

# POSITIONAL GOODS ....OR POSITIONAL PEOPLE? IMPLICATIONS FOR TAXATION AND HAPPINESS

by

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## *Abstract*

We report the results of surveys on positional concerns for income and leisure. The results confirm earlier evidence that a majority of people are positional regarding income. We also look at the distribution of both these positional concerns among our respondents, something which has not previously been investigated. Our findings point to the need for a more subtle approach than has previously been proposed for using taxation to correct distortions in the income-leisure choice.

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## ***Introduction***

Relative income (and status in general) matter. In the happiness literature, comprehensively surveyed by Clark *et al.* (2008), it is widely accepted that, while income is a positional good, leisure is not. People for whom income is a positional good prefer to have more income than others in their reference group. The resulting ‘income arms race’ is inefficient. People spend too much time working to achieve what is at best a temporary gain in relative income. All might be better off if overworking were deterred. Frank (1985, 1999, 2005, 2006) in the US, and Layard (2005a, 2005b, 2006) in the UK therefore advocate taxation on income or consumption in order to correct this inefficient misallocation of time. More leisure time could then be spent investing in interpersonal relationships - e.g. with family, friends and within the community. Happiness research consistently reveals that, once a fairly basic level of real income has been achieved, extra income or consumption gives very little additional happiness, compared with enjoying such relatively time-intensive relationships as these.

Of course, competition for income is not necessarily a negative sum game. It might generate inventions, technical progress and new products. In what follows, we ignore such potential ‘dynamic’ gains; similarly we ignore whatever benefits might accrue to consumers from any additional output produced when others work ‘excessively’ long hours.

Solnick and Hemmenway (1998), hereafter SH98, were the first to provide empirical evidence “that positional concerns for income loom larger than positional concerns for leisure”. However SH98 also drew attention to two earlier studies, Tversky and Griffen (1991) and Zeckhauser (1991), where the evidence is more ambiguous. The seminal SH98 paper has been much cited in subsequent research. A more recent paper by the same authors, Solnick and Hemmenway (2005), hereafter SH05, supports their earlier conclusion. Both studies are based on survey data. SH98 surveyed 257 faculty, students and staff at the Harvard School of Public Health. Their later survey, SH05, elicited responses from 226 individuals: this sample includes “a few” students. Alpizar *et al.* (2005) who survey 325 students at the University of Costa Rica, reach a more nuanced conclusion. They find that, though less positional than some consumer goods and income, relative time spent on vacation is also important. We too have surveyed a large number of students at the University of Reading, England, and Singapore Management University. Our results concur with the aggregate finding that more people are positional regarding income than leisure. However, when we disaggregate, and look at the responses of each individual to both survey questions together, on income and leisure, we find a more complex distribution of attitudes. These findings point to the need for a more subtle approach than has previously been proposed for using taxation in order to correct distortions in the income-leisure choice.

## ***Methods:***

A large questionnaire investigating various possible determinants of subjective well-being was administered in class to 251 students at the University of Reading who were taking undergraduate microeconomics courses. This survey included the following two questions, which were later also put to 137 undergraduates taking a class in statistics for economics and business students at Singapore Management University (SMU):

Question 1: *Income*

Which of the following alternative worlds would you prefer? (Prices are the same in both worlds.)

You earn 40,000 £ sterling (or Singapore \$) per year, and all others get half of that.

You earn 80,000 £ sterling (or Singapore \$) per year, and all others get double that.

Question 2: *Leisure*

Which of the following alternative worlds would you prefer?

You have four weeks of paid holiday per year, and all others have two weeks.

You have six weeks of paid holiday per year, and all other have eight weeks.

Choice of the first world in each question indicates a positional concern; those who prefer absolute levels of income or leisure would choose the second world. Students were instructed verbally that in all other respects the two worlds are identical; so, for example, this very simple ‘thought experiment’ precludes general equilibrium consistency. As SH98 (pp. 379-380) point out, “variations in the questions posed might affect the proportions choosing the positional state . . . . Indeed, we could imagine that by systematically adjusting the figures for income, we could discover the point for each individual at which he is indifferent between the two states of the world”. In just this way Alpizar *et al.* (2005) attempt to estimate individuals’ marginal rate of positionality.

Care therefore needs to be taken when interpreting and comparing the results of Reading and Singapore surveys. If respondents in one country appear to be on average “more positional” than those in the other, this finding alludes to the proportions of respondents who choose the positional option, given the data presented in the two hypothetical worlds. It does not imply that individuals in the “more positional” country are prepared to make a greater absolute sacrifice to obtain a relative advantage in income or leisure. Also, these students’ choices between hypothetical worlds may be conditioned by their perceptions of the economic realities in their respective country. Prices, actual earnings, hours of work and vacation entitlements differ between the UK and Singapore. Conclusions regarding comparative positional preferences are therefore inevitably tentative.

SH98 and SH05 are alert to the possibility that survey respondents might suffer from status quo bias: they might interpret as the status quo whichever hypothetical world is presented first in each pair of questions, and choose accordingly. Or they might always choose the first option simply as a low cost response strategy. To test for this possible bias, we created different versions of our survey, some with the positional state of the world first, some with it second. We trialled these different formats on a subsample of 85 Reading students. No bias was found in favour of whichever option was listed first, rather it was the second option which was chosen more frequently. The survey was therefore administered to the full sample in the format shown above.

## **Results**

Table 1 compares the percentage of ‘positional’ answers given by Reading and SMU students with those from the two previous surveys carried out by Solnick and Hemenway. Here, positional concerns regarding first income and then leisure are analysed independently, the data aggregated and averaged across all respondents within each sample.

Our results confirm the earlier findings that income is indeed ‘more positional’ than leisure, in the sense that a higher proportion of respondents give the positional answer for income. Income rivalry characterises a majority of all students sampled, whether at Harvard, Reading or SMU, though the SMU proportion, 75 percent, is markedly highest. The difference between SMU’s proportion and Reading’s 59 percent, the second highest, is statistically significant ( $z = 2.61$ ,  $P = 0.009$ ). SH98 comment that students are more likely than others to make positional choices “because they feel themselves to be in constant competition with one another, to earn approval and good grades while in school and to establish themselves in society after graduation” (p379).

Though income is consistently the more positional of the two goods, compared with SH98 and SH05 respondents a greater proportion of both our groups are also rivalrous about leisure. Positional concerns over both domains appear to loom larger at SMU than at Reading, and much more so than at Harvard. Indeed a majority of SMU students would prefer shorter annual holidays as long as they have more weeks of vacation than others have. Alpizar *et al.* are the only others who report this novel finding.

While responses to our two survey questions taken separately support the view that income is a positional good, the status of leisure seems more ambiguous. Combining the results of our two survey questions for each individual respondent gives added insight into concerns regarding relative standing. Neither SH98 nor SH05 do this, nor do Alpizar (*et al.*) (2005). At issue is the following: are those individuals who are positional regarding income the same individuals who are also positional regarding leisure? We believe that the answer to this question has relevance to the design of income taxation (see below).

Table 2 for Reading, SMU and the two samples pooled, explores the distribution of positional concerns across both domains, income and leisure. Individuals can then be classified by membership of one of four possible categories. We denote these categories as follows, showing an individual’s concerns regarding first income and second leisure as either positional, P, or absolute (or non-positional), A:

- (P,P) consistently positional concerns;
- (P,A) positional concerns over income but not leisure;
- (A,P) non-positional concerns for income, positional concerns regarding leisure;
- (A,A) consistently non-positional concerns.

If individuals are typically positional regarding income but not leisure, as is generally asserted, this should be reflected in our findings: the majority of respondents should fall into the (P,A) category. This is clearly not the case. Tests on our (P,A) proportions

show all of them to be significantly below 50 percent. Moreover we cannot even reject the null hypothesis that they were generated randomly – i.e. they are not significantly different from 25 percent. The relevant percentages, z statistics and corresponding P- values for the null hypotheses of 50 percent and 25 percent are as follows:

	(P,A) %	H <sub>0</sub> = 50%		H <sub>0</sub> = 25%	
		z	P	z	P
Reading	29	- 6.65	< 0.0005	1.46	0.14
SMU	25	-5.85	< 0.0005	- 0.05	0.96
Reading & SMU pooled	27	- 9.06	< 0.0005	0.91	0.36

Of those respondents who are positional on income, one half at Reading and two-thirds at SMU are also positional on leisure.

An alternative hypothesis is people have *either* consistently positional *or* consistently absolutist concerns regarding these two goods. On this hypothesis we would expect the majority of respondents to fall into categories (P,P) and (A,A) combined. This indeed is what it observed. The proportions (P,P + A,A) for Reading, SMU and the two universities pooled are significantly larger than 50 percent. Percentages, z statistics and P- values are as follows:

	(P,P + A,A) %	H <sub>0</sub> = 50%	
		z	P
Reading	65	4.75	< 0.0005
SMU	69	4.45	< 0.0005
Reading & SMU pooled	67	6.70	< 0.0005

We conclude therefore that a clear majority - approximately two thirds - of our respondents have consistent concerns, whether positional or absolutist, regarding both income and leisure.

Similar overall consistency between Reading and SMU students, as evidenced by the sum of (P,P) and (A,A) proportions, conceals a marked difference in the composition of these totals. Consider the diagonal elements in Table 2. SMU students are much more consistently positional, (P,P), their modal category: about 50 percent compared with 30 percent at Reading. This difference is statistically significant ( $z = 3.92, P < 0.0005$ ). On the other hand Reading has a significantly higher proportion of consistent absolutists, (A,A), which is their modal category: 36 percent against 19 percent at SMU. ( $z = 3.39, P = 0.0006$ ). There is a further difference between the two samples. The choices of our Reading sample are more evenly distributed between full consistency (P,P or A,A) and being positional on income but non-positional on leisure (P,A): all three proportions lie in the range from 29 to 36 percent.

It may be that culture plays a part in explaining these differences in attitudes, in particular the greater positional homogeneity of the Singaporeans. A large majority of SMU students are ethnic Chinese. Reading students are ethnically more diverse. The full Reading questionnaire invited students to identify their ethnic group. About 60 percent were white, 13 percent were black African or Caribbean, 10 percent were Chinese and another 10 percent were Asian Indian, Pakistani or Bangladeshi. (Two thirds of Reading students were British nationals, the remainder coming from overseas.) This enables us, in Table 3, to disaggregate positional concerns by ethnicity.

One finding stands out when comparing attitudes of white and non-white respondents: Consistency, of one sort or the other, is the modal attitude of both groups though the type of consistency differs. The proportion of white consistent absolutists (A,A), is identical to the proportion of non-whites who are consistently positional (P,P).

We can further disaggregate our analysis of non-whites, though no great significance should be attached to the findings for each individual sub-group: the sample sizes are relatively small. However choice consistency again characterises all five ethnic sub-groups: the modal type is either (P,P) for Asians, Chinese and the miscellaneous group, or (A,A) for Whites and Blacks. Only a minority are positional solely on income (P,A). And there is a remarkable, albeit not unexpected, similarity between the four-way classification of the Reading Chinese (Table 2) and the Singaporeans (Table 3). This similarity gives us some confidence that our surveys do reveal genuine differences in positional preferences between the two samples independent of the different economic contexts, UK and Singapore, in which the surveys were administered.

We conclude this summary of our results by noting the following: only a very small number of our respondents, typically under 10 percent, report choices which are positional solely on leisure (A,P). This holds for both Reading and SMU surveys in aggregate, and for all but one of the ethnic subgroups in the Reading survey.

### ***Discussion: Leisure as a Positional Good, and the Implications for Taxation***

Our research confirms earlier evidence that more people are positional on income than on leisure. However perhaps the most interesting aspect of our study is the finding that a high proportion, 43 percent overall, of our respondents are positional on leisure, and that only a slightly smaller percentage are *consistently* positional - that is, positional over both domains. Moreover almost 60 percent of those who are positional on income are also positional on leisure.

Leisure in our study, as in the two studies by Solnick and Hemenway, is defined as the number of weeks of paid holiday per year. The tradeoff therefore encompasses both the standard income-leisure choice and decisions about occupational choice or promotion-seeking behaviour. We are not surprised that vacation time is reported to be positional or rivalrous by a significant number of those in our survey. Nor, we suspect, would Veblen (1899). For him, the 'leisure class' of the late nineteenth century enjoyed their status because they did not have to work. Spending time on leisure activities and income on consumer goods were both markers of wealth, and he considered both to be wasteful (Veblen, 1899. p.53). If he put more emphasis on conspicuous consumption it was because he judged that it was easier at that time to display goods than leisure, not because the benefits to the individual of enjoying leisure were any less socially

contextual - quite the reverse. Veblen argued that as a population becomes more mobile, the display of wealth becomes more important than the display of leisure, which is less visible, a hypothesis recently echoed by Frijters and Leigh (2005). Surely Veblen would judge from his perspective that, a century or more later, the majority of worker-consumers in developed economies are themselves members of his leisure class, such is the comparative abundance of goods and services which are complementary with longer leisure hours and a greater variety of visible leisure activities.

Nowadays a job's status often but not always reflects the components of the employment package, which includes both pay and vacation time. Longer paid vacation time for a given annual salary is equivalent to a higher wage rate for whatever hours are worked. Time taken on vacation (and, for example, the resulting suntan and other goods acquired on holiday) may well be highly visible within the workgroup, between family members, among neighbours and the community within which one lives. Almost all consumption activities, certainly vacations, require complementary inputs of time and income. As Frank (2005, p. 79) writes: "Vacations offer the opportunity to see new places, visit distant relatives and friends, take up a new sport, read books, lie on a beach, hike in the wilderness or whatever the spirit moves you to do." But the spirit's willingness to move is constrained by the budget's ability to pay. For these reasons, status, visibility and complementarity, an individual may hold positional preferences over both domains: income and leisure.

Our Chinese respondents in particular appear to be consistently positional. Again, this cannot be surprising. Compared with the typical western perception of individual identity, the Chinese sense of self is more interdependent, 'networked' and embedded in often hierarchical relationships, especially the extended family (Hofstede, 1991, Redding 1990, Smith and Bond, 1998). A common cultural characteristic is sensitivity to preserving 'face' among family, classmates, social reference groups and work groups (Redding, 1990). The psychological sanction is shame rather than guilt. Superiority in status is esteemed (Nakamura, 1964). Noting that reported happiness is lower in East Asian economies than in industrial economies in which living standards are roughly comparable, as well as in many other countries with lower standards of living, Ng (2002a, b) points to the competitiveness of attitudes in East Asia. He argues that East Asian culture is too preoccupied with appearance, on not losing face, on reputation and family history. The pursuit of hedonic happiness, which western cultures emphasise, is regarded as unworthy or shameful in Confucian culture. What better way therefore to signal that one is a higher achiever, a 'smarter', more productive worker than to have a job which offers better pay *and* longer vacations than one's peers? Relative leisure may be particularly status-significant in an economy such as Singapore, where the norm is a long working week. The frustration of trying vainly to get ahead in the race for leisure and income - and perhaps in other domains too - may contribute to the comparative unhappiness of Singaporeans. Further evidence of a high degree of Chinese positionality is provided by Knight and Song (2006) in their study of rural households: relative income - where the reference group are fellow-villagers - is at least twice as important for individual happiness as is actual income.

We turn now to the implications for taxation of our research. An efficient tax is proposed in order to correct excessive income, consumption and labour supply at the expense of leisure. Specifically, "we expect an imbalance in the choice between two activities if the individual rewards from one are more context-sensitive than the individual rewards from the other" (Frank 2005b, p. 84), and "the bias from

interdependence depends on the strengths of the effects along various margins” (Arrow *et al* 2004, p.159).

A simple formal treatment of these issues shows that, if we permit the possibility that both income and leisure may be positional, the efficient rate of income tax (or income subsidy) is shown to depend on the relative size of the marginal interdependence parameters  $\alpha$  (for income) and  $\beta$  (for leisure).

Suppose there are  $n$  identical individuals, each with utility function

$$u = u(m - \alpha \bar{m}, h - \beta \bar{h}) \quad u_1, u_2 > 0, \quad 0 < \alpha, \beta < 1$$

where  $m$  denotes real income,  $h$  leisure hours, and  $\bar{m}$  and  $\bar{h}$  are the average values of income and leisure for the relevant reference group. We assume that all individuals are paid the same wage, and face the same price vector. Income and leisure choices are constrained by total time,  $\tau$ , so that

$$m = w(\tau - h)$$

where  $w$  is the hourly real wage rate, and so

$$u = u(w(\tau - h) - \alpha \bar{m}, h - \beta \bar{h})$$

Individuals independently choose leisure time (and hence hours of work and income) ignoring the impact of the negative externality of their choice on others, i.e they take  $\bar{m}$  and  $\bar{h}$  as givens:

$$\begin{aligned} -wu_1 + u_2 &= 0 & (1) \\ u_2/u_1 &= w & (1a) \end{aligned}$$

The socially optimal levels of leisure, work hours and income reflect the external costs of each individual’s choices on everyone else, because they affect average income and leisure. Note that, as all individuals are identical,  $\bar{m} = m$  and  $\bar{h} = h$ . The utility function can then be written as

$$u = u((1 - \alpha)w(\tau - h), (1 - \beta)h)$$

and the first-order condition which defines the social optimum is

$$-w(1 - \alpha)u_1 + (1 - \beta)u_2 = 0 \quad (2)$$

$$u_2/u_1 = (1 - \alpha)w/(1 - \beta) \quad (2a)$$



To correct the externalities, and assuming that neither leisure nor those goods and services which are complementary with leisure are directly taxable, a flat rate income tax,  $t$ , could be imposed such that

$$(1 - t) = (1 - \alpha)/(1 - \beta)$$

$$t = (\alpha - \beta)/(1 - \beta)$$

When people are consistently non-positional over both domains,  $\alpha = \beta = t = 0$ . If all individuals are positional only regarding income,  $\beta = 0$  and  $t = \alpha$ .

If leisure but not income is rivalrous,  $\alpha = 0$  and  $t = -\beta/(1 - \beta)$ : the wage should be enhanced by a subsidy in order efficiently to discourage excessive leisure. Supposing that income and leisure are positional to the same degree,  $\alpha = \beta$  and no tax is required. As Arrow *et al* (2004, p.159) observe, in this case the interdependence effects operate “like a lump-sum tax, reducing a person’s sense of well-being without changing that person’s allocation of labour resources or income.” Otherwise, when the positional biases are not symmetric, the appropriate tax rate will be determined by the relative size of  $\alpha$  and  $\beta$ . This analysis is summarised in Table 4, our four-way classification of positional concerns and the corresponding implications for income tax. However a caveat is in order here. Oswald (1983) shows that optimal taxation becomes much more complicated where, for example, individuals have different non-separable utility functions with different degrees of positionality. He concludes (p.86) that “at the most general level ... no simple results emerge ... when people look over their shoulders before they decide how happy they feel.” Other practical problems of such a tax system are discussed by Frank (1999) and Ireland (2001).

Solnick and Hemenway do not provide empirical evidence on these parameters; nor do we. Instead, SH98 and SH05 clearly show that more people are positional on income than on leisure. We agree, indeed the proportions of respondents in our surveys who are positional on income are larger than those reported in SH98 and SH05, particularly so for SMU students. Nevertheless, that a majority of people are context-sensitive on income in itself gives little guidance on tax policy: some of these people may also be positional on leisure. Both SH98 and SH05 elicit respondents’ positional concerns for a larger number of “goods” and “bads”, public and private, than just income and leisure. They find that no respondent is consistently positional or non-positional for all items; they do not report the distribution of individuals’ positional concerns over the pair of goods, income and leisure, which is the subject matter of our research, and which we believe to be relevant to the design of taxation.

Using experimental methods, Alpizar *et al.* produce parameter estimates of the marginal degree of positionality for various goods, including income and vacation time. Depending on the assumed underlying utility function, the mean degree of positionality for income is either 0.45 or 0.40, and the median value is between 0.25 and 0.5. For vacation time the corresponding values are somewhat lower. The mean degree of positionality is either 0.41 or 0.37, and the median lies below 0.25. Useful as this pioneering study undoubtedly is, it does not offer clear guidance on appropriate tax rates, not least because the estimated means disguise what the authors describe as an “almost bipolar” response distribution: the majority of the respondents have either very high or very low positional concerns on each good. Lexicographic respondents are those who are either non-positional for all goods or highly positional for all goods.

When these lexicographic responses are removed, the mean degree of positionality for leisure rises from 0.25 to 0.38 and there is a similar but unreported increase for income. Alpizar *et al.* (2005) do not report the proportions of their respondents who are lexicographic; it is just this interpersonal distribution of positional concerns which is our concern here.

Reading and Singapore surveys show that a majority of those who are positional on income are also positional on leisure. Moreover less than a third of our respondents are positional on income alone. Only for this group, the (P,A)s, would a tax rate equal to  $\alpha$  be appropriate. Layard (2005a) proposes that  $t = \alpha = 0.3$ , based on econometric estimates for the USA from Blanchflower and Oswald (2004). For those who are positional over both domains, the (P,P)s, 30 percent of Reading respondents and 50 percent of Singapore students, an efficient tax rate would be determined by the relative size of  $\alpha$  and  $\beta$ , on which we have no evidence. Were income and leisure positional to the same degree, an unlikely possibility, no tax would be required. Nor would a tax be required for the 36 percent of those who are consistently non-positional: these (A,A)s are the modal preference category at Reading, though a much smaller proportion of SMU respondents. Only 5-6 percent of our respondents are positional on leisure but not income: any income tax would further distort their already inefficient choices.

## ***Conclusions***

The title of our paper asks a question to which the answer is self-evident. Positionality is a property of an individual's preferences. That said, because of clear evidence that more people are positional on income than on leisure, much of the earlier discussion on the appropriate policy response to positional concerns seems to have proceeded on the implicit assumption that positionality is a property of goods: thus, "income is positional, leisure is not". Our research shows that the preferences of only a minority of people can be described in this way. The majority have consistent preferences regarding interdependence: they are either consistently positional or consistently non-positional over both domains, income and leisure.

In the absence of further evidence on the marginal effects of interdependence on well-being, it would be unwise to advocate a corrective rate of income tax, payable by all income earners, solely on the basis of the positional concerns of less than one-third of the population, particularly when we have additional tentative evidence that the scope and strength of positional concerns may differ across cultures. Indeed if these positional concerns are as heterogeneous as our results suggest, any single tax rate seems problematic. And there are other potential complications. There may be additional external benefits from an individual's leisure – benefits, for example to family and friends. This would reinforce the case for the income tax. On the other hand, particularly for those working in teams, long hours of work may be necessary to support workplace friendships by "not letting the side down". These externalities would argue for a lower tax rate. Our overall conclusion must be a cliché but a valid cliché nonetheless: more research is needed in this area.

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**Table 1**  
**Percentage giving 'Positional' Answer**

	Solnick & Hemenway (1998), Harvard <sup>a</sup>			Solnick & Hemenway (2005)		Reading	SMU	Total
	Students (n = 159)	Others (n = 79)	Total (n = 247)	Sample includes "a few students" (n = 122)      (n = 104)		(n = 251)	Students (n = 137)	(n = 388)
Income	52	35	48	33 <sup>c</sup>	48 <sup>c,d</sup>	59	75	65
Leisure	19 <sup>b</sup>	10 <sup>b</sup>	16 <sup>b</sup>	16		36	56	43

Notes:

a Weighted averages from two versions of the survey

b Average of two versions of the leisure survey question

c,d Results for two versions of the income survey question: the levels of income proposed in version c are lower than those in version d

n Number of respondents

**Table 2**  
**Distribution of Positional Concerns**  
**Percent**

		Leisure	
		P	A
Reading (n = 251)	Income P	30	29
	A	6	35
SMU (n = 137)	Income P	50	25
	A	6	19
Reading and SMU pooled (n = 388)	Income P	37	27
	A	6	30

Notes:  
P,A denote positional and absolute (non-positional) concerns respectively

**Table 3**  
**Ethnic Composition of Reading Respondents**  
**Percent**

		Leisure	
		P	A
White (n = 152)			
Income	P	23	33
	A	3	41
Total Non-White (n = 99)			
Income	P	41	22
	A	9	27
Of whom:			
Black <sup>a</sup> (n = 26)			
Income	P	27	27
	A	15	31
Asian <sup>b</sup> (n = 23)			
Income	P	39	26
	A	4	30
Chinese (n = 24)			
Income	P	54	21
	A	8	17
Miscellaneous <sup>c</sup> (n = 26)			
Income	P	46	15
	A	8	31

Notes:

a Caribbean, African and other

b Indian, Pakistani and Bangladeshi

c Other Asian background, mixed ethnic background, other ethnic background, no response on ethnicity

P, A denote positional and absolute (non-positional) concerns respectively

**Table 4**  
**Taxation and the Distribution of Positional Concerns**

	Leisure	
	P	A
P	$\alpha, \beta > 0$	$\alpha > 0, \beta = 0$
Income	$t = (\alpha - \beta) / (1 - \beta)$	$t = \alpha$
A	$\alpha = 0, \beta > 0$	$\alpha = \beta = t = 0$
	$t = -\beta / (1 - \beta)$	

Notes:  $t$  is the rate of income tax. Definitions of  $\alpha$  and  $\beta$  are given in the Appendix