakis (2009, 2011), who finds severe discrimination against gays and lesbians in Greece; and Ahmed, Andersson, and Hammarstedt (2013), who find that gays and lesbians are treated unfavourably in Sweden, with the lowest callback rates in male-dominated occupations for gays and female-dominated

occupations for lesbians.² To what extent are the earnings differences between gay, lesbian and straight workers driven by discrimination? The evidence is mixed. While it is theoretically possible to predict the observed wages of both gays and lesbians within a discriminating labour market, the empirical evidence on discrimination appears most consistent with the observed wages of gays, and not of lesbians.

Differences in skills

Another traditional explanation for differences in earnings is differences in productive skills. Economists often emphasize that workers obtain their productive skills through schooling and work experience. In human capital models (Becker 1964; Mincer 1974), for example, expectations about labour market earnings drive the relationship between sexual orientation and educational attainment. If gay and lesbian students take the gay penalty and lesbian premium into account, human capital models would predict that gays will spend fewer years in school than other men, whereas lesbians will spend more years in school than other women. The empirical evidence again appears mixed. While most empirical studies, listed in the meta-analysis of Klawitter (2015), indeed report that lesbians are better educated than other women, the common finding that gays are better educated than other men runs counter to what human capital models predict.³

In alternative models of household specialization (Becker, 1981), expecta-

²There are several related field experiments that study treatment differentials by sexual orientation outside the labour market. Ahmed and Hammarstedt (2009) examine discriminatory behaviour in the Swedish housing market. They report that gay men receive fewer callbacks and invitations to see apartments than straight men. Diaz-Serrano and Meix-Llop (2015) consider primary school admission requests for children of gay, lesbian and straight couples in Spain. They find that schools treat children of gay couples (but not of lesbian couples) less favourably in terms of callback rates and school invitations. And in one of their treatments, Gneezy, List, and Price (2012) compare price offers given to gay and straight men in the auto market. They find that black salesmen charge higher prices to gay men, whereas white salesmen charge lower prices to gay men. The authors suggest that the unfavourable treatment of black salesmen arises from taste-based discrimination, whereas the favourable treatment of white salesmen arises from information-based discrimination.

³There are other reasons why gays and lesbians may, on average, appear better educated. Gays and lesbians have the option to hide their true sexual orientation in surveys. If gays and lesbians raised in more tolerant and better educated families are more likely to reveal their sexual orientation, we expect to find that gays and lesbians are, on average, better educated. With this in mind, we would then expect no such schooling differences within families. This is not the case. In Plug, Webbink, and Martin (2014), a comparison of educational attainment within identical twin pairs shows that gays and lesbians are better educated than their straight twin siblings.

tions about having children (or the absence thereof) can lead to differences in work experience between gay, lesbian and other workers. If gay and lesbian couples are less likely to have children and thus less likely gain from specialization, models of household specialization predict that gays work less and as a consequence accumulate fewer productive skills than other men, and reversely that lesbians work more and accumulate more productive skills than other women. While these explanations certainly capture part of the actual earnings patterns (Black et al., 2003; Black, Sanders, and Taylor, 2007), formal evidence is scarce. Some studies investigate the division of labour in gay, lesbian and straight couples. In general, these studies find that gay men work less than other men, whereas lesbian women work more than other women. Additional evidence is then taken from earnings regression models, in which several specialization-related covariates are added, including the presence of children, work experience and its square, part-time work (and variations thereof). After including these covariates, the same studies continue to find penalties for gays and premia for lesbians that are sizable and statistically significant (Antecol, Jong, and Steinberger, 2008; Baumle and Poston, 2011; Tebaldi and Elmslie, 2006).

Do sexual orientation differences in earnings arise from sexual orientation differences in productive skills? The existing theories of human capital and household specialization are successful in capturing some elements of the sexual orientation differences in earnings, but certainly not all.

Differences in tastes

If preferences systematically differ by sexual orientation, this could partially explain the observed differences in labour market outcomes. Empirical research on the role of preferences for labour market differences between heterosexuals and homosexuals is scarce and we therefore draw upon the large empirical literature in behavioral economics on gender differences in preferences, to understand which particular preferences may matter for earnings, and in what way.

Possible preference-related explanations for sexual orientation differences in labour market outcomes include, among others, differences in competitiveness, differences in risk preferences, differences in social preferences, and differences in willingness to negotiate. See Bertrand (2011) for a survey on gender differences in such preferences as a possible explanation for gender differences in

labour market outcomes. Of these gender differences in preferences, the gender gap in competitiveness is the one which is most consistently found in the lab and largest in magnitude. If we take the gay penalty and lesbian premium at face value, it is quite clear how the sexual orientation differences in competitive preferences should look like. If competitive workers are more likely to sort into more competitive and higher paid professions, we expect gays to be less competitive than straight men and lesbians to be more competitive than straight women. But what do we actually know about the sexual orientation differences in such preferences? Not much. There is, to this date, no empirical research that looks at sexual orientation differences in competitiveness or any other economic preferences.

To wrap up, we have considered three standard explanations for sexual orientation differences in earnings, including differences in productivity, differences in tastes, and a discriminating labour market. Empirical evidence in favour of productivity differentials and discrimination is far from overwhelming. Empirical evidence in favour of (or against) differentials in economic preferences is essentially nonexistent. In this paper, we aim to fill this gap by focusing on competitiveness, one of the most promising preference factors to emerge from the behavioral economics literature on gender differences. In particular, we investigate whether willingness to compete differs between gay and straight men and lesbian and straight women and whether such differences can explain the observed earnings of men and women, and gays and lesbians in particular.

3 Sampling and experimental design

We conduct our competitiveness experiment on the LISS panel, a representative Dutch online panel of 5000 households whose members respond to monthly questionnaires. Academic researchers can apply to add questionnaire items or conduct simple experiments. The main advantage of using the LISS panel is the large amount of data already available on the panel members. This allows us to select gay and lesbian participants without informing them that we are interested in their sexual preferences, thus avoiding priming. Furthermore, it allows us to link our experimental results to survey data on income and educational careers.

The questionnaires contain a couple of items that help us to identify lesbian

Table 1: Sample

		(1)	(2)	(3)	(4)
		LISS population	Sample	Participants	Participants <65
Male	straight	4,146	157	124	80
	gay	163	77	66	46
Female	straight	4,795	172	134	112
	lesbian	164	84	61	47
Total		9,268	490	385	296

Note: column 1 counts all panel members with information on sexual preferences. Column 2 counts all members within our sampling frame. Column 3 counts all members within our sampling frame who actually participated in the experiment and column 4 counts those who participated and are below 65 years of age (the working-age sample used in our main analysis)..

and gay panel members. A 2009 questionnaire asked “Are you attracted to men or to women?”, with answers on a five-point scale: 1 only to men; 2 especially to men, but to some extent also to women; 3 as much to men as to women; 4 especially to women, but to some extent also to men; 5 only to women. Our gay sample includes men who answered 1, 2 or 3 and our lesbian sample includes women who answered 5, 4 or 3.⁴ This question was answered by 4,794 panel members. We further use the question “What is your partner’s gender?” which was asked yearly from 2008 to 2012. Panel members who at least once stated having a partner of the same sex are added to the gay and lesbian samples whereas those who always stated to be single or with a partner of the other gender are added to the heterosexual sample. This gives us 9,268 individuals, 163 of whom are gay and 164 of whom are lesbian (see Table 1).⁵

To obtain a measure of competitiveness, we conducted an incentivised on-line experiment. We invited all active homosexual panel members to participate, supplemented by a random selection of heterosexual members, stratified by age and gender. Of these 490 candidates, 385 participated in the experiment, 66 of whom are gay and 61 of whom are lesbian.⁶ Because we are

⁴The gay and lesbian samples therefore also include bisexual individuals.

⁵Of these, 5,357 individuals are active panel members at the time of the experiment. An active panel member is defined here as a member who has participated in at least one survey round within the last 3 months.

⁶Because only 79 percent of the individuals in our sampling frame actually participate in the experiment, selective non-response is a potential concern. That is, the decision of participating in the experiment could be related to the outcome variables. This is not the case. Neither income nor education level differ between those who participate and those who do not (to test this we ran t-tests for log income and chi-squared tests for education level for the sample as a whole as well as for each of the four subgroups). Also, the decision to participate is not significantly related to gender and sexual orientation.

Figure 1: Matrix task

6.25 <input type="checkbox"/>	9.81 <input type="checkbox"/>	1.46 <input type="checkbox"/>
6.50 <input type="checkbox"/>		2.46 <input type="checkbox"/>
7.10 <input type="checkbox"/>	4.10 <input type="checkbox"/>	7.54 <input type="checkbox"/>

6.25 <input type="checkbox"/>	9.81 <input type="checkbox"/>	1.46 <input type="checkbox"/>
6.50 <input type="checkbox"/>		2.46 <input checked="" type="checkbox"/>
7.10 <input type="checkbox"/>	4.10 <input type="checkbox"/>	7.54 <input checked="" type="checkbox"/>

interested in labour-market outcomes, in the main empirical analysis we work with the subsample of working-age individuals (see Table 1). The experimental design is similar to the design introduced by Niederle and Vesterlund (2007) which has become the standard in the literature on gender and competitiveness. Participants are paid for their performance in a simple task where they can choose between competitive tournament incentives and a non-competitive piece-rate payment. The task consists of a series of matrices with eight numbers. Out of these eight numbers, participants have to find the two numbers which add up to exactly ten (see Figure 1). As soon as they click the correct pair of numbers, the next matrix appears. After reading the instructions, participants receive a series of three matrices for practice, with an option of receiving three more.⁷

The experiment consists of two incentivised rounds of three minutes each. In round 1, participants are paid a piece-rate of 40 euro cents per solved matrix. Their score in this round serves as a baseline performance measure. In round 2, participants can choose how they would like to be paid. In particular, they can choose between a 40 cent piece-rate and entering a winner-takes-all tournament. If they choose the tournament their performance is compared with the performance of one other randomly chosen participant.⁸ If they perform better, they earn 100 cents per solved matrix, otherwise they receive nothing.⁹ The choice of payment scheme serves as our measure of competitiveness, with competitiveness equal to 0 for people who choose the piece rate scheme and 1

⁷See the Online Appendix for details on the online version of the competition experiment, including instructions and screen descriptions.

⁸This random opponent is picked amongst all other participants regardless of their choice.

⁹In case of a tie, each participant receives 40 cents. The earnings are transferred to participants' bank accounts together with their monthly LISS participation fee.

for those who choose the relative scheme.

The experiment is followed by a brief questionnaire which assesses participants' confidence in their own ability for the task and their willingness to take risk, two factors which have been shown to influence the choice of payment scheme (Niederle and Vesterlund, 2011). We measure confidence through the question "What do you think is the probability that you solved more matrices than another randomly chosen opponent?". The answer is on a scale from 0 ("the lowest") to 10 ("the highest"). We measure willingness to take risks through the question "Tell us to what extent, in general, you are willing to take risks" (with answers on a scale from 0 ("not at all willing") to 10 ("fully willing")). This question is similar to the risk question used by Dohmen et al. (2011) which has been shown to predict both incentivized choices in a lottery task and risk taking across a number of contexts, including holding stocks, being self-employed, participating in sports, and smoking. Before the start of the first round, participants had a chance to practice the task. The data was collected in March 2014. Participants earned 8.82 Euros on average.

4 Data

Table 2 describes some of the basic characteristics of our target sample — individuals of working age. The data shows the standard pattern from the experimental gender difference literature. While 37 percent of straight men choose the tournament scheme, only 23 percent of straight women do, even though their first-round performance is statistically indistinguishable. Women also rate themselves as significantly less risk-seeking and are significantly less confident about their performance in the task. Gays and lesbians enter the tournament at similar rates as straight women, 24 and 19 percent respectively. Gays do not differ from straight men in their risk aversion and confidence, nor do lesbians differ from straight women along these characteristics.

To directly test whether our experimental measure of competitiveness can explain labour market differences between heterosexual and homosexual individuals, we use data on income and education levels contained in the LISS data. Income and education are part of the background data questions which are asked every time an individual answers a questionnaire. Our income variable is the average net income over all these observations for each individual. Education is defined in six categories according to the definition of CBS (Statistics

Table 2: Descriptives

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Straight males	Gay	Lesbians	Straight females	P (1) vs. (2)	P (3) vs. (4)	P (1) vs. (4)
Experimental variables:							
Round 1 performance (age<65)	9.045 (4.261)	9.217 (4.195)	7.702 (3.906)	8.589 (4.423)	0.823	0.235	0.462
Competitiveness (age<65)	0.371 (0.486)	0.239 (0.431)	0.191 (0.398)	0.232 (0.424)	0.124	0.575	0.032
Risk (age<65)	5.202 (1.902)	5.522 (1.918)	4.766 (2.442)	4.768 (1.755)	0.358	0.996	0.095
Confidence (age<65)	5.337 (1.827)	4.978 (1.556)	4.106 (2.046)	4.393 (1.694)	0.258	0.362	0.000
Background variables (LISS population):							
Age (all ages)	52.9 (16.9)	53.1 (16.7)	50.7 (16.4)	50.2 (16.2)	0.858	0.710	0.000
Log income (age<65)	7.394 (0.779)	7.359 (0.748)	7.041 (0.774)	6.797 (0.921)	0.659	0.005	0.000
Education level (percentages, age<65):							
basisonderwijs (primary)	5.90	3.48	4.51	5.99			
vmbo (lower track-secondary)	18.74	20.87	17.29	21.70			
havo/vwo (higher-track secondary)	10.52	6.96	7.52	11.33			
mbo (vocational training)	28.61	21.74	28.57	27.69			
hbo (applied-science university)	23.69	29.57	29.32	24.08			
wo (university)	12.54	17.39	12.78	9.20			
Education level (average, age<65)	3.831	4.052	3.992	3.698	0.108	0.019	0.000

P-values are from t-tests. Income is defined as the average income over all months for which income data is available on the LISS panel for a given individual. For average education level we assign a number from 1 (primary) to 6 (university) to each individual.

Netherlands). We use the most recent observation. With respect to income, we find that the income (measured in logs) of straight women is significantly lower than that of straight men. Lesbians earn significantly more on average than straight women, whereas there is no significant difference between gay and straight men. With respect to education, we find that the straight men in our sample are on average higher educated than straight women, and that gays and lesbians are on average higher educated than straight men and women.

5 Results

Table 3 contains the results on sexual orientation differences in competitiveness. Here we regress a binary variable indicating whether an individual chose the competitive payment scheme on sexual orientation dummies, controlling for first-round scores. We show results for the whole sample as well as the subsample of individuals below 65 years of age, which will serve as the empirical basis for our subsequent analysis on the link between competitiveness and salaries. We find that working-age gays are indeed significantly less competitive than straight men. In the working-age sample, gays are around 14 percentage points less likely to choose the competitive payment scheme conditional on performance. However, there is virtually no difference between the competitiveness of lesbians and straight women. We also replicate the standard finding that straight women are less competitive than straight men, a difference of 12 percentage points for working-age individuals. Controlling for confidence and risk attitudes in column 4 explains about half of the straight gender difference in competitiveness but not the gay effect. These results indicate that individual differences in competitiveness indeed have the potential to explain differences in labour market outcomes between gay and straight men, but not between lesbian and straight women. We should note that when we use the whole sample (and include those older than 65), as we do in columns 1 and 3, the differences in competitiveness get somewhat weaker. This result is comparable to the result reported by Flory et al. (2015). They find that gender differences in competitiveness are weaker in older samples.¹⁰

¹⁰We have also estimated the same regression models on a sample of individuals below 55 and found sexual orientation differences in competitiveness that are more pronounced. In the specification without the risk and confidence covariates, the parameter estimates (with standard errors in parentheses) are -0.194 (0.086), -0.197 (0.086) and -0.157 (0.078) for gays, lesbians and straight females, respectively.

Table 3: Estimating the relationship between competitiveness and sexual orientation

	(1)	(2)	(3)	(4)
	All	<65	All	<65
Gay	-0.072 (0.062)	-0.138* (0.075)	-0.073 (0.058)	-0.144** (0.069)
Lesbian	-0.075 (0.064)	-0.130* (0.076)	-0.039 (0.063)	-0.079 (0.072)
Straight female	-0.086* (0.050)	-0.122** (0.061)	-0.040 (0.048)	-0.068 (0.057)
Score round 1	0.035*** (0.005)	0.037*** (0.005)	0.022*** (0.005)	0.022*** (0.006)
Risk			0.059*** (0.010)	0.066*** (0.012)
Confidence			0.032** (0.012)	0.034** (0.014)
Lesbian-Straight f.	0.011 (0.061)	-0.008 (0.069)	0.001 (0.058)	-0.011 (0.065)
	385	294	385	294

Coefficients are from OLS regressions with a binary indicator for choosing the competitive remuneration as the dependent variable. In all regressions, the reference group are straight males. Robust standard errors in parentheses; *, ** and *** denote significance at 10, 5 and 1 percent, respectively.

To directly test whether individual differences in competitiveness can explain differences in labour market outcomes, we regress log income on sexual orientation dummies and our experimental indicator of competitiveness. The results are presented in Table 4. All regressions control for a quadratic polynomial of age. The results reported in column 1, using the whole LISS sample, confirm the expected income differences: gays earn less than straight men and lesbians earn more than straight women, although this effect is significant only for the lesbians. Gays and lesbians in our sample are substantially more likely to be highly educated (see Table 2). In column 6, we restrict the sample to individuals who attended college. Conditional on having attended college, we find that gays earn substantially and significantly less than straight men. We also find that the lesbian earnings advantage shrinks, which suggests that larger part of the lesbian advantage is an educational advantage. We also find a gap of 57 percent (46 percent for college-educated individuals) between straight men and straight women.¹¹

Columns 2 and 7 repeat this exercise using only individuals from the experimental sample for whom we have a measure of their competitiveness.¹² In columns 3 and 8, we then additionally control for performance in the experiment and in columns 4 and 8 we add competitiveness (i.e. a dummy for choosing the tournament) to the regression. Competitiveness strongly and significantly predicts income: conditional on performance, those who choose to compete in the experiment earn 17 percent more than those who choose the piece-rate (20 percent for college-educated individuals). Controlling for confidence and risk attitudes in column 5 actually increases the bonus for competitiveness to 19 percent (25 percent). Controlling for competitiveness reduces the gay income disadvantage which shrinks by 39 percent (33 percent). As expected, controlling for competitiveness does not affect the estimated income difference between lesbians and straight women.

To further explore the relationship between education, sexual orientation and competitiveness, we run ordered probit regressions of education level on sexual preference dummies and our measure of competitiveness. Table 5 contains these ordered probit estimates. As before, the results reported in columns

¹¹The reason why this gap is larger than typically reported in the literature is likely due to the high incidence of part-time work among Dutch women (Bosch and Van der Klaauw, 2012).

¹²Restricting the experimental sample to university graduates leaves us with a fairly small sample of 34 straight males, 26 gays, 21 lesbians and 39 straight women.

Table 4: Estimating the relationship between income, sexual orientation, and competitiveness (working age individuals)

	LISS sample		Experimental sample		P-val.		LISS sample		Experimental sample		P-val.	
	(1)	(2)	(3)	(4)	(5)	(3)<(4)	(3)<(5)	(6)	(7)	(8)	(9)	(8)<(9)
Gay	-0.061 (0.054)	-0.065 (0.091)	-0.070 (0.087)	-0.043 (0.087)	-0.021 (0.090)	0.070	0.040	-0.177** (0.089)	-0.211 (0.136)	-0.199 (0.136)	-0.133 (0.138)	-0.170 (0.136)
Lesbian	-0.368*** (0.060)	-0.483*** (0.111)	-0.454*** (0.113)	-0.428*** (0.112)	-0.410*** (0.117)	0.096	0.080	-0.405*** (0.088)	-0.625*** (0.181)	-0.601*** (0.189)	-0.525*** (0.185)	-0.571*** (0.184)
Straight female	-0.566*** (0.019)	-0.683*** (0.100)	-0.675*** (0.096)	-0.655*** (0.096)	-0.641*** (0.090)	0.094	0.094	-0.455*** (0.026)	-0.394*** (0.118)	-0.384*** (0.118)	-0.324*** (0.114)	-0.360*** (0.113)
Competitiveness				0.170* (0.088)	0.191* (0.099)					0.201* (0.111)		0.249* (0.130)
Confidence					0.022 (0.032)							-0.090*** (0.028)
Risk					-0.024 (0.026)							0.028 (0.031)
Age controls	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
Performance controls			✓	✓	✓				✓	✓	✓	✓
College educated only								✓	✓	✓	✓	✓
Lesb. - straight f.	0.198*** (0.061)	0.200 (0.134)	0.221 (0.137)	0.229* (0.137)	0.228* (0.137)	P(3)>(4)	P(3)>(5)	0.050 (0.090)	-0.231 (0.188)	-0.216 (0.194)	-0.201 (0.195)	-0.210 (0.192)
N	6122	267	267	267	267	2288	120	120	120	120	120	120

Coefficients are from OLS regressions with the logarithm of income as the dependent variable. In all regressions, the reference group are straight males. The sample consists of all individuals younger than 65 years. Income is defined as the average net income over all months for which income data is available on the LISS panel for a given individual. The age controls consist of age and age squared in years. Performance is the amount of points scored in round 1 of the experiment. Regressions using the experimental sample also control for performance in round 1 of the experiment. Robust standard errors in parentheses; *, ** and *** denote significance at 10, 5 and 1 percent, respectively. P-values for differences in coefficients are from one-sided tests using Stata's `suest` command.

Table 5: Estimating the relationship between educational attainment, sexual orientation, and competitiveness (working age individuals)

	LISS sample		Experimental sample			P-val.	P-val.
	(1)	(2)	(3)	(4)	(5)	(3)<(4)	(3)<(5)
Gay	0.168 (0.106)	0.396** (0.198)	0.395** (0.199)	0.454** (0.197)	0.480** (0.199)	0.061	0.053
Lesbian	0.124 (0.092)	0.080 (0.184)	0.155 (0.189)	0.205 (0.188)	0.267 (0.199)	0.091	0.067
Straight female	-0.101*** (0.026)	-0.123 (0.147)	-0.099 (0.146)	-0.053 (0.147)	-0.001 (0.153)	0.069	0.033
Competitiveness				0.396** (0.157)	0.350** (0.169)		
Confidence					0.070 (0.044)		
Risk					-0.009 (0.033)		
Age	√	√	√	√	√		
Performance			√	√	√		
Lesbian-Straight f.	0.225** (0.092)	0.203 (0.176)	0.254 (0.181)	0.257 (0.182)	0.267 (0.184)	P(2)>(3) 0.545	P(2)>(4) 0.538
N	6985	294	294	294	294		

Coefficients are from ordered probit regressions with education level as the dependent variable. In all regressions, the reference group are straight males. The sample consists of all individuals younger than 65 years. Education level is split into six levels according to the definition of CBS (Statistics Netherlands). The age controls consist of age and age squared in years. Performance is the amount of points scored in round 1 of the experiment. Regressions using the experimental sample also control for performance in round 1 of the experiment. Robust standard errors in parentheses; *, ** and *** denote significance at 10, 5 and 1 percent, respectively. P-values for differences in coefficients are from one-sided tests using Stata's `suest` command.

1 and 2, obtained with the full and experimental sample, confirm the typical educational differences that have been observed elsewhere: gays are on average higher educated than straight men and lesbians are higher educated than straight women. In column 4, we add a competitiveness dummy to the regression. Competitiveness significantly and positively predicts the education level (see also Buser, Peter, and Wolter, 2017b). Controlling for competitiveness significantly increases the gay education advantage and explains part of the education disadvantage of straight women vis-a-vis straight men but does not significantly affect the lesbian education advantage relative to straight women. These education results are similar to the income results we have discussed earlier. In particular, controlling for competitiveness significantly alters both the education advantage and the earnings disadvantage of gay men. In contrast, controlling for competitiveness has little impact on the education and earnings advantage of lesbian women.

Our results on competitiveness, income and education are correlational. One possible interpretation is that competitiveness is fixed at an early age and affects income via an effect on education. This fits with the results of Buser, Niederle, and Oosterbeek (2014) and Buser, Peter, and Wolter (2017a), who find that competitive students pick more challenging and prestigious study tracks in the Netherlands and Switzerland respectively. In both cases competitiveness is measured before the educational decisions are taken. Alternatively, participating in higher education might enhance both people's earnings potential and their willingness to compete.

6 Conclusions

In this study we have proposed a new explanation of the systematic relationship between sexual orientation and earnings, namely taste for competition. If gays are less attracted to competition than straight men and lesbians are more attracted to competition than straight women, we argue that such sexual orientation differences in competitiveness could lead to a labour market in which there is a gay wage penalty for men and a lesbian wage premium for women. The evidence from our online experiment on competitiveness, which we link to information about subjects' sexual orientation and earnings, suggests that gays are indeed less competitive than straight men but lesbians are as competitive as straight women. This means that preferences for compe-

tition cannot be the main mechanism that explains the link between sexual orientation and earnings but nevertheless may play a substantial role for the earnings difference between straight and gay men.

We also contribute to the literature on gender differences in competitiveness. First, we show that the gender difference in competitive preferences found in student samples carries over to a representative sample of the Dutch population; that is, men are much more competitive than women. Second, we show that the measure of competitiveness which is most commonly used in the lab is a strong predictor of earnings and education levels.

A weakness of our paper is the relatively small sample size which results in some imprecisely estimated differences. It is also important to keep in mind that competitiveness might be endogenous with respect to earnings rather than being a fixed trait. We mean here that working in competitive (and presumably well-paid) positions might increase people's willingness to compete. The same might be true of higher education. In analogy with the experimental literature on gender and competitiveness, our claim is therefore that individual preferences for competition have the potential to explain career differences between straight men and straight women, between straight men and gay men, but not between straight women and lesbian women.

References

- Ahmed, Ali M, Lina Andersson, and Mats Hammarstedt. 2013. "Are gay men and lesbians discriminated against in the hiring process?" *Southern Economic Journal* 79 (3):565–585.
- Ahmed, Ali M and Mats Hammarstedt. 2009. "Detecting discrimination against homosexuals: Evidence from a field experiment on the Internet." *Economica* 76 (303):588–597.
- Antecol, Heather, Anneke Jong, and Michael Steinberger. 2008. "The sexual orientation wage gap: The role of occupational sorting and human capital." *Industrial & Labor Relations Review* 61 (4):518–543.
- Arrow, Kenneth J. 1973. "The Theory of Discrimination." In *Discrimination in Labor Markets*,, edited by Orley Ashenfelter and eds Albert Rees. New Jersey: Princeton University Press.

- Baumle, Amanda K and Dudley L Poston. 2011. “The economic cost of homosexuality: Multilevel analyses.” *Social Forces* 89 (3):1005–1031.
- Becker, Gary S. 1964. *Human Capital Theory*. Columbia, New York.
- . 1971. *The Economics of Discrimination*. University of Chicago Press.
- . 1981. *A Treatise on the Family*. Harvard University Press.
- Berge, Lars Ivar Oppedal, Kjetil Bjorvatn, Armando Jose Garcia Pires, and Bertil Tungodden. 2015. “Competitive in the lab, successful in the field?” *Journal of Economic Behavior & Organization* 118:303–317.
- Bertrand, Marianne. 2011. “New Perspectives on Gender.” In *Handbook of Labor Economics*, vol. 4B, edited by Orley Ashenfelter and David Card. Elsevier, 1543 – 1590.
- Black, Dan, Gary Gates, Seth Sanders, and Lowell Taylor. 2002. “Why do gay men live in San Francisco?” *Journal of Urban Economics* 51 (1):54–76.
- Black, Dan A, Hoda R Makar, Seth G Sanders, and Lowell J Taylor. 2003. “The earnings effects of sexual orientation.” *Industrial & Labor Relations Review* 56 (3):449–469.
- Black, Dan A, Seth G Sanders, and Lowell J Taylor. 2007. “The economics of lesbian and gay families.” *The Journal of Economic Perspectives* 21 (2):53–70.
- Bosch, Nicole and Bas Van der Klaauw. 2012. “Analyzing female labor supply: Evidence from a Dutch tax reform.” *Labour Economics* 19 (3):271–280.
- Buser, Thomas, Muriel Niederle, and Hessel Oosterbeek. 2014. “Gender, competitiveness and career choices.” *Quarterly Journal of Economics* 129 (3):1409–1447.
- Buser, Thomas, Noemi Peter, and Stefan C Wolter. 2017a. “Gender, competitiveness, and study choices in high school: Evidence from Switzerland.” *American Economic Review* 107 (5):125–130.
- . 2017b. “Gender, Willingness to Compete and Career Choices along the Whole Ability Distribution.” *Working paper* .

- Croson, Rachel and Uri Gneezy. 2009. "Gender differences in preferences." *Journal of Economic Literature* 47 (2):448–74.
- Diaz-Serrano, Luis and Enric Meix-Llop. 2015. "Do schools discriminate against homosexual parents? Evidence from an internet field experiment." *IZA Discussion Paper No. 9044* .
- Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jurgen Schupp, and Gert G. Wagner. 2011. "Individual risk attitudes: Measurement, determinants, and behavioral consequences." *Journal of the European Economic Association* 9 (3):522–550.
- Drydakis, Nick. 2009. "Sexual orientation discrimination in the labour market." *Labour Economics* 16 (4):364–372.
- . 2011. "Women's sexual orientation and labor market outcomes in Greece." *Feminist Economics* 17 (1):89–117.
- Flory, Jeffrey A, Uri Gneezy, Kenneth Leonard, and John A List. 2015. "Gender, Age, and Competition: the Disappearing Gap." *Working paper* .
- Flory, Jeffrey A., Andreas Leibbrandt, and John A. List. 2015. "Do competitive workplaces deter female workers? A large-scale natural field experiment on job-entry decisions." *Review of Economic Studies* 82 (1):122–155.
- Gneezy, Uri, John List, and Michael K Price. 2012. "Toward an understanding of why people discriminate: Evidence from a series of natural field experiments." *NBER Working Paper No. 17855* .
- Hammarstedt, Mats, Ali M Ahmed, and Lina Andersson. 2015. "Sexual prejudice and labor market outcomes for gays and lesbians: Evidence from Sweden." *Feminist Economics* 21 (1):90–109.
- Herek, Gregory M. 2000. "Sexual prejudice and gender: Do heterosexuals' attitudes toward lesbians and gay men differ?" *Journal of Social Issues* 56 (2):251–266.
- Kite, Mary E and Bernard E Whitley. 1996. "Sex differences in attitudes toward homosexual persons, behaviors, and civil Rights a meta-analysis." *Personality and Social Psychology Bulletin* 22 (4):336–353.

- Klawitter, Marieka. 2015. "Meta-analysis of the effects of sexual orientation on earnings." *Industrial Relations: A Journal of Economy and Society* 54 (1):4–32.
- Mincer, Jacob. 1974. *Schooling, Experience, and Earnings*. New York: National Bureau of Economic Research.
- Niederle, Muriel and Lise Vesterlund. 2007. "Do women shy away from competition? Do men compete too much?" *The Quarterly Journal of Economics* 122 (3):1067–1101.
- . 2011. "Gender and competition." *Annual Review of Economics* 3 (1):601–630.
- Phelps, Edmund S. 1972. "The statistical theory of racism and sexism." *The American Economic Review* 62 (4):659–661.
- Plug, Erik, Dinand Webbink, and Nick Martin. 2014. "Sexual orientation, prejudice, and segregation." *Journal of Labor Economics* 32 (1):123–159.
- Reuben, Ernesto, Paola Sapienza, and Luigi Zingales. 2015. "Taste for competition and the gender gap among young business professionals." *Working paper. Columbia University*. .
- Reuben, Ernesto, Matthew Wiswall, and Basit Zafar. 2015. "Preferences and Biases in Educational Choices and Labor Market Expectations: Shrinking the Black Box of Gender." *Economic Journal* forthcoming.
- Tebaldi, Edinaldo and Bruce Elmslie. 2006. "Sexual orientation and labour supply." *Applied Economics* 38 (5):549–562.
- Tilcsik, András. 2011. "Pride and prejudice: Employment discrimination against openly gay men in the United States." *American Journal of Sociology* 117 (2):586–626.
- Weichselbaumer, Doris. 2003. "Sexual orientation discrimination in hiring." *Labour Economics* 10 (6):629–642.
- . 2015. "Testing for discrimination against lesbians of different marital status: A field experiment." *Industrial Relations: A Journal of Economy and Society* 54 (1):131–161.

Zhang, Y. Jane. 2012. "Can experimental economics explain competitive behavior outside the lab?" *Working paper* .