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ABSTRACT

Doux Commerces: Does Market Competition Cause Trust?

This paper documents a strong positive relationship between individual reported trust levels (obtained from the US General Social Survey) and the competitiveness of the sector in which an individual works (obtained from the US census of firms). This correlation is robust to the inclusion of all of the previously studied determinants of individual trust, e.g., income, education, age, sex, marital status, city size, religion, and is large; a one standard deviation increase in sectoral competitiveness makes respondents approximately five percent more likely to answer the canonical trust question with a "usually trust" as opposed to a "usually don't trust" response. The addition of a rich set of workplace controls shows that this correlation is not likely to be driven by the size of the workplace, the amount of supervision, or related to a congenial work culture. It also appears that it is not due to selection (i.e., trustworthy or trusting individuals selecting into competitive sectors) or risk aversion, but instead seems to be due to individuals becoming more trusting the longer their experience in competitive sectors. We conjecture that trust levels are high when workplaces are characterized by high contributions of discretionary effort, i.e., when co-workers are more likely to be trustworthy. We develop a model which shows that such discretionary efforts are more likely to arise when competition within a sector is high. Competition mitigates incentives for free-riding by imposing costly shut-down on poor performing firms, makes employees more trustworthy, and thus increases trust. The model generates a positive correlation between trust and sectoral competitiveness, displays a threshold effect, suggests a non-monotonic relationship between competition and job security, and predicts patterns for a number of other variables. The data displays a high degree of consistency with these predictions.

JEL Classification: D10 and J54
Keywords: competition, trust and values

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"it is almost a general rule that wherever manners are gentle (moeurs douces) there is commerce, and wherever there is commerce, manners are gentle" Montesquieu (1749, cited in Hirschman 1982)

1 Introduction

Arrow (1972) was amongst the first modern economists to emphasize the importance of trust in overcoming everyday transaction costs and facilitating trade. He further argued a link to development: low trust tended to both characterize underdeveloped economies and significantly contribute to their state of underdevelopment.[2] A recent and growing body of empirical work studies the evidence regarding that link. Typically, this work explores the relationship between aggregate (country or region wide survey) responses to the World Values Survey generalized "Trust" question and economic outcome variables such as GDP per capita. The question: "In general, would you say that individuals can be trusted, or that you can't be too careful in dealing with people", has been asked in the World Values Survey for nearly thirty years, and in country surveys (e.g., the US General Social Survey and the German Socio-Economic Panel Study) and continent level surveys (Latinobarometer, Asiabarometer, Eurobarometer, Afrobarometer). At the micro level, answers have been shown to predict behavior in games where financial rewards are at stake, and other types of pro-social behavior.[3]

To explore causal effects of trust on economic outcomes, economists have utilized varying sets of (usually historical) instruments to isolate the effects of predetermined components of trust on outcome variables (most commonly GDP per capita). Most studies in this vein report evidence of significant, and usually large effects of trust, which they argue suggest a causal link from trust to economic development.[4]

[2] Other social scientists have also emphasized the key role played by trust for considerable time some examples are Banfield (1958), Coleman (1988), Putnam (1993, 2000), Williamson (1993), and Fukuyama (1995).

[3] Specifically the "Trust" game described in Berg, Dickhout and McCabe (1995). Glaeser et. al. (2000) showed the answers to this question correlated with trustworthiness (receiver behavior in this game), using a sample of Harvard undergrads. On the other hand, Fehr et. al. (2003) showed that it correlated with trusting (sender) behavior in the "Trust" game, using the German Socio-Economic Panel. Sapienza, Toldra and Zingales (2008) also find evidence to suggest that answers to the trust question pick up trusting behavior in a sample of Chicago MBA students, and argue that the survey questions are generally better at eliciting trust, see more on this in the text. Uslaner (2005) also shows trusting to be correlated with charitable contributions, and volunteering. Bacharach Guerra and Zizzo (2007) provide an extensive review of experiments on the Trust game, and interpretations of the findings therein. They also explore another way in which trust is built – i.e., the communication of a belief that an individual will be trustworthy leads individuals to act in more trustworthy ways.

[4] A recent literature in development economics has singled out trust as a key component of the broader notion of social capital in explaining underdevelopment; both Platteau (2000) and Basu (2006) discuss the societal benefits that arise when a generalized trust is extended between previously unacquainted indviduals. This notion also underpins the formal theories developed by Zak and Knack (2000) and Francois and Zabojnik (2005). Uslaner (1999) also emphasizes the importance of generalized trust, i.e., trust in the unknown other rather than acquaintences. He argues that such trust derives largely from parents, and is not affected by daily experience. Our empirical results question this conclusion. On the empirical front, some attempts at identifying trust's effects are: Knack and Keefer (1997) who use a sample of countries and instrument for trust using ethnic fractionalization, Tabellini (2007) includes Trust as one of his sub-components in the regions of Europe study, he also includes it on its own and instruments for it using historical literacy and historical political institutions. Guiso, Sapienza, and Zingales (2006) instrument trust using the average levels in the country of origin for children of parents who immigrated to the US. La Porta et. al (1998) instrument for trust using hierarchical religions. Algan and Cahuc (2009) explore within country variation by using country fixed effects. They do this by constructing a long time series on trust for countries by using information about ancestors' origins in the GSS. They also find a strong and large causal role of trust on country level outcomes, which persists with the addition of other time varying controls.

If societal trust is important for development, a key next step in this literature is to understand how societal trust is built. Montesquieu – as the quote with which this paper starts indicates – believed that market competition played a major positive role in developing trust via its civilizing effect on individuals. The subsequent two hundred and fifty years have seen a number of theories positing relationships between markets and values in both directions, which we briefly outline in the next section. But there has been very little evidence brought to bear on this issue. Here we examine a variant of Montesquieu's "Doux Commerces" hypothesis, wtih specific reference to the issue of trust. We ask what effect, if any, does market competition have on trust.

A first analysis of aggregate data presents mildly encouraging evidence for Montesquieu's Doux Commerces hypothesis. A cross-country correlation is presented in Figure 1 below.[5] This figure plots the relationship between the country-wide average of answers to the generalized "Trust" question and a measure of the degree to which markets are dominated by a few firms, obtained from the World Economic Forum. The World Economic Forum (2003-2007) in its "Global Competitiveness Report" asks between one and two hundred executives in approximately sixty countries questions regarding the business environment in their country.[6] One question called "market dominance" asked starting in 2003 states: "Market dominance by a few enterprises is (1 = common in key industries, 7 = rare)". Countries obtain a score on this measure obtained by averaging across the responses between 1 and 7 of its executives sample, and then averaging across the sample years. As the figure indicates, there is a positive correlation between low market dominance (a high number) and trust. More encouragingly, this correlation persists after the inclusion of a set of controls for country characteristics, Table 1, including the main variables that have been used to explore trust in cross-country settings; GDP per capita, education levels, measures of institutional quality, and historical measures of these.[7]

[Insert Figure 1]

[Insert Table 1]

Though providing some motivation, country level analyses have clear limitations in the present context. Firstly, there are a plethora of additional country level measures that could be included in such a regression but have not been because degrees of freedom problems bite quickly in such small samples.[8] Perhaps one of these omitted variables is a co-determinant of both these factors. Secondly, even if we could include all that

[5] With the exception of the competition variable, described below, the variables used here have all been thoroughly explored in the literature on institutions and development. We describe them fully in the Appendix.

[6] A description of the data and survey methodology are available here: http://www.gcr.weforum.org/

[7] All of which are described in the appendix.

[8] We have experimented with a number of other aggregate measures. Including income inequality, urbanization and corruption measures do not change the significance or size of the market dominance measure substantially, though we are limited by sample size in going much further.

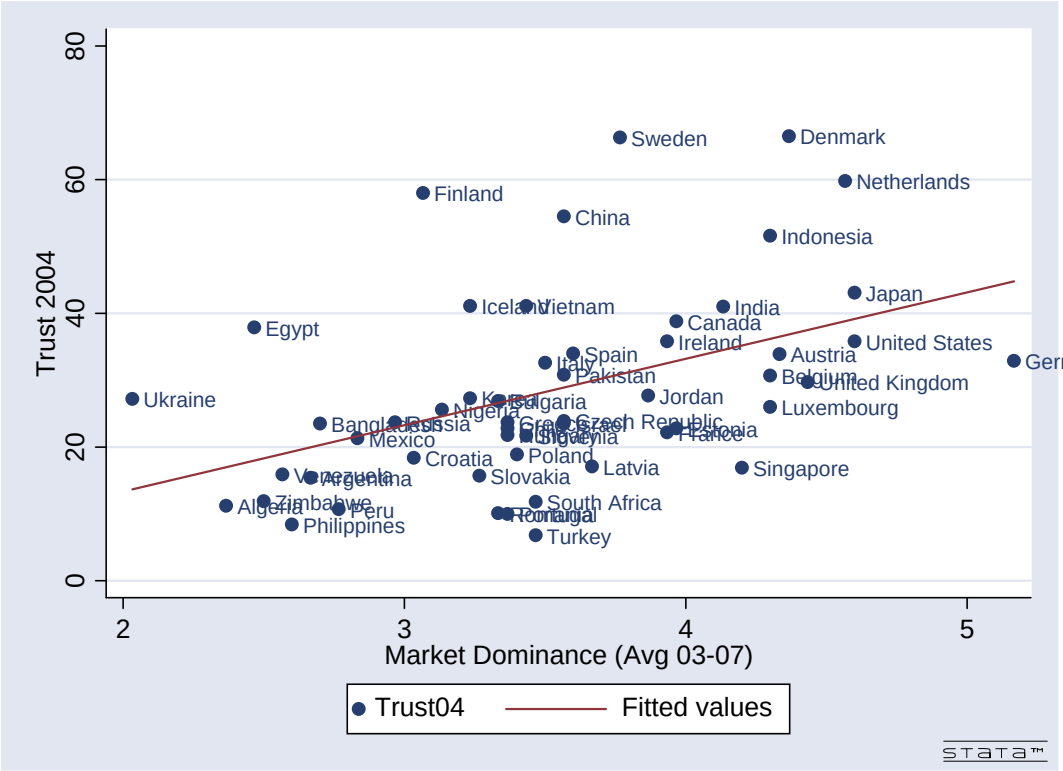

Trust 2004
0
20
40
60
80
2
3
4
5
Market Dominance (Avg 03-07)
Sweden
Denmark
Netherlands
Finland
China
Indonesia
Japan
Iceland
Vietnam
India
Canada
Egypt
Ireland
United States
Austria
Germany
Spain
Italy
Pakistan
Belgium
United Kingdom
Ukraine
Jordan
Luxembourg
Nigeria
Bulgaria
Czech Republic
Bangladesh
Russia
Mexico
Croatia
Poland
Latvia
Singapore
Venezuela
Argentina
Slovakia
Zimbabwe
Algeria
Peru
South Africa
Philippines
Turkey
Trust04
Fitted values
stata™

Table 1: OLS Regressions Trust 2004

Dependent Variable	Trust04	Trust04
Market Dominance	12.045**	13.460**
	(3.683)	(4.118)
Gdp/cap	0.00009	0.00030
	(0.00038)	(0.00052)
Education(2000)	-0.218	-0.690
	(1.152)	(1.406)
Polity	-1.934	-2.229
	(1.147)	(1.474)
Risk Exprop	-0.869	-1.195
	(0.965)	(1.049)
Exec Const.	4.369	6.000
	(3.536)	(4.767)
Government Effectiveness	-0.443	1.327
	(3.918)	(4.716)
Scandinavia	35.662**	36.358**
	(8.052)	(8.639)
Autocracy 45-98		0.682
		(2.284)
Exec Const.45-98		0.340
		(3.439)
Law & Order Tradition		-4.309
		(3.910)
Constant	-21.222	-13.821
	(21.774)	(24.355)
Observations	40	39
R-squared	0.63	0.65

Note: i) Standard errors in parentheses, ii)***,**,* Significant at the 1%, 5% and 10% levels respectively.

is measured, without a good instrument for competition it is impossible to either rule out reverse causation, or the possibility of non-measured omitted factors causing both. Thirdly, even if we could be sure of the aggregate relationship, it is difficult to tell what mechanism the proxy for competition may be picking up in such cross country regressions. Do people trust others more because they believe that sellers who cheat are more likely to be punished in competitive markets? Or is it because competitive markets are more likely to force sellers to charge prices near marginal cost? Alternatively, this relationship may have nothing to do with trading relationships but may instead reflect that, in more competitive countries, individuals are more likely to work in sectors where labor markets are competitive and therefore are less likely to be exploited by bosses. These are just some of many conjectures that are consistent with such a correlation.

Here we follow a different tack to cross-country analyses and present what we believe is the first analysis of the relationship between competition and trust undertaken using individual level data. Since individuals as consumers are affected by competition in similar ways, we are not able to explore retail channels such as those hypothesized above. However we are able to explore potential channels arising through the workplace. Specifically we examine the relationship between an individual's level of trust, and the degree of competition in the sector in which he or she works. By taking the 2004 wave of the US General Social Survey, which included an extended workplace module, we match these sectors to a measure of competition obtained from the 2002 wave of the US census survey of firms.[9] The census reports a type of sectoral concentration measure – the per cent of total sales in a sector covered by the largest n firms. From this, we construct two proxies for competition for $n = 4$ and 50.[10] Our first main finding is that each of these measures exhibits a statistically significant and robust correlation with a positive answer to the generalized trust question.

This correlation is robust to the inclusion of controls for the measures that have been previously shown to predict trust, and is large: a one standard deviation increase in the competition measure is correlated with an approximately five percent increase in the probability that a respondent usually trusts individuals. An advantage of the data that we use is that it is unlikely to suffer from reverse causation. The concentration of firms in a sector is unlikely to be caused by the level of trust reported by workers in the sector. Another advantage is the existence of an extremely detailed "Workplace Environment" module available only for the 2004 wave of the GSS, which allows us to explore further the reasons for this correlation. Doing this rules out a number of possibilities: the relationship between trust and competition is not arising because more competitive sectors have smaller workplaces, higher unionization rates, or more intense supervision. It is also not arising in particularly congenial workplaces – as would be consistent with a corporate culture explanation. We also find no evidence of selection of high trust individuals into more competitive sectors. However, higher levels of experience interacted with working in a competitive sector is a strong predictor of

[9] http://www.census.gov/epcd/www/concentration.html

[10] Since our measures are of competition they are coded inversely to concentration measures. The correlations between our measures of competition, which have the advantage of being available for all sectors, and the Hirschman/Herfindahl index of concentration which is available for manufacturing sectors only is -0.77 (comp4) and -0.85 (comp50).

reported trust, suggesting that trust may be being built through time spent in competitive environments.

We then develop a theory to explain our empirical findings. The first step in developing such a theory is to take a stand on whether answers to the trust question are picking up respondent's beliefs about how others are likely to behave, i.e, the trustworthiness of others, or if they are picking up preferences regarding factors like altruism or reciprocity. Sapienza, Toldra and Zingales (2008) look at how answers to the trust question correspond with play in a modified version of the trust game where senders are also asked directly for information on their beliefs regarding receiver behavior. They show there that trust, as reflected in answers to the trust question, is highly correlated with a respondent's beliefs about the trustworthiness of a paired playing partner in the game. Another factor indicating it is beliefs that are being elicited is suggested by the place of work having such a formative effect. Adult experiences, like the workplace, are more likely to affect beliefs than preferences, which are formed when young and are generally less mutable through adulthood.

Most theoretical work on the relationship between market competition and trust has predicted the opposite to what we observe. A survey by Bowles (1998) summarizes the main arguments in this literature: competition limits the possibility of repeated interaction; anonymity – a factor also thought to characterize atomistic competitive markets – doesn't allow reputations to be gained; the time and familiarity required to build trust is limited by the churning that characterizes competitive markets. Previous literature thus tends to suggest that the canonical anonymous, atomistic, competitive market is ill-suited to developing pro-social behavior, and thus unlikely to engender trust.

But previous analyses of the role of competition have been concerned with the impact of increased competition amongst traders on the behavior of traders themselves. Instead, as is consistent with the correlation we document, we study the impact of competition *across* firms on trust levels of agents *within* firms. Our hypothesis is that, since so much of one's waking life is spent at work, the trustworthiness of one's co-workers has some impact on one's expectations about the trustworthiness of people in general. When one's co-workers are trustworthy, one is more likely to not only trust these co-workers, but also to believe that others are likely to be trustworthy and thus report a higher level of generalized trust.

We suggest more trustworthiness arises due to the disciplining effect of competition on free-riding behavior. Each one of the many workplaces in the labor market constitutes a collection of workers linked together via the performance and continued existence of their firm. Within a group, some degree of free-riding is always possible, and always beneficial for the individual worker, conditional upon group performance. But groups with more free-riders tend to under-perform. In sectors where groups (or firms, which are our unit of observation) are engaged in more intense competition, the collective punishment for under-performance is greater, as firms are more likely to be forced to shut-down. Consequently the group competition effect punishes free-riding, and this punishment is greater the stronger is sectoral level competition. An immediate implication is that more competitive sectors should have lower levels of free-riding, i.e., more trustworthy

co-workers and hence, under our maintained assumption, higher levels of generalized trust.[11]

The data does not allow us to directly test the assumption that workers' beliefs about the general trustworthiness of the population, i.e., their answers to the generalized trust question, are informed by the degree of free-riding by their colleagues. However, the final part of the paper indirectly tests the model by exploring implications for other variables in the same data set, and beyond. The model predicts: threshold effects in the relationship between competition and trust; a non-monotonicity in the relationship between competition and job security; non-monotonicities in the relationship between wages and competition; and lower effects of competition on workers who are insulated from the disciplining effects of market competition (like government employees). Almost everywhere the data is found to be consistent with the predictions of the model. For a few of these predictions, though consistent, the findings are too statistically weak to count as a plausible test. For the remainder, the findings are both consistent and yields statistically significant results that are strongly in line with the model's predictions.

The Paper proceeds as follows. Section 2 locates the paper with respect to literature not already mentioned. Section 3 establishes the basic relationship between trust and competitiveness using the GSS and census data sources, and controlling for the usual determinants and an extended set of controls. It also explores experience interactions. Section 4 develops a model to explain this relationship and extracts a set of additional implications from the model that can be empirically scrutinized. Section 5 returns to the data to examine these predictions. Section 6 concludes, discusses the results obtained here in reference to the current literature, and suggests future directions of research.

2 Previous Literature

We are examining a contrasting side of the trust phenomenon to that which has been the focus of much recent work. A number of recent studies have used the same trust question and compared answers of GSS respondents with those of the country of origin of their ancestors, obtained from the World Values Survey. These studies find that trust shows considerable cross-generational persistence. Controlling for many of the cross-sectional determinants of trust, individual levels are predicted by average trust levels in their parents' countries of origin, Guiso et al. (2006) and Algan and Cahuc (2006, 2007).[12] Uslaner (1999, 2006) also argues strongly for the inculcation of trusing behavior by parents.

While not denying the importance of the past, it is also clear that trust is not entirely determined by the

[11] Henrich (2004) argues for a type of group based selection in explaining pro-social behavior that is similar to what we model. In his model the "between-group" component of selection acting on the frequency of a group beneficial, but individually costly trait (here it is trustworthiness) exactly offsets the "within-group" forces that disfavor that trait. Henrich's paper argues more broadly for models of "group selection" in the social sciences, and provides some context and comparison with their use in genetics and biology.

[12] The idea of inheriting attitudes has been applied more broadly than trust. For example, Fernandez (2007) used attitudes towards working women in source countries to predict attitudes of US immigrants to such work.

past. For example, education has long been known to correlate with reported trust levels.[13] We view our inquiry as thus complementary to these studies. Whereas they have been trying to rule out higher frequency influences on attitudes in order to uncover their persistent components (which we do not contest on the basis of strong evidence for such effects), we are interested in a relatively immediate impact of an economic factor on these same attitudes.

One reason to be interested in such a higher frequency source of impact is that, if it exists, it suggests an important avenue for policy. Accordingly, our findings temper against a type of policy nihilism that arises when cultural or attitudinal variables correlate with economic outcomes. When such attitudes or cultures are seen as deep immutable parameters of individual preferences there is little that can be done to affect outcomes through these channels.[14] However, as the findings here suggest, when such cultural variables are influenced by elements of the economic or institutional environment, it is possible for these to be directly influenced by policy, and thereby for policy aimed at culture to work.

Previous models of cultural evolution, which primarily hinge on parent-to-child values transmission such as Bisin and Verdier (2001), do not seem like the natural place to start to examine the effect of the workplace.[15] A caveat to this statement is in cases where individuals with differing characteristics, that are acquired through the family, select into different occupations or different sectors based on these characteristics. These are features explored in the models of Corneo and Jeanne (2007) and Doepke and Zilibotti (2008). The latter assume that parents effectively choose the occupation of their off-spring by selecting a discount rate for them, whereas the former explore the effects of parents' inculcating different values on these occupational choices. Both develop models that are focused on societal trajectories over the very long run, and since our data will suggest that selection is not a big factor for our findings, we do not use models like those here.

Our findings relate to a debate, dating back at least as far as Montesquieu, that centred around the question of whether markets "civilize"; encourage altruism, generosity and trustworthiness, or "debase"; lead to greed and narrowly pursued self interest. Eighteenth century thinkers, starting with Montesquieu, argued the former, Schumpeter, Marx and other nineteenth century writers argued the opposite. It is conjectured that for functioning markets, social capital often plays an important facilitating role. However, if market competition itself undermines social capital, then it will be the case that, without extraneous ameliorating

[13] For example, Tabellini (2008b) is concerned with the problem that trust levels may be determined by the quality of governance indicators and vice versa. One empirical strategy he exploits there is to explore exogenous source of variation in values (deriving from language) and exogenous sources in governance (deriving from legal origins) in order to net out causal effects running from trust to governance.

[14] This can be one interpretation of the inter-generational stability of trust attitudes as reported in the studies we reference above.

[15] Cross-generational characteristic acquisition has been modeled through processes of cultural evolution that were pioneered in economics by Bisin and Verdier. See Bisin and Verdier (2001) for an early formal treatment of cultural selection, and Bisin and Verdier (2006) for an extensive discussion of the many applications of this model.

factors, the extension of markets and competition will tend to undermine one of the very factors necessary for their inception. Hirschman (1982) contends that twentieth century work tended to ignore the whole question, leading to the conclusion that markets are largely irrelevant to the development of such behaviour. Our results weigh in strongly in favor of the eighteenth century thinkers, like Montesquieu cited earlier; the extension of markets themselves may induce the changes in beliefs that are necessary for further extension to be successful.

This beneficent effect of markets and competition has not generally been reported in experimental settings where the role of market setting on subject behavior has been analyzed in laboratory contexts. Bowles (1998) summarizes the earlier experimental literature:

> "The experimental results might be summarized by saying that the more the experimental situation approximates a competitive (and complete contracts) market with many anonymous buyers and sellers, the less other-regarding behavior will be observed." p.89

Recent experimental results are more mixed. Huck Lunser and Tyran (2007) study the effects of increased competition amongst sellers with an ability to build reputations for experience goods. The possibility of punishing sellers by shopping elsewhere increases trust in sellers. But in a similar environment Brandts, Riedl and van Winden (2006) find increased competition has little positive effect.[16]

A number of papers share a related interest to ours in exploring the effects of policy on beliefs and norms of cooperation.[17] Aghion, Algan and Cahuc (2008) argue that government minimum wage policies can undermine the ability of firms and workers to learn about each others' cooperative attitudes, and that low cooperation in turn creates a demand for wage policies. They show that such interactions can precipitate both good (high trust, high unionization and low regulation) and bad equilibria. The model's patterns are shown to be consistent with cross-country patterns in these variables. Relatedly, Aghion, Algan, Cahuc and Shleifer (2008) show that government regulation is strongly negatively correlated with social capital. They explain this with a model in which economies converge to one of two types of equilibria: individuals do not invest in civic attitudes, create negative externalities in their business dealings, and demand high regulation of business actions, or they invest, impose fewer negative externalities, and regulation demand is low. A similar finding of substitutability between centralized government regulation of an activity and civic attitudes that would support it is studied in the case of trust and decentralized investment decisions by Carlin,Viswanathan and Dorobantu (2007). Alesina and Angeletos (2005) similarly showed a two way causation between policies and beliefs, in their case it was between the size of government, ensuing corruption levels and beliefs about

[16] The work in laboratory settings on this issue does not seem to have reached a clear conclusion yet. In a recent study, Bolton, Loebbecke and Oxenfels (2008) argue that in internet markets competition may improve trust levels by improving information flows.

[17] Although competitiveness, and not competition policy, is the factor we measure, it is clear that if it can be established that competitiveness of a sector affects attitudes, it is a small step to then showing that competition policy also does so.

what sort of corruption and rent-seeking levels are fair. Alesina and Fuchs-Schendelien (2005) studied the effects of communism on beliefs, and Nunn and Wantchekon (2008) use Afrobarometer surveys to explore the effects of the slave trade on trust within African regions today.

Laporta, Lopez, Shleifer, Vishny (1997) use the World Values Survey (WVS) trust question (which is similar to that used here) to compare trust across countries and its correlation with legal, civic and bureaucratic features of countries. They find positive correlations between bureaucratic quality, tax compliance, judicial performance, civic participation, large organizations and trust levels. A number of cross-country studies have explored the role of trust (amongst other attitudinal variables), as measured in the WVS, for growth and economic outcomes more generally across large groups of countries, Knack and Keefer (1997), and within the regions of Europe, Tabellini (2007) and Beugelsdijk and van Schaik (2005). In primitive societies, related findings have been reported in a series of papers by Henrich et. al. (2001). Market integration leads to higher average offers in the ultimatum game played in these societies, though the marked difference in contexts suggests no easy parallels with the results here.

A similar analysis to that which we presented as motivation above, has been undertaken at the cross-country level by Fischer (2007). Using the same trust question as used here from the World Values Survey, she interacts country level competition (proxied by investment price/goods price ratio) and market integration (proxied via income categories). Though the way of measuring competition is widely different from what we have done above, she has similar findings. Market integration seems to have a larger positive impact on trust in competitive environments.

Finally Glaeser et. al. (2000) and Alesina and La Ferrara (2002) have examined many of the determinants of trust using different waves of the General Social Survey. Their analyses inform the basic regressions and controls that we will carry throughout the analysis. Glaeser's study was important in being the first to demonstrate that responses to the trust survey correlate with actual trusting play in experimental situations where financial rewards are at stake.[18] Alesina and La Ferrara extended the analysis of trust to investigation of neighbourhood effects. They documented such effects on trust arising from equality and heterogeneity and showed that it can be an important contributor to mistrust.

No previous study has examined the effect of competition on trust using micro data. Our matching of competition data from the census of firms to the General Social Survey is, to our knowledge, the first such attempt to do so.

[18] Though, somewhat surprisingly, they found that being trusting was correlated with playing trust games in a trustworthy matter. It was not the case that reporting oneself as trustworthy correlated with trustworthiness of play in the game. See also footnote 3 above.

3 The Relationship between Trust and Competitiveness using the GSS

Data Description

We use the 2004 wave of the US General Social Survey, in order to exploit its uniquely detailed workplace information. The survey was first implemented in 1973, and at least every other year since then. Since 1994 there have been two samples in even numbered years with a target sample of 1500 each. The survey is asked of one adult per household and the sampling reflects regional population densities.[19] The dependent variable of interest is "Can Trust" which is a response to the following question: "Generally speaking, would you say that people can be trusted or that you can't be too careful in dealing with people?" There are four categories of response: 1 ALWAYS TRUSTED, 2 USUALLY TRUSTED, 3 USUALLY NOT TRUSTED, 4 ALWAYS NOT TRUSTED. The unconditional distribution of responses is depicted in Figure 2.[20]

[Insert Figure 2]

The literature on trust has established a set of individual characteristics to be used as explanatory variables. The other variables that we include are those that have been previously shown to predict trust: Income, which is a categorical variable with 24 categories which we include as dummies; Education, measured in years of completed schooling; Age, Marital status; Sex; and City size.[21] Additionally, three categories of race (white, black, other) and self-reported ethnicity information by country of ancestral origin are included. From these we construct ethnicity and race dummies, the details of which are elaborated in the data appendix. Table 2 reports the sample means and standard deviations for each of these variables for a sub-sample of 616 individuals. The determinants of this sample are explained below.

[Insert Table 2]

The Competition Measure

We match individual sector of employment with a sectoral measure of competition. Every five years, the census office surveys the population of US firms. The survey reports the percentage of total sales covered by the n largest firms ($n = 4, 8, 20, 50$) in North American Industrial Classification System (NAICS) sectors.[22]

[19] The main General Social Survey website is at http://www.norc.org/GSS+Website/ This site contains full information and documentation for every wave of the survey and downloads upto 2006.

[20] Most waves of the General Social Survey and the World Values Survey have not included a four-fold response category. Instead, they allow either "usually trust" or "can't be too careful in dealing with people" with often a third category "it depends", as responses to the same trust question as asked above.

[21] We mainly follow Glaeser et. al. (2000) here. We include controls for the size of a city in which one lives, and will include workplace size controls later. Alesina and La Ferrara (2002) analyze a richer set of regional measures than we have available, and connect these to regional income Ginis and fragmentation measures.

[22] See the website http://www.census.gov/epcd/www/naics.html for details.

Figure 2

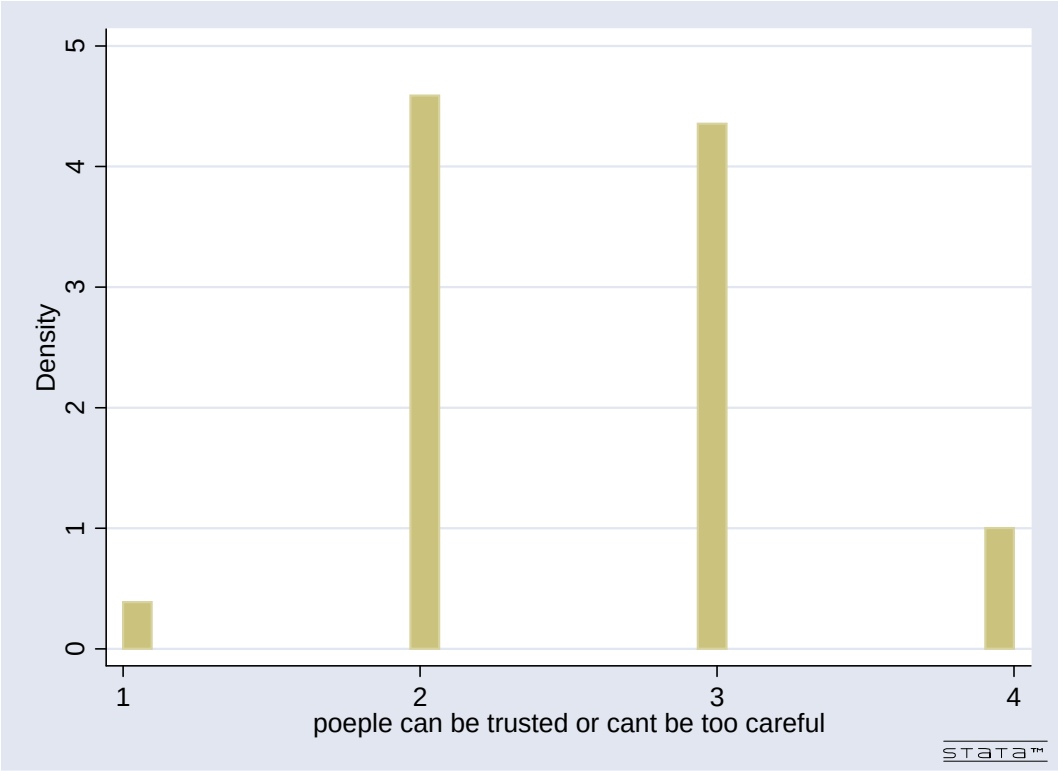

Density
0
1
2
3
4
5
1
2
3
4
poeple can be trusted or cant be too careful
Stata™

Table 2. Summary Statistics

Variable	Obs.	mean	sd
trust2	616	0.495	0.500
income98	616	16.560	5.841
educ	616	13.537	2.867
female	616	0.599	0.490
age	616	46.020	16.429
anglo	616	0.206	0.405
northeur	616	0.216	0.412
southeur	616	0.080	0.271
africa	616	0.086	0.281
asia	616	0.063	0.244
black	616	0.130	0.336
white	616	0.807	0.395
size	616	290.961	1041.760
married	616	0.523	0.500
widdivsep	616	0.274	0.447
protestant	616	0.537	0.499
catholic	616	0.224	0.417
jewish	616	0.026	0.159
noreligion	616	0.125	0.331
comp4	616	83.171	16.000
comp50	616	60.615	24.913

As a measure of competition this is clearly not perfect, as factors other than the competitiveness of a sector will affect these measures. A preferred, but still imprecise measure would be the Hirschman/Herfindahl Index measure of concentration, but the census reports these for manufacturing only. As mentioned earlier, for sectors where both are present, the correlation between our measures and the Hirschman/Herfindahl index is around 0.8.

Since the GSS reports sector, or industry, using 1980 census (3 digit) codes, it is necessary to first convert these to 1990 census code measures and then use a cross-walk converter to obtain the corresponding NAICS (4 and 5 digit) measures. Each one of these steps leads to the loss of a small number of observations as industry classification systems change.

Once a NAICS measure is obtained for each household observation it is matched with the census percentage sales measures. We do this for the largest and smallest census measures, i.e., $n = 4$ and $n = 50$. The final variables, which are our measures of competition, "Comp4" and "Comp50" are computed by subtracting the respective concentration measures from 100. Thus Comp4 for sector x is the percentage of total sales in x that is NOT covered by the largest 4 firms in that sector; similarly for Comp50. A higher measure for each of these variables corresponds to a more competitive sector.

The average sector in our sample has measures of 82.65 for Comp4 and 60.53 for Comp50. A sector corresponding approximately to the average is NAICS # 42314 "Used Motor Vehicle Parts Merchant Wholesalers". An example of a competitive sector is NAICS # 44112 "Used Car Dealers", with Comp4 = 92.9 and Comp50 = 87. A particularly uncompetitive sector is NAICS # 31132 "Chocolate and Confectionery Manufacturing from Cacao Beans", with Comp4 = 31.0 and Comp50 = 1.2. Figures 3a and 3b plot the distribution of Comp50 and Comp4 respectively, the appendix reports sectoral averages for highly aggregated sectoral constructs.[23] In general, most services are more competitive than both manufacturing and retailing.

[Insert Figures 3a and b]

Estimation Procedure

In order to explore the impact of competition on trust we run regressions of the following form:

$$Cantrust = \beta_0 + \beta_1 Comp\ x + \widetilde{\beta}\widetilde{Z},$$

where we use both $x = 4$ and $x = 50$ in different estimations, and where $\widetilde{Z}$ is a vector of independent variables that we describe below. The vector $\widetilde{\beta}$ corresponds to their coefficients. Since the "Cantrust" variable has four ordered categories, it is natural to try to estimate this with an ordered logit regression. We have experimented with many such estimates, but a Brant test of any of these ordered logit specifications rejects

[23] There are over 100 different sectors reported by respondents in the full sample. The appendix aggregates up to two digit NAICS sectoral classification numbers.

Figure 3a

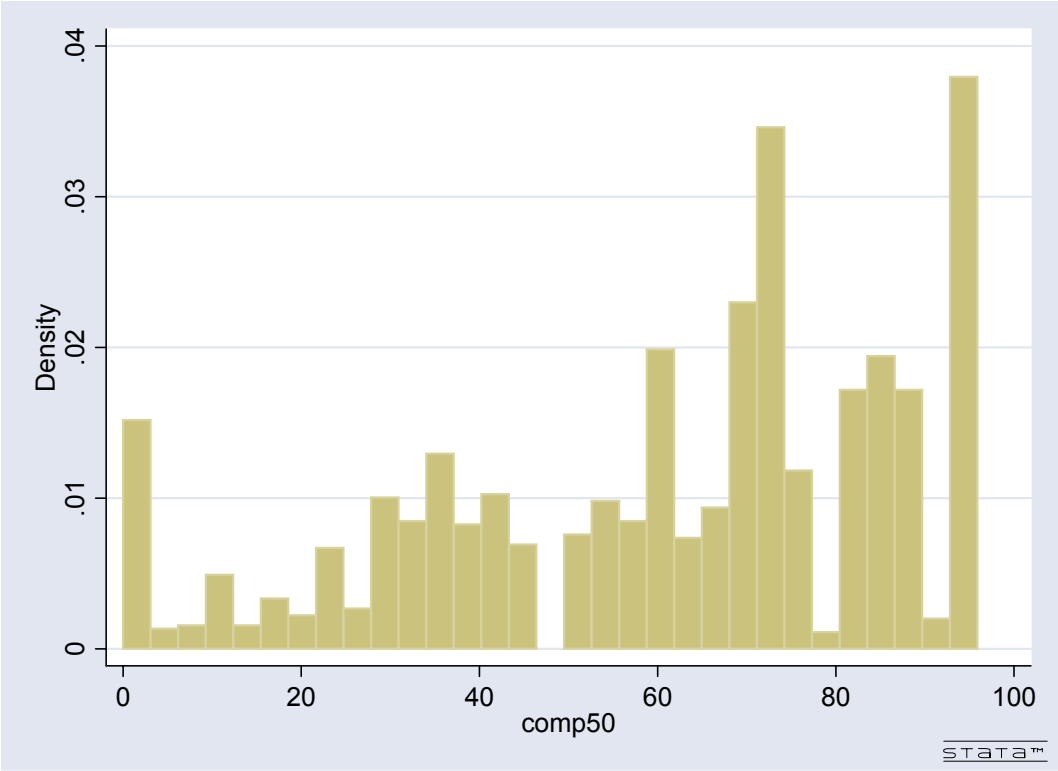
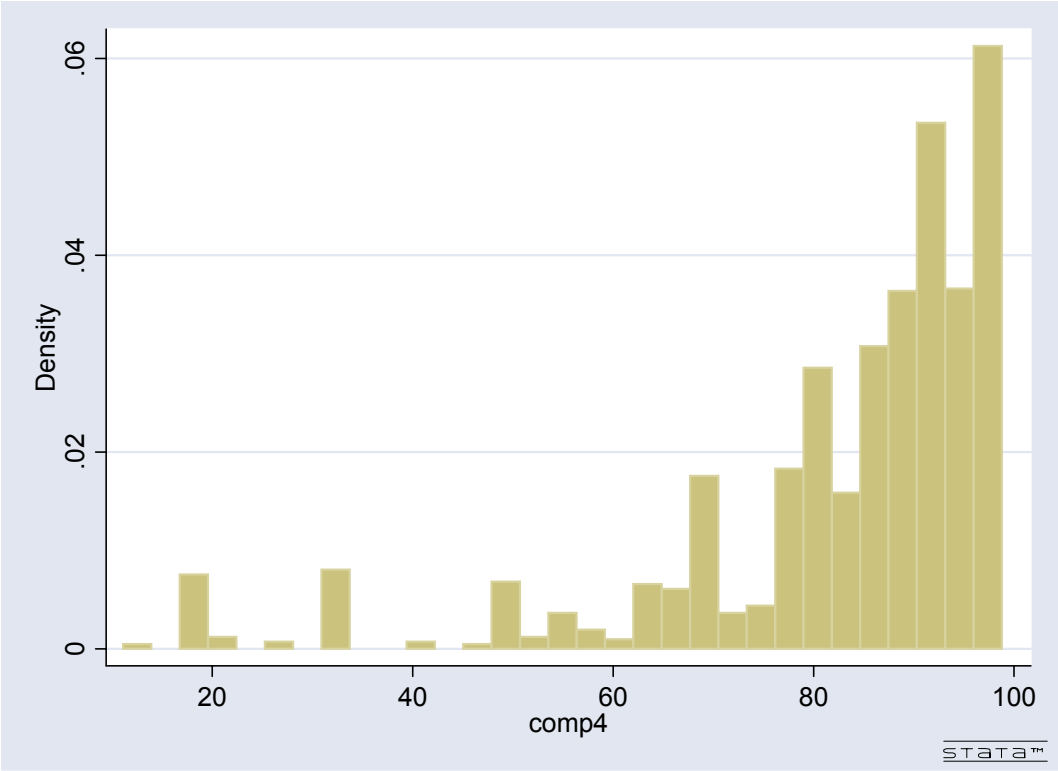


Figure 3b



the parallel regressors assumption which is imposed in ordered logit estimation. This is not surprising since parallel regressors amounts to imposing a constant set of βs for the transition across each category. Such an assumption is restrictive in the present context as, for example, it amounts to assuming that the marginal impact of a regressor on the choice between answering "always trust" and "usually trust" is equivalent to the marginal impact of a variable on the choice between answering "usually trust" and "usually don't trust". Accordingly, none of the ordered logit estimation results will be reported from hereon. Since almost ninety percent of the responses fall in the two middle categories "usually trust" and "usually don't trust", we focus on these from hereon. We code "usually trust" as 1 and "usually don't trust" as 0 and name this variable "trust2". We have estimated all of the regressions we report below as logit and probit, but we report results in the paper obtained from estimating a linear probability model, since the significance of estimates does not change under this specification, and the coefficients can be directly interpreted.[24]

We first show that the data conform to the usual patterns seen when trust is regressed on individual characteristics. Table 3 reports regressions with the trust dependent variable run on a common set of individual regressors without the inclusion of any competition measures. This set of estimations is on our core sample of 616 respondents for whom we have industry information and can therefore designate a competition variable, the appendix reports summary statistics for this core sample as well. The mean answer to the trust question is 0.495 with standard deviation 0.500, i.e., about 50% of respondents answer "usually trust" as opposed to "usually don't" in response to the canonical trust question. This is higher than the usual positive answers to the trust question reported in most previous studies undertaken using US subjects for two reasons. The first is our focus on the "usually trust" versus "usually don't" groups. As can be seen from the histogram in Figure 2, the extreme answerers — subjects responding with "always trust" and "always do not trust" are almost twice as likely to answer in the negative. Excluding these extreme answerers thus disproportionately rules out negative responses. Secondly, in order to obtain workplace competition measures, we have selected on individuals who have a sector of employment, and therefore have jobs. As previous studies have found a positive correlation between trust and income, we should expect this to imply a higher than representative proportion of trusters in our core sample.

Column one of Table 3 reports results for a basic set of regressors that have been explored in previous studies. Errors here are unclustered. As in previous studies (Glaeser et. al (2000), Helliwell and Putnam (2007) and Alesina and La Ferrara (2002)), years of education is a strong determinant of trust, with each year of completed schooling being correlated with a 3.69% (without occupation dummies, column 1) and

[24] We also experimented with two further types of estimation. In one, we estimate a multinomial logit version of the model which utilizes all of the four response categories, but allows different betas to be estimated for the transition to each response relative to an omitted category. The results that we obtained on the "usually trust" versus "usually don't" under this estimation are very similar to those reported here. In a second variant, we pooled all responses into a binary category. That is, the responses "always trust" and "usually trust" are coded as 1 for "yes" to the trust question and "always don't trust" and "usually don't trust" are coded as 0 for "no". This estimation yields slightly lower size on the competition variables than reported here, and sometimes attenuates significance of the weaker of our competition measures, but leaves things otherwise unchanged.

2.54% (with occupation dummies, column 2) increase in the probability that an individual reports that they "usually trust" as opposed to "usually don't trust" in answer to the canonical trust question. A one standard deviation increase in years of schooling increases trust by 7 to 10 percentage points. Income dummies are included as income is a categorical variable in the GSS, and, as in previous studies, higher income is a positive determinant, (F-test suggests these are jointly significant). Religious denomination has no significant effect in this specification. Self-reported ancestory does have an effect. Individuals with Northern European ancestors, and Anglo (10% significance) (both of which are defined in the appendix) are more likely to answer the trust question positively. Age is entered as a second order polynomial, and is significant at the higher order, though marginally when occupation dummies are included. Neither race nor religion have significant effects though their signs are consistent with those found in previous studies – e.g. Alesina and La Ferrara (2002) find women and blacks less likely to trust.[25] Column 2 includes occupational dummies (which leads to the loss of 2 individuals from the sample). The inclusion of these dummies substantially lowers the effect of education on trust, suggesting that education is operating on trust partly through its effect on occupation. Individuals living in larger cities also report lower levels of trust.

[Insert Table 3]

Table 4 adds the sectoral competitiveness variables to the baseline set of regressors. Since the variation in competition is only at the sectoral level, for all of the regressions where sectoral competitiveness measures are used we report results with errors clustered at the sectoral level, (there are approximately 100 clusters).[26] Odd columns report results for the Comp50 measure, and even ones for Comp4. The first two columns of this table repeat the specification for the first column in Table 3 which does not include occupation dummies. The coefficient on Comp50 in column 1 is 0.00183 and is significant at the 1% level. This coefficient means that a 1% increase in sectoral level competition leads to 0.183 percentage points increase in the probability that a respondent answers "usually trust". In variance normalized terms, this implies that a one standard deviation increase in Comp50 leads to about 4.5 percentage points increase in trust. The estimate on Comp4 is similar, 0.00176 but is only significant at the 10% level. The standard deviation is also smaller for Comp4 so the standard deviation interpretation is of an approximately 2.7 percentage point increase in the likelihood of answering usually trust as opposed to usually don't for a one standard deviation increase in Comp4. This pattern of relatively strong significance for Comp50 and lesser significance for Comp4 is generally repeated throughout the paper.[27] The other regressors enter in a similar direction to the previous table: income and

[25] By varying the sets of regressors, both of these variables sometimes become significant, but since this is not the focus of the present paper we do not explore this here and instead persist with the full set of occupation, income, ethnicity, religion and marital status dummies under which they are not significant.

[26] We have also replicated all of these results without clustering of errors, and by running the regressions with robust standard errors. Once again, nothing significant changes.

[27] Our conjecture as to why this is the case relates to the coefficient of variation in Comp50 being significantly larger than that of Comp4. The proportion of sales covered by the largest 50 firms seems to be picking up much more of the cross industry variation in competition than that of the top 4.

Table 3

VARIABLES	(1) trust2	(2) trust2
educ	0.0369***	0.0254***
	(0.00750)	(0.00845)
female	-0.0101	-0.0424
	(0.0411)	(0.0453)
age	-0.0116	-0.0107
	(0.00748)	(0.00762)
agesquare	0.000146**	0.000135*
	(7.25e-05)	(7.37e-05)
anglo	0.171**	0.147*
	(0.0839)	(0.0826)
northeur	0.164**	0.148*
	(0.0829)	(0.0822)
southeur	0.0825	0.0709
	(0.103)	(0.103)
africa	0.0403	0.0383
	(0.115)	(0.117)
hisp	-0.0141	-0.0363
	(0.118)	(0.118)
asia	-0.0496	-0.0609
	(0.126)	(0.126)
black	-0.184	-0.192
	(0.129)	(0.131)
white	-0.0975	-0.0933
	(0.0999)	(0.101)
size	-4.08e-05**	-4.74e-05***
	(1.69e-05)	(1.74e-05)
married	0.01000	0.0221
	(0.0656)	(0.0669)
widdivsep	-0.0148	0.00308
	(0.0709)	(0.0717)
protestant	0.0177	0.0102
	(0.0783)	(0.0776)
catholic	-0.0351	-0.0367
	(0.0838)	(0.0834)
jewish	-0.231	-0.242
	(0.149)	(0.154)
noreligion	0.0804	0.0770
	(0.0865)	(0.0863)
Constant	0.265	0.512*
	(0.274)	(0.290)
Observations	616	614
R-squared	0.181	0.195
F-test: income dummies jointly=0: Prob > F	0.0316	0.0286

Income, and occupation dummies (in column 2) included.
*** p<0.01, ** p<0.05, * p<0.1
Clustered standard errors in parentheses

schooling remain significant determinants of trust, the ethnicity variables 'Anglo' and 'Northern European' are significantly positive relative to the "other ethnicity" category. None of the race variables are significant and the only thing that changes is that being Jewish enters negatively with significance at the 10% level. The inclusion of occupation dummies, columns 3 and 4, leave the magnitudes for competition effectively unaltered, though they continue to lower the direct effects of schooling, and tip Comp4 to insignificance at the ten percent level (t-stat = 1.650).

[Insert Table 4]

Additional Workplace Variables

The advantage of using the 2004 wave of the General Social Survey is that this wave added a module that asked a rich set of workplace related questions. These are briefly described in Table 5 with details (means, standard deviations, response categories) relegated to the appendix. Most of these variables are based on a question with a pre-statement by the interviewer which was "Please respond to the following statements based on your experience during the past 12 months unless otherwise specified, with reference to your current place of employment only." Many of the variables in the table are directly concerned with exploring the respondent's perceptions of relations between co-workers in the workplace; for example, whether there are heated arguments, people shout, people are put down, others take credit, others are helpful when needed, people act upset, or they turn away when others are threatened. Others ask directly whether the workplace is stressful and how often the respondent skipped work due to unhappiness with the work situation. Respondents were also asked whether they felt their job security was good.

[Insert Table 5]

One may conjecture that the forces of competition induce firms to provide these more congenial workplaces – which are costly – in order to retain the best employees. This is an argument made by Cohen and Prusak (2001). They argue that competitive environments that threaten employers with worker turnover are those that require successful employers to provide the sorts of workplaces that mitigate stress, allow workers to attain a sense of achievement, and respect family and other obligations. Accordingly, one would then expect that such factors would be more prevalent in sectors where competition is more intense among firms, and that these then underly the greater sense of trust that employees in such sectors report. We are able to test such a possibility directly by using this extended workplace module.

Table 6 reports the relationship between the same sets of variables used before and trust, after the addition of these extra workplace variables. The first three columns include Comp50 and the last three Comp4. Column 1 inlcudes all of the additional workplace variables for Comp50 and similarly in column 4 for Comp4. The first thing to note is that for both measures of competition, the picture that emerged previously

Table 4

VARIABLES	(1) trust2	(2) trust2	(3) trust2	(4) trust2
comp50	0.00183*** (0.000633)		0.00191** (0.000733)	
comp4		0.00176* (0.000973)		0.00175 (0.00106)
educ	0.0368*** (0.00801)	0.0370*** (0.00824)	0.0255*** (0.00754)	0.0255*** (0.00761)
female	-0.0166 (0.0359)	-0.0134 (0.0351)	-0.0477 (0.0396)	-0.0452 (0.0399)
age	-0.0108 (0.00703)	-0.0114 (0.00708)	-0.00959 (0.00736)	-0.0104 (0.00736)
agesquare	0.000143** (6.79e-05)	0.000146** (6.86e-05)	0.000128* (7.16e-05)	0.000133* (7.17e-05)
anglo	0.172** (0.0842)	0.174** (0.0839)	0.147* (0.0794)	0.149* (0.0792)
northeur	0.160* (0.0882)	0.166* (0.0879)	0.145* (0.0841)	0.150* (0.0843)
southeur	0.0746 (0.109)	0.0845 (0.109)	0.0566 (0.110)	0.0700 (0.111)
africa	0.0531 (0.115)	0.0554 (0.113)	0.0546 (0.118)	0.0542 (0.115)
hisp	-0.0263 (0.128)	-0.0191 (0.127)	-0.0498 (0.124)	-0.0415 (0.124)
asia	-0.0645 (0.116)	-0.0549 (0.114)	-0.0764 (0.108)	-0.0660 (0.107)
black	-0.190 (0.124)	-0.189 (0.123)	-0.203 (0.124)	-0.199 (0.123)
white	-0.102 (0.102)	-0.0979 (0.101)	-0.102 (0.106)	-0.0954 (0.105)
size	-4.35e-05*** (1.64e-05)	-4.20e-05** (1.66e-05)	-4.94e-05*** (1.69e-05)	-4.83e-05*** (1.70e-05)
married	0.0115 (0.0597)	0.0126 (0.0591)	0.0230 (0.0603)	0.0242 (0.0603)
widdivsep	-0.0160 (0.0658)	-0.0142 (0.0650)	0.000932 (0.0655)	0.00309 (0.0652)
protestant	0.0205 (0.0770)	0.0161 (0.0767)	0.0153 (0.0769)	0.00960 (0.0762)
catholic	-0.0285 (0.0736)	-0.0384 (0.0728)	-0.0279 (0.0718)	-0.0388 (0.0702)
jewish	-0.240* (0.144)	-0.239* (0.142)	-0.246* (0.147)	-0.247* (0.146)
noreligion	0.0845 (0.0812)	0.0800 (0.0804)	0.0829 (0.0837)	0.0773 (0.0818)
Constant	0.110 (0.275)	0.0974 (0.275)	0.347 (0.244)	0.346 (0.253)
Observations	616	616	614	614
R-squared	0.188	0.184	0.202	0.198

Note: i) Clustered standard errors in parentheses, ii)***,**,* Significant at the 1%, 5% and 10% levels respectively, iii) Income and occupation dummies (in columns 3 and 4) included.

Table 5

Brief Description of Additional Workplace Variable (variable name)
• Heated arguments occur in workplace (hotargus)
• People at work can be relied on (reliedon)
• How often respondent finds work stressful (wkstress)
• Some people hold standards in workplace that others don't (difstand)
• People feel free to report problems in workplace (rptprobs)
• Other people take credit for respondents work or ideas (othcredt)
• People at work treat respondent in a manner that puts respondent down (putdown)
• People at work fail to give respondent necessary information (lackinfo)
• People at work get in respondent's personal space to intimidate (perspace)
• Respondent has been threatened with physical harm at work (physharm)
• People at work throw things when upset with respondent (actupset)
• People at work shout at respondent in hostile manner (shout)
• How often respondent stayed at home or left work early (skipwork)
• People are treated with respect (treatres)
• People look the other way when others are threatened (lookaway)
• Job security is good (gdjobsec)

persists largely unchanged, the coefficients on both Comp50 and Comp4 remain at around .002, suggesting that these workplace variables do not seem to be related to the avenues through which competition affects trust. Once again Comp50 remains highly significant ($t-values$ over 2.5), and Comp4 is of less significance, ($t-values$ around 2). For the most part, the additional workplace module questions are generally not significantly correlated with trust. The one exception is the variable "hotargus" which is the answer to the question: "Please respond to the following statements based on your experience during the past 12 months unless otherwise specified, with reference to your current place of employment only:. Heated arguments occur in my workplace." this is coded as a 1 if heated arguments occur "often", or "sometimes" and 0 if "rarely" or "never". The negative sign suggests that places with fewer heated arguments are also workplaces where individuals have higher levels of trust. The "skipwork" variable is marginally significant. The literature question is: "During the past 3 months, how often did you stay at home or leave work early because you were unhappy about your work situation?"

The regressors also include whether the workplace is unionized, and the size of the workplace, with the "local number" variable which literally asks: "About how many people work at the location where you work?" Neither the workplace size nor union variables are significanly correlated with trust. Column 2 repeats the specification in column 1 including unionization, the size of the workplace and the two workplace variables that were significant in column 1 ("hotargus" and "skipwork"), and column 3 modifies this by dropping unionization and size of the workplace. Neither of these specifications change anything of substance with respect to Comp50, and repeating the same steps for Comp4 (columns 5 and 6) also leads to no changes of note.

We have experimented with many different combinations from this full set of additional workplace variables and the picture obtained remains unchanged. The significance and magnitude of either competition measure is largely unaltered by the particular combination we try. The relationship between competition and trust that we are picking up seems to be occuring through a channel that is independent of the workplace module questions asked in the GSS. We conclude that we are unlikely to be picking up an effect like that posited in Cohen and Prusak (2001), namely congenial environments engendering greater trust.

[Insert Table 6]

Risk Aversion

It has been found in play of the trust game first described by Berg, Dickhout and McCabe (1995) by for example Karlan (2005) and Schechter (2004), that trusting behavior in this game (the amount sent by the first mover) is highly correlated with low risk aversion. If competitive sectors had low levels of job security, then it may be that these select risk lovers, who are also those likely to trust. This makes some

Table 6

VARIABLES	(1) trust2	(2) trust2	(3) trust2	(4) trust2	(5) trust2	(6) trust2
comp50	0.00208**	0.00214***	0.00194***			
	(0.000794)	(0.000763)	(0.000714)			
comp4				0.00213*	0.00215*	0.00190*
				(0.00111)	(0.00111)	(0.00108)
educ	0.0255***	0.0256***	0.0246***	0.0256***	0.0257***	0.0246***
	(0.00822)	(0.00782)	(0.00766)	(0.00828)	(0.00789)	(0.00776)
age	-0.0104	-0.0111	-0.0108	-0.0113	-0.0120	-0.0116
	(0.00727)	(0.00737)	(0.00740)	(0.00719)	(0.00736)	(0.00739)
age square	0.000135*	0.000139*	0.000135*	0.000141**	0.000146**	0.000141*
	(7.07e-05)	(7.18e-05)	(7.20e-05)	(7.01e-05)	(7.17e-05)	(7.19e-05)
size	-3.66e-05**	-3.55e-05**	-3.95e-05**	-3.52e-05**	-3.44e-05**	-3.81e-05**
	(1.61e-05)	(1.62e-05)	(1.62e-05)	(1.63e-05)	(1.63e-05)	(1.64e-05)
union	-0.103	-0.0929		-0.107	-0.0974	
	(0.108)	(0.105)		(0.108)	(0.105)	
hotargus	-0.180**	-0.189***	-0.187***	-0.180**	-0.191***	-0.191***
	(0.0770)	(0.0665)	(0.0643)	(0.0771)	(0.0667)	(0.0645)
skipwork	0.242*	0.222*	0.221*	0.237*	0.214*	0.212*
	(0.132)	(0.123)	(0.123)	(0.134)	(0.125)	(0.125)
wkstress	-0.0910			-0.0952		
	(0.0593)			(0.0591)		
difstand	0.0152			0.00974		
	(0.0479)			(0.0476)		
putdown	0.0433			0.0463		
	(0.0831)			(0.0822)		
gdjobsec	-0.0308			-0.0277		
	(0.0511)			(0.0525)		
treatres	0.0639			0.0592		
	(0.121)			(0.122)		
reliedon	0.0848			0.0847		
	(0.106)			(0.106)		
rptprobs	0.104			0.106		
	(0.0814)			(0.0818)		
othcredt	-0.00104			-0.00150		
	(0.0654)			(0.0660)		
lackinfo	0.0508			0.0519		
	(0.0666)			(0.0667)		
perspace	0.00939			0.00312		
	(0.0937)			(0.0940)		
physharm	-0.150			-0.153		
	(0.185)			(0.186)		
actupset	0.00474			-0.000194		
	(0.163)			(0.163)		
shout	0.0721			0.0647		
	(0.186)			(0.185)		
lookaway	0.0353			0.0390		
	(0.0843)			(0.0839)		
Observations	614	614	614	614	614	614
R-squared	0.236	0.224	0.218	0.232	0.220	0.214

Note: i) Clustered standard errors in parentheses, ii) ***,**,* Significant at the 1%, 5% and 10% levels respectively, iii) the regressions include a constant and Income, Occupation, Religion, Ethnic, Sex and Marital status dummies.

sense. If trusting means taking a risk, then individuals who report trusting may simply be individuals with low levels of risk aversion. This is investigated in Table 7 which includes the variables "optimist" (strength of agreement with "I'm always optimistic about my future") and "moregood" (strength of agreement with "Overall, I expect more good things to happen to me than bad"). Column 1 includes "moregood", column 2 "optimist", and column 3 both together with Comp50 used as the competition measure. Neither of these optimism variables enters significantly either on their own or together, though they do marginally reduce the size of the coefficient on Comp50, but not its significance. A similar slight reduction is seen for Comp4, the last 3 columns, which in this case makes it insignificant, but this is also due to the sample falling when this variable is included. However, the insignificance of these risk aversion measures and their very small effects on competition suggest that these are not what we are picking up.[28]

[Insert Table 7]

Selection of Trusting into Sectors or Effect of Sector on Trust

Competition at the sectoral level does seem to correlate with reported trust. We now ask whether this is because individuals who are more trusting happen to be selected into these more competitive sectors, or whether individuals entering the workforce with similar trust levels diverge when working in sectors that vary in competition levels. Since we do not have time varying information by individual, we do this by constructing an experience measure for respondents in the sample. This is created by subtracting years of education from the respondent's age minus 6. We then interact each of our competition measures with this constructed experience variable. Table 8 reports results obtained when we omit experience directly in the regressions, as it is colinear with age and education. In order to be able to include experience we also report table 9 where we include age dummies instead of age as a continuous variable and include our constructed measure of experience as a control as well. The results in these two tables are not significantly different so we mainly discuss table 8.

The fact that we are attributing accrued experience to the current sector of employment for individuals who may have switched sectors throughout their career will tend to introduce noise into the analysis, but not an obvious bias. Since there are more chances for switching for individuals who have longer experience, the noise should be worse for these individuals that have been in the workforce longer.

In Table 8 the odd columns report results for Comp50 and the even for Comp4. Columns 1 and 2 are for the baseline set of regressors in Table 4, columns 3 and 4 included a partially extended set of workplace regressors, and columns 5 and 6, the full set of workplace variables.

[Insert Tables 8 and 9]

[28] As noted in Table 7 too, the variable relating to job security was also not significant.

Table 7

VARIABLES	(1) trust2	(2) trust2	(3) trust2	(4) trust2	(5) trust2	(6) trust2
comp50	0.00165** (0.000787)	0.00167** (0.000779)	0.00161** (0.000780)			
comp4				0.00156 (0.00111)	0.00164 (0.00110)	0.00160 (0.00110)
moregood	-0.0464 (0.0613)		-0.0655 (0.0610)	-0.0428 (0.0618)		-0.0624 (0.0614)
optimist		0.0165 (0.0574)	0.00568 (0.0582)		0.0166 (0.0583)	0.00469 (0.0591)
educ	0.0224** (0.00891)	0.0227** (0.00915)	0.0219** (0.00911)	0.0226** (0.00897)	0.0228** (0.00921)	0.0221** (0.00917)
age	-0.0156** (0.00709)	-0.0157** (0.00708)	-0.0143** (0.00685)	-0.0159** (0.00713)	-0.0160** (0.00712)	-0.0146** (0.00688)
age square	0.000199*** (6.74e-05)	0.000199*** (6.73e-05)	0.000185*** (6.46e-05)	0.000200*** (6.79e-05)	0.000200*** (6.78e-05)	0.000186*** (6.50e-05)
size	-4.66e-05** (2.19e-05)	-4.68e-05** (2.19e-05)	-4.31e-05** (2.16e-05)	-4.55e-05** (2.19e-05)	-4.58e-05** (2.19e-05)	-4.20e-05* (2.16e-05)
Observations	532	532	532	532	532	532
R-squared	0.221	0.221	0.226	0.219	0.218	0.223

Note: i) Clustered standard errors in parentheses, ii) ***,**,* Significant at the 1%, 5% and 10% levels respectively, iii) the regressions include a constant and Income, Occupation, Religion, Ethnic, Sex and Marital status dummies.

Table 8: With quadratic age and without experience

VARIABLES	(1) trust2	(2) trust2	(3) trust2	(4) trust2	(5) trust2	(6) trust2
comp50	-0.000758		-0.000468		-0.000597	
	(0.00149)		(0.00148)		(0.00152)	
comp50exper	9.31e-05*		9.06e-05*		9.22e-05*	
	(4.72e-05)		(4.72e-05)		(4.79e-05)	
comp4		-0.00182		-0.00149		-0.00154
		(0.00252)		(0.00247)		(0.00241)
comp4exper		0.000141*		0.000143*		0.000143*
		(8.23e-05)		(8.18e-05)		(7.98e-05)
age	-0.0189**	-0.0246**	-0.0200**	-0.0264**	-0.0195**	-0.0257**
	(0.00879)	(0.0109)	(0.00866)	(0.0109)	(0.00856)	(0.0104)
agesquare	0.000166**	0.000160**	0.000177**	0.000174**	0.000173**	0.000170**
	(7.40e-05)	(7.17e-05)	(7.40e-05)	(7.26e-05)	(7.30e-05)	(7.08e-05)
educ	0.0311***	0.0373***	0.0313***	0.0378***	0.0313***	0.0377***
	(0.00808)	(0.0105)	(0.00831)	(0.0103)	(0.00881)	(0.0107)
union			-0.0969	-0.0985	-0.105	-0.105
			(0.105)	(0.104)	(0.108)	(0.108)
hotargus			-0.177***	-0.181***	-0.169**	-0.170**
			(0.0641)	(0.0643)	(0.0740)	(0.0744)
skipwork			0.216*	0.209*	0.236*	0.231*
			(0.122)	(0.124)	(0.131)	(0.133)
Observations	612	612	612	612	612	612
R-squared	0.212	0.208	0.233	0.229	0.245	0.242

Note: i) Clustered standard errors in parentheses, ii) ***,**,* Significant at the 1%, 5% and 10% levels respectively, iii) the regressions include a constant and Income, Occupation, Religion, Ethnic, Sex and Marital status dummies, iv) in column (5) and (6) all non significant “work place environment” variables are included but not reported.

Table 9: With age dummies and experience

VARIABLES	(1) trust2	(2) trust2	(3) trust2	(4) trust2	(5) trust2	(6) trust2
comp50	-0.000632		-0.000412		-0.000633	
	(0.00144)		(0.00142)		(0.00142)	
comp50exper	9.21e-05*		9.12e-05*		9.56e-05**	
	(4.72e-05)		(4.74e-05)		(4.69e-05)	
comp4		-0.00170		-0.00140		-0.00150
		(0.00252)		(0.00247)		(0.00237)
comp4exper		0.000141		0.000146*		0.000149*
		(8.62e-05)		(8.64e-05)		(8.28e-05)
exper	-0.00573	-0.0117	-0.00731	-0.0139	-0.0124	-0.0188
	(0.0126)	(0.0142)	(0.0129)	(0.0146)	(0.0136)	(0.0149)
educ	0.0244*	0.0247*	0.0236*	0.0237*	0.0192	0.0194
	(0.0131)	(0.0132)	(0.0132)	(0.0131)	(0.0141)	(0.0141)
union			-0.110	-0.112	-0.130	-0.131
			(0.104)	(0.103)	(0.109)	(0.108)
hotargus			-0.171***	-0.175***	-0.161**	-0.162**
			(0.0647)	(0.0650)	(0.0746)	(0.0750)
skipwork			0.213*	0.207	0.244*	0.240*
			(0.124)	(0.126)	(0.132)	(0.133)
wkstress					-0.102*	-0.103*
					(0.0571)	(0.0566)
Observations	612	612	612	612	612	612
R-squared	0.222	0.218	0.242	0.239	0.257	0.254

Note: i) Clustered standard errors in parentheses, ii) ***,**,* Significant at the 1%, 5% and 10% levels respectively, iii) the regressions include a constant and Age, Income, Occupation, Religion, Ethnic, Sex and Marital status dummies, iv) in column (5) and (6) all non significant workplace variables are included but not reported.

The results are striking. Adding the interaction term makes both competition variables on their own insignificantly different from zero. The interaction term itself is positive and significant for both competition variables across all specifications, at the 10% level. This seems to be evidence against the selection hypothesis. Individuals without experience are no more likely to respond positively to the trust question if they work in competitive sectors. However, as individuals increase their experience in the labor market, working in a competitive sector has a positive impact on their reported trust. Moreover, this impact is increasing the longer their experience. Table 9 confirms that this is independent of any effect coming from not entering experience directly, as in this panel age is being controlled for through the age dummies so that experience can also be included.

One explanation for this finding could be that interacting competition with experience is significant because this measure has less noise than the competition measure on its own. Though possible, this seems unlikely as the experience we measure is, if anything, introducing more noise because its ability to proxy for time spent in a sector is weaker the longer the individual has been in the labor market. The results here suggest it is unlikely to be the case that competitive sectors are selecting individuals with high levels of trust.

Supervision

Is it the case that sectoral competition is increasing trust by leading to a greater degree of supervision of employees? That is, one possible hypothesis is that sectoral competition, by increasing the costs to firms from poor performing employees, induces firms to employ proportionately greater supervisory resources. This makes individuals seem more trustworthy and leads to higher reported trust levels. In order to examine this possibility, another part of the survey asks the following question: "Does the Respondent have a supervisor on your job to whom you are directly responsible." This variable is included in Table 10. Columns 1 to 3 report the results for Comp50 and columns 4 to 6 for Comp4. Columns 1 and 4 are for the basic specification without experience interaction. The first thing to note is that the supervision variable never enters as a significant determinant of trust. Secondly the results on other variables are essentially unchanged from the basic results reported in Table 4. Comp50 and Comp4 are both significant at the same levels and have essentially the same magnitude of coefficients. Columns 2 and 5 include experience interactions and Columns 3 and 6 include experience interactions and the full set of workplace regressors for Comp50 and Comp4 respectively. Once again, the same pattern emerges. When experience interactions are introduced, competition no longer enters significantly directly, but the experience interaction term is significant and positive. The point estimates are also similar to those reported in the relevant comparison tables without supervision.

[Insert Table 10]

There seems to be no evidence that sectoral competition is working through its effect on firms' supervisory activities. Both competition variables remain significant in the specifications where they did without

Table 10

VARIABLES	(1) trust2	(2) trust2	(3) trust2	(4) trust2	(5) trust2	(6) trust2
comp50	0.00187**	-0.000900	-0.000731			
	(0.000718)	(0.00149)	(0.00152)			
comp50exper		9.66e-05**	9.53e-05*			
		(4.82e-05)	(4.92e-05)			
comp4				0.00185*	-0.00184	-0.00161
				(0.00105)	(0.00254)	(0.00243)
comp4exper					0.000145*	0.000147*
					(8.43e-05)	(8.26e-05)
age	-0.0113	-0.0209**	-0.0209**	-0.0122*	-0.0267**	-0.0272**
	(0.00723)	(0.00885)	(0.00872)	(0.00722)	(0.0110)	(0.0107)
agesquare	0.000149**	0.000188**	0.000185**	0.000156**	0.000182**	0.000182**
	(6.93e-05)	(7.27e-05)	(7.37e-05)	(6.93e-05)	(7.01e-05)	(7.14e-05)
supervisor	-0.0358	-0.0411	-0.0686	-0.0437	-0.0485	-0.0749
	(0.0735)	(0.0725)	(0.0779)	(0.0747)	(0.0736)	(0.0785)
educ	0.0261***	0.0318***	0.0315***	0.0261***	0.0382***	0.0379***
	(0.00740)	(0.00783)	(0.00870)	(0.00745)	(0.0104)	(0.0107)
hotargus			-0.167**			-0.168**
			(0.0725)			(0.0729)
skipwork			0.231*			0.225*
			(0.132)			(0.134)
Constant	0.446*	0.739***	0.505	0.441*	0.868***	0.633
	(0.242)	(0.268)	(0.386)	(0.248)	(0.327)	(0.400)
Observations	614	612	612	614	612	612
R-squared	0.207	0.217	0.251	0.203	0.214	0.248

Note: i) Clustered standard errors in parentheses, ii) ***,**,* Significant at the 1%, 5% and 10% levels respectively, iii) the regressions include a constant and Income, Occupation, Religion, Ethnic, Sex and Marital status dummies, iv) in column (3) and (6) all non-significant workplace variables are included, only significant ones are reported.

supervision, with similar point estimates both with and without experience interactions.

Summary of empirical results

The Comp50 measure of the competitiveness of a worker's sector of employment is a very robust predictor of a worker's propensity to trust, Comp4 is more marginal (10% significance) but of similar magnitude in effect.They do not seem to be picking up occupation characteristics, worker characteristics like risk aversion, or the number of workers in the workplace. Moreover, competition is working independently of factors related to the internal running of the workplace, including the congeniality of worker relationships, the extent of supervision, and their overall happiness with their job. Competition is only important for individuals with significant experience, suggesting that selection of trustworthy individuals into competitive sectors is not likely to be the cause. We now develop a model to explain why competition might increase trust in this way.

4 The model

Our aim here is to understand how competition in the sector where one works can make one's co-workers more trustworthy. This will explain the correlation we find in the data if it is additionally the case that individuals base (at least part of) their estimates of the anonymous other's trustworthiness on the experience of the trustworthiness of their co-workers. Since so much of ones waking life is spent in the workplace, we think this is a reasonable assumption. As mentioned earlier, we cannot test this assumption directly, but we can check if other predictions of the model are consistent with elements of the data; which we do in the next section.

Notation

There are $J+1$ sectors and a firm in each sector requires N workers to produce. The model is static. Firms in the J sectors produce either high quality (H) or low quality (L), depending on the effort decisions of their workforce. There are no other factors of production.

In sector $J+1$ there is a constant (piece-rate) employment technology, workers there obtain wage W with certainty, at effort cost normalized to zero.

Work Decision

Workers search for employment in a sector of choice. Search and matching are frictionless in all J sectors. After entering one of the J sectors a worker can apply (costlessly) to all, or any sub-set, of firms in the sector. If offered at least one job, they choose one, and then firms can re-offer positions until all are either filled, or there remain no more workers in the sector. Alternatively, one can think of the firms moving in order. Firms are ordered randomly. The first firm in the sector orders all applicants (perhaps randomly) and proceeds down the list of applicants until it receives the required number of acceptances. After that, the second firm proceeds, and so on, until either all firms have completed hiring, or all individuals in the sector are employed.

If an individual is not offered a job, the worker is unemployed and receives zero wage. Let the equilibrium object, p_j^i, denote the probability of obtaining employment in firm i in sector j. Alternatively, a worker can work in sector $J+1$, the piece-rate sector, in which case he is hired with probability one at wage W.[29]

Production technology

Each worker employed in a J sector firm independently and simultaneously chooses whether to provide effort. Effort provision imposes disutility cost of c, and without effort disutility costs are zero. If and only if at least one of the N workers provides non-contractible effort the firm is high, H, quality, otherwise it is low quality, L.

Utility

Worker utility is linearly increasing in wages and decreasing in effort costs.

Competition

Competition determines the probability that a low quality firm is forced to shut-down. The more competitive the environment, the higher this probability. L quality firms shut down with probability $\gamma_j \geq 0$, for each sector j. H quality firms do not shut down. The competitiveness of a sector is thus denoted by the probability of shut down in the event of low quality; γ_j.

Wages and Profits

Firm revenues are denoted R. Firms call wages, w_j^i for firm i in sector j, before workers apply for jobs. Wages are conditioned only on whether production occurs, and are paid equally to all workers. Importantly, they cannot be conditioned upon whether effort costs are contributed by the worker, nor on whether the firm is L or H quality. If the firm shuts down, workers become unemployed, are not paid their wages, and firm revenues are zero. Consequently firm profits are $R - Nw_j^i$ if production occurs, and zero otherwise.[30]

4.1 Analysis

4.1.1 Effort Decision

Employed individuals in the J sectors choose whether to contribute non-contractible effort to production – at personal cost c. Contributing effort increases the chance the firm will be H quality, and that wages will be paid, but since all individuals receive the same wage, irrespective of who contributed effort, all have incentive to free-ride on the efforts of others. The effort contribution decision depends on individual expectations about the contributions of co-workers.

If a worker were to contribute effort at any firm in which she works, then the firm would be H with probability one. Consequently, the expected benefit to working in sector j conditional upon effort being

[29] Worker indifference conditions will similarly trade-off wages and employment possibilities as in Harris and Todaro (1970). An implication is that sectoral unemployment rates can possibly differ in equilibrium, as in Helpman, Itzhoki and Redding (2008) and Helpman and Itzhoki (2009).

[30] In order to ensure zero economic profits ex ante, we could also introduce an earlier fixed entry cost decision stage. We do not model this as it is of no consequence for our equilibrium implications, and we do not have any information about firms in our data.

contributed if employed is:

$$\int_0^{n_j} \left(w_j^i - c\right) p_j^i di,$$

where n_j is the number of firms in sector j. In equilibrium it will be seen that all firms in sector j choose the same wages, which we shall denote w_j. Since we will only focus on symmetric equilibria, it saves on notation to simply denote a constant probability of receiving a job offer from at least one firm in sector j, p_j.[31] In establishing the equilibrium, we will of course allow firms to deviate to choosing any wage.

Thus the expected benefit to contributing effort if employed in sector j is:

$$w_j - c.$$

Similarly, the expected benefit to not contributing effort is

$$\begin{aligned} &w_j \left(\left(1-\gamma_j\right)\left(1-\alpha_j\right)+\alpha_j\right) \\ &\text{where } 1-\alpha_j = \left(1-\phi_j\right)^{N-1}. \end{aligned}$$

Not contributing effort lowers the chances of receiving a wage. How much it does so depends on the probability of at least one other worker in the firm contributing effort, which we denote α_j. In a symmetric equilibrium, α_j depends positively on the probability of any single worker in sector j contributing effort, ϕ_j.[32] Alternatively, even if no other worker contributes effort, the worker will still be paid if the low quality firm is not shut down; the term $\left(1-\gamma_j\right)\left(1-\alpha_j\right)$.

Workers will be indifferent to contributing effort in a firm in sector j if and only if:

$$\phi_j = 1 - \left(\frac{c}{w_j \gamma_j}\right)^{\frac{1}{N-1}}. \tag{1}$$

Intuitively, ϕ_j solving this implies the cost of higher effort to a worker in sector j is just offset by the increased probability that the worker will receive the wage w_j. Clearly, ϕ_j is increasing in w_j and increasing in sectoral competitiveness, γ_j, for any given w_j.

If the wage is set so that no one contributes effort, $\phi_j = 0$ so that $\alpha_j = 0$. Then in order to induce participation in sector j, when the probability of obtaining employment there is p_j, wages must satisfy:

$$\begin{aligned} p_j \left(w_j(1-\gamma_j)\right) &\geq W \\ w_j &\geq \frac{W}{p_j\left(1-\gamma_j\right)}. \end{aligned} \tag{2}$$

since a worker can obtain W with probability one in sector $J+1$.

[31] Note that this is not simply the symmetric version of p_j^i in the previous expression.

[32] We will only solve for symmetric equilibria here.

4.1.2 Optimal Wage Setting

Wages will have to at least induce participation from workers for production to be viable. But firms may also be willing to set them strictly in excess of such a level in order to induce more effort – a type of efficiency wage. A situation where all agents contribute effort for certain will never arise, and for some values of γ_j, all workers not contributing effort is also not feasible, i.e.:

Lemma 1 *A) For all* γ_j, $\phi_j < 1$.
B) For $\gamma_j > c/(W+c)$, $\phi_j > 0$.

Intuitively, if noone else were to free-ride, free-riding would be costless, as production would always occur, and would thus dominate contributing effort. Consequently, here must always exist individuals who plan to shirk with some positive probability. When sectors are competitive enough, i.e., $\gamma_j > c/(W+c)$, the threat of competition itself is sufficient to discipline workers. Consequently, even at wages just satisfying the participation condition, there is a positive chance of someone contributing effort; i.e., $\phi_j > 0$.

For $\gamma_j > \frac{c}{W+c}$ the firm's problem is to pick w_j to maximize $E(\Pi_j) = \left[1-\left(1-\phi_j\right)^N\right](R-Nw_j) + \left(1-\phi_j\right)^N(1-\gamma_j)(R-Nw_j)$ subject to inducing worker participation: $w_j \geq W+c$. An implication of the lemma is that for $\gamma_j > \frac{c}{W+c}$ since $\phi_j \in (0,1)$ ϕ_j solves equation (1). Consequently, we can substitute for ϕ_j and maximize $(R-Nw_j)\left(1-\gamma_j\left(\frac{c}{w_j\gamma_j}\right)^{\frac{N}{N-1}}\right)$ subject to $w_j \geq W+c$ in this range of γ. This yields one of two solutions. Either the participation condition for workers binds, so that they are just indifferent to working for the firm or working in sector $J+1$, i..e, $w_j = W+c$. Or they can pay an "efficiency wage". Workers at the firm then obtain strictly higher utility than they would have obtained had they worked in sector $J+1$. By paying a higher wage, the firm raises ϕ_j and thus increases the probability that production occurs and R is received. Of course, this comes at the cost of higher wages. The level of the efficiency wage is determined from the interior solution to the firm's optimization problem, which is unique, i.e.:

$$\begin{aligned}
\frac{dE(\Pi_j)}{dw_j} &= -N\left(1-\gamma_j\left(\frac{c}{w_j\gamma_j}\right)^{\frac{N}{N-1}}\right) + \gamma_j(R-Nw_j)\frac{N}{N-1}\left(\frac{c}{w_j\gamma_j}\right)^{\frac{N}{N-1}}\frac{c}{w_j^2\gamma_j} = 0 \\
\text{so that } w_j^* \text{ solves } 1 &= \left(\frac{R}{w_j^*}-1\right)\left(\frac{\gamma_j^{-\frac{1}{N-1}}}{N-1}\left(\frac{c}{w_j^*}\right)^{\frac{N}{N-1}}\right). \qquad (3)
\end{aligned}$$

Optimal wage setting by firms depends on whether the benefits to the efficiency wage strategy, in terms of higher effort contributions, offset the extra wage costs. It turns out that this depends on the profitability of production as specified below. Moreover, note that once optimal firm strategies are computed, since firms take into account the effects of their wage decisions on worker effort and sectoral choices, the solution to the firm's problem is sufficient to pin down the equilibrium of this model.

Proposition 2 *(Equilibrium) There exist two critical values of* γ *denoted* $(\tilde{\gamma}, \overline{\gamma}) \in (0,1]$*:*
Case 1. If $\overline{\gamma} > \tilde{\gamma}$*, then for* $\gamma \in [0, \tilde{\gamma}]$*,* $w_j = \frac{W}{1-\gamma_j}, p_j = 1$*, and* $\phi_j = 0$*. For* $\gamma \in [\tilde{\gamma}, 1]$ $w_j = \max\left[w_j^*, W + c\right]$*, where* w^* *is the solution to* (3)*,* $p_j < 1$*,and* $\phi_j > 0$*.*
Case 2. If $\overline{\gamma} \leq \tilde{\gamma}$*, then for* $\gamma_j \leq \frac{c}{W+c}, w_j = \frac{W}{1-\gamma_j}, p_j = 1$*, and* $\phi_j = 0$*. For* $\gamma_j > \frac{c}{W+c}, w_j = W + c, p_j = 1$*, and* $\phi_j > 0$*.*
Case 1 is more likely the higher are firm revenues relative to worker opportunity costs.
That is: $\overline{\gamma} \geq \frac{c}{c+W} \geq \tilde{\gamma} \Leftrightarrow R \geq \tilde{R} \equiv \frac{(N-1)(W+c)^2}{c} + (W + c)$*.*

In words, this proposition says that in sectors with low competition, discretionary effort is not forthcoming, and there is no trust. Beyond a threshold, increases in competition increase discretionary effort, and increase trust levels. Firms' wage seting follows one of two different scenarios depending on the value of firm revenues relative to labor opportunity costs. Where revenues are relatively high, firms follow the high wage strategy for some levels of sectoral competitiveness, when opportunity costs are relatively high, wages just induce participation in all sectors.

Graphically, wage setting in the two cases is as follows: Figure 4a corresponds to Case 1, which occurs when $\overline{\gamma} > \tilde{\gamma}$, and is depicted by the heavy line below:

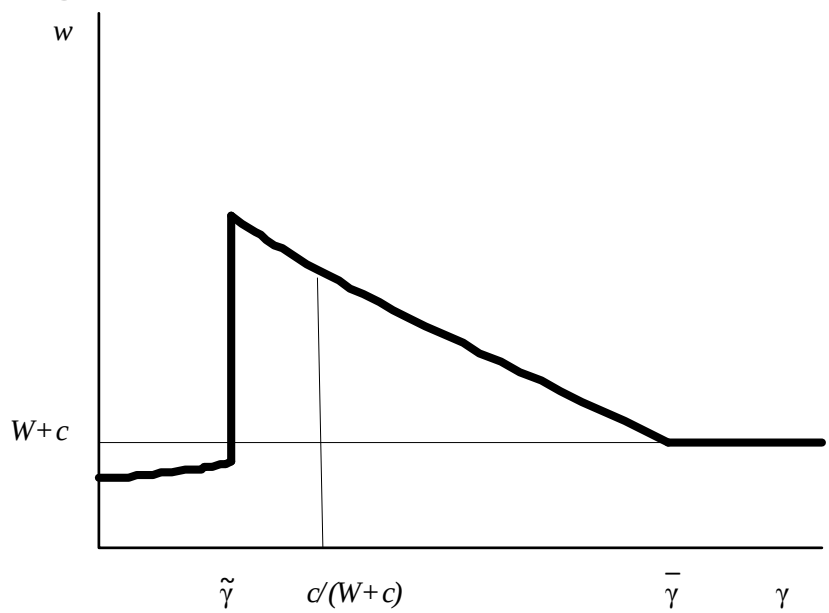


Figure 4a: Case 1

For $\gamma < \tilde{\gamma}$, firms set wages at binding participation inducing wages. In these sectors, all applicants find jobs, $p_j = 1$, and receive utility exactly equal to what they would have received had they gone to the reservation sector $J + 1$. For $\gamma \in (\tilde{\gamma}, \overline{\gamma})$ firms pay wages so that workers who get jobs receive strictly higher expected utility than workers in sector $J + 1$. This is still only expected utility, as final receipt of promised wage payments depends on production occuring. The probability of obtaining work in one of the sectors between $\tilde{\gamma}$ and $\overline{\gamma}$, p_j, falls strictly below one, so that workers are ex ante indifferent across sectors. For γ beyond $\overline{\gamma}$, wages are again at participation inducing levels, so that there is no sectoral unemployment.

Wages are non-monotonic because two different forces are determining their pattern over the differing regions. For low values of γ, competition is too low to induce discretionary effort from employees and hence trust is low. Here, wages are increasing in γ in reflection of the higher shut-down probabilities that occur as markets become more competitive. Beyond a threshold level, $\tilde{\gamma}$, competition is sufficient to induce effort from employees and firms pay efficiency wages. But note that wages and competition both have the effect of increasing effort, consequently as competition increases beyond the threshold, firms optimally choose to cut back on their use of wages to induce effort, so that wages decline beyond $\tilde{\gamma}$ until the participation constraint binds again at $\overline{\gamma}$.

Case 2:

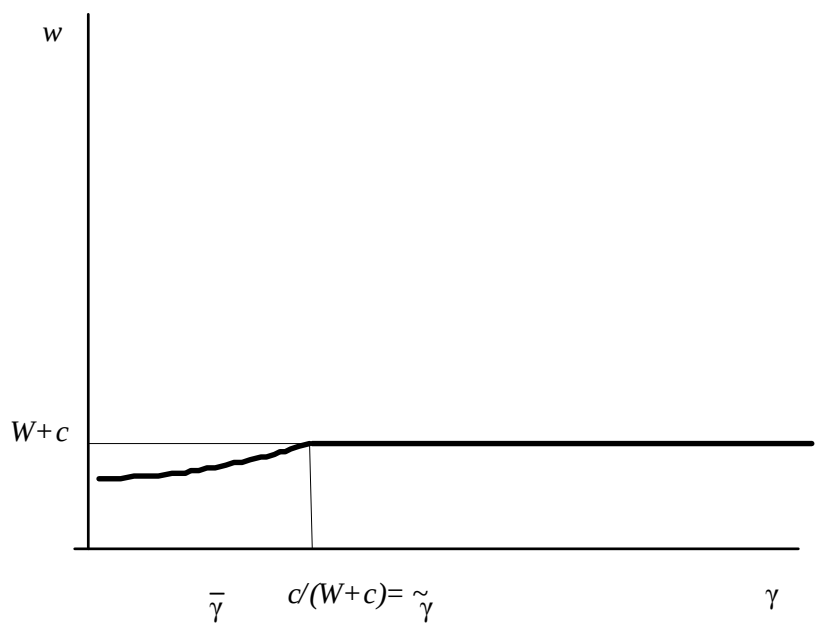


Figure 4b: Case 2

In case 2 which occurs when $\overline{\gamma} \leq \tilde{\gamma}$, depicted in figure 4b, wages (the bold line) are always set at binding

participation inducing levels, and there is no unemployment.

The final part of the proposition indicates that Case 1 becomes relatively more likely the higher are firms net profits, i.e., revenues relative to opportunity costs of labor. Intuitively, when net profits are likely to be high, firms find it more costly to risk shut-down in case of low quality. They respond by raising wages and inducing more effort, in expectation. This corresponds to pure profit here, as we have not modelled the costs of ex ante investment decisions.

The following proposition lists the equilibrium implications for the model's main variables.

Proposition 3 *(Predictions) Let γ^* denote the lowest value of γ for which $\phi_j > 0$. We then have:*
1. ϕ is monotonically increasing in γ beyond γ^* and independent of γ for γ below γ^*.
2. Job insecurity is an inverted U, it monotonically increases upto γ^*, then falls monotonically beyond.
3. Wages are monotonically increasing in competition upto γ^*, and then vary depending on which case holds. In Case 1, wages jump at γ^*, monotonically decline to $\overline{\gamma}$ and are flat beyond $\overline{\gamma}$. In case 2 wages are flat beyond γ^*.

Low levels of competition are insufficiently strong to induce any discretionary effort from employees. In either case 1 or 2, there exists a threshold level of γ denoted γ^* where discretionary efforts are forthcoming. For levels of γ beyond this, discretionary effort is monotonically increasing in competition. Though firms internalize the effect of increased competition by lowering wages beyond γ^* in case 1, the net incentive is still higher. In case 2, it is clearly higher, so in both cases ϕ_j rises with j. Job insecurity follows an inverted U shape with respect to competition for essentially similar reasons. Below the threshold, more competition simply lowers the probability that a firm will produce – as discretionary effort is never applied there. Above the threshold, effort levels increase in response to heightened competition. In the constant wage case, case 2, this clearly implies that shut-down probabilities fall. When firms respond by lowering wages with γ_j, the net effect is not so clear. The effort inducing effects of competition are partly offset by the falling wage, but it follows from the firm's optimization problem that the decline in wages is not so steep as to offset the competition effect so that net effort induced by employees is higher.

We shall check these implications in the data. A final indirect implication of the model concerns goverment employees. Though these are not directly modelled we have clear implications for what we should expect to see under the reasonable assumption that the competitive effect of shut-down in case of poor performance does not apply – or applies more weakly – to government employees.

Corollary 4 *Government employees should have lower trust levels.*

The reason for this is simple. Even if government employees face some threat of shut-down due to poor performance, for a given level of competition in the sector where they provide their service, the chances of

shutting down a government unit will tend to always be weaker. Since the GSS does include information about whether the respondent is a government employee, it is possible to see whether this channel induces a negative effect on trust levels.

4.1.3 Robustness

The key insight of the model is that competition across firms provides a type of discipline on free-riding within the firm by imposing additional costs on poorly performing organizations. The more intensive the competition, the greater the discipline and the lower the propensity workers have to free-ride. We discuss the robustness of results to alternative ways of modeling this key idea.

Varying the Production Technology

We have assumed that discretionary effort needs to be supplied by only one of the N workers in each firm. Consider what happens if instead of one, the critical number of workers required to contribute discretionary effort for the firm to be H quality is some $x : 1 < x \leq N$? The first thing to note is that there now emerges a degenerate equilibrium in which, for any w_j and any γ_j, all workers contribute zero effort. This is because, upto x, effort contributions are complementary, conditional upon zero effort from co-workers, it is always optimal to provide zero effort oneself. The key element of the model that we have studied, free-riding, and the mitigating effect that competition has upon this, does not arise in such degenerate equilibria.

However, there always exists another equilibrium which is qualitatively similar to that which we observe in our model. Specifically, for sufficiently high levels of competition, an equilibrium also emerges in which all individuals will contribute effort with some probability less than 1. The incentive for free-riding here is qualitatively identical to that which occurs in the model we study. In equilibrium, individuals are indifferent to contributing effort because the increased cost of effort raises the possibility of the firm being high quality. Each single individual is strictly better off if another subset of workers contributes effort for them. Increases in competition raise the probability of firm shut-down in case of L quality and thus induce higher effort contributions, ceteris parabus, just as in the model we study. Similarly, firms react to this by either lowering the efficiency wage, when $\phi_j > 0$, or raising the participation inducing wage when $\phi_j = 0$.For all $x < N$ this equilibrium of the model thus behaves identically to the one we study.

Things change drastically if $x = N$. Now, everyone is pivotal and required for the firm to be H. This implies that, as in the $x < N$ cases, there are two equilibria, but what changes is that there is no free-riding in the positive effort equilibrium any more. If in that equilibrium, all individuals contribute effort with probability one. Consequently the tradeoff between free-riding and firm performance, and this interaction with competition, which is central to all of the empirical predictions above, plays no role. We conclude then that the model we study generalizes in its implications along this dimension provided that not all individuals are required for the firm to be high quality.

Allowing Other Incentive Devices

The model allows for no possibility that firms can provide direct incentives for the provision of discretionary effort. In reality, though there may be a group component to payoffs, it may also be possible to directly reward some discretionary tasks. Adding such tasks to the model would not change things here provided there remained tasks that were non-contractible and these contributed to the performance of the firm. The contractible tasks would be directly rewarded if in the interests of the firm to do so, but the non-contractible ones that provided diffused benefits would remain subject to the free-riding problem which is at play here.

Varying the Shut-down Margin

The effect of competition across firms is to increase the probability of firm's shutting down. In reality, however, firm's may be well away from the shut-down margin, and the degree of competition in the sector may simply effect the scale of market share and hence the scale of operations, i.e., firms' intensive margins. In such an extension of the model, the considerations that are at play here would only arise for those workplaces which are marginal with respect to firm operations. The infra-marginal ones would not be, or would only weakly be, affected by the competitiveness of the sector. However, at the margin, the tradeoffs at play in the model here would be similar. So, though the effects of competition would be muted in such a model, the free-riding limiting effect of competition would still be present.

5 Examining the Predictions

We test each one of the predictions in Proposition 3 of the model, and the implications for government workers, in this section.

Threshold effect of competition prediction.

Proposition three predicts a threshold below which there is no relationship between competition and trust and above which it is positive. We explore the shape of the relationship between trust and competition in two ways. Firstly, we create dummies for each of the competition variables corresponding to very low (bottom quintile), low (20-40 percentile), medium (40-60 percentile), high (60-80 percentile) and very high (above 80 percentile) competition sectors. Results are reported in Table 11. The omitted category is the very low competition category. Column 1 reports results for Comp50 and column 2 for Comp4. For column 1, the medium and high categories are significantly positive relative to very low, the very high category is also positive and significant at the 10% level, and the low category is not significantly different from the very low omitted category. These results are consistent with a threshold at the low category in Comp50. The results for Comp4 also suggest the possibility of a threshold but are weaker. Now all categories are positive relative to the omitted "very low" category, but only the high (60-80 percentile) category is significantly

different.

[Insert Table 11]

One can visually depict this relationship by partialing out the effects of all other controls variables and observing the resulting two way relationship between competition and trust via a non-linear plot. To do this, we plot residuals obtained from regressing both competition and trust on all of the main explanatory variables in Table 4. That is, each one of the competition measures and trust are regressed on household income, education, age, age squared, sex, occupational, ethnicity, race, marital, and religious dummies, and a constant. Figures 5 and 6 depict the outcome of a fractional polynomial prediction plot of the trust residual against Comp50 and Comp4 residuals respectively. The trust residuals are on the y axis. Both figures reiterate the findings in Table 11 and are consistent with the threshold prediction. For very low levels of residuals, the error bands are extremely wide, so essentially nothing can be said about the relationship in these wide bands. However, beyond residuals of around -60 for either competition measure, estimates become tighter and we see a pattern consistent with that predicted by the model. The relationship is flat, upto around residuals of 0, and then positive beyond that.

[Insert Figures 5 and 6]

Wage Predictions. Wages cannot be explored with the GSS as the GSS does not contain respondent's hourly wage information. The income dummies used as controls in the main regressions earlier are for household income. However the US Occupation Employment Statistics Survey conducts a semi-annual mail survey of employers producing estimates of employment and wages for specific non-farm and non-self-employed individuals by occupation and NAICS industry.[33] The data does not include industry level demographic and education information that we have used throughout the paper, so that these controls cannot be included. Corresponding with our competition measures from the survey of firms taken in 2002, we use the 2002 survey of the OES.

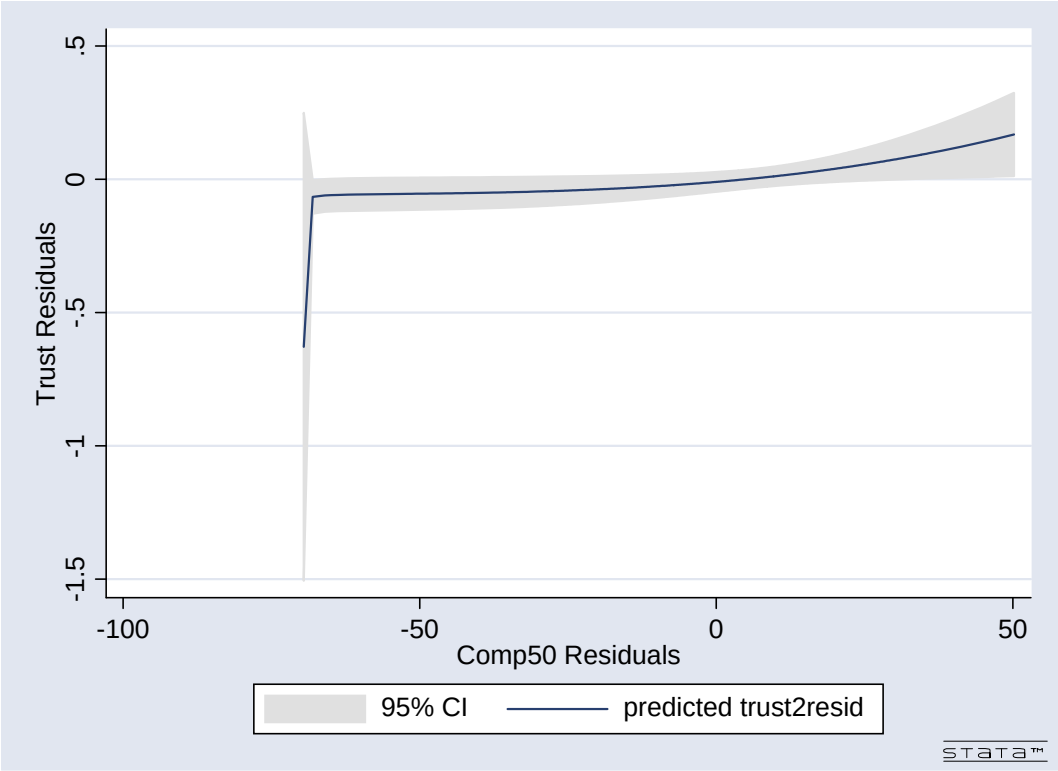
Here we present the plots for the direct correlation between competition measures and wages, since the OES data does not include individual level variables that we can use to partial out other characteristics. The results here for the model are mixed. The Comp50 measure in figure 7 is inconsistent with the predictions of the model. Average industry wages are downward sloping monotonically in competition. However, the Comp4 measure is consistent with the non-monotonicity prediction of Case 1. Average industry wages are increasing upto a threshold, and then monotonically declining beyond. The error bands are large at the tails,

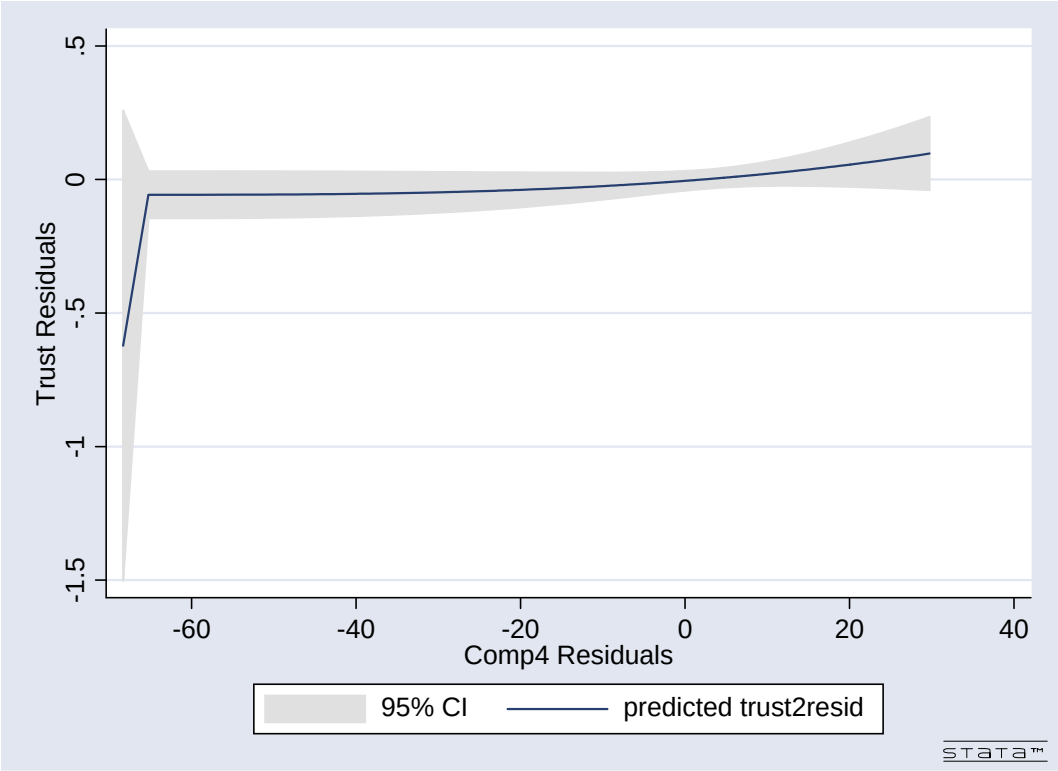
[33] The data is available from the BLS at http://www.bls.gov/data/#wages

Table 11

VARIABLES	(1) trust2	(2) trust2
comp50low	-0.0459 (0.0486)	
comp50med	0.182*** (0.0624)	
comp50hi	0.137** (0.0548)	
comp50vhi	0.0874* (0.0501)	
comp4low		0.0616 (0.0650)
comp4med		0.0898 (0.0558)
comp4hi		0.139** (0.0601)
comp4vhi		0.0836 (0.0533)
educ	0.0248*** (0.00768)	0.0251*** (0.00771)
age	-0.00948 (0.00741)	-0.0101 (0.00742)
agesquare	0.000127* (7.18e-05)	0.000132* (7.16e-05)
union13	-0.0879 (0.103)	-0.0741 (0.104)
na_union	0.00889 (0.0411)	0.0153 (0.0418)
Constant	0.392 (0.244)	0.388 (0.254)
Observations	614	614
R-squared	0.220	0.203

Note: i) Clustered standard errors in parentheses, ii) ***,**,* Significant at the 1%, 5% and 10% levels respectively, iii) the regressions include Income, Occupation, Religion, Ethnic, Sex and Marital status dummies.


Trust Residuals
.5
0
-.5
-1
-1.5
-100
-50
0
50
Comp50 Residuals
95% CI
predicted trust2resid
stata™


Trust Residuals
.5
0
-.5
-1
-1.5
-60
-40
-20
0
20
40
Comp4 Residuals
95% CI
predicted trust2resid
stata™

but when we regress industry on comp4 and comp4 squared (not reported) the coefficients are consistent with this inverted U prediction and significant.

[Insert Figures 7 and 8]

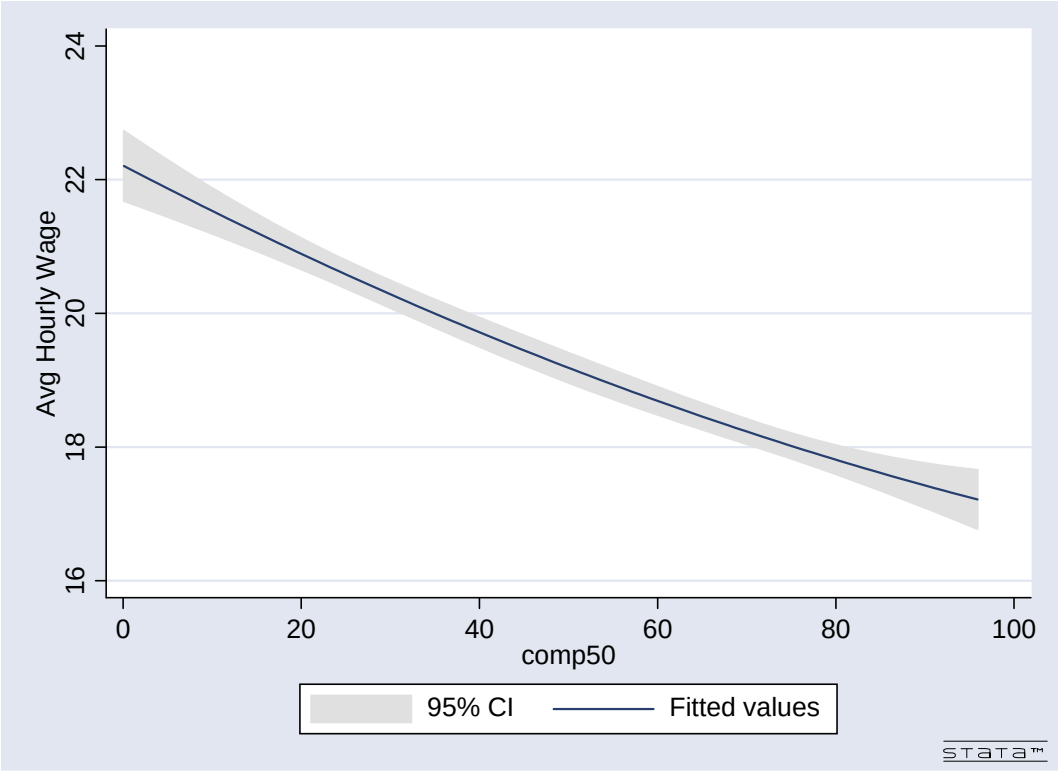
Job Security prediction. We now examine whether there is evidence of a non-monotonic relationship between job security and competition. Recall that the model suggests security should be first increasing then decreasing with competition measures. The GSS asks respondents a question regarding job security "gdjobsec" which states to respondents "Job Security at your Place of Employment is Good." To which respondents choose one of: 1. Very True, 2. Somewhat True, 3. Not too True, 4. Not at all True.

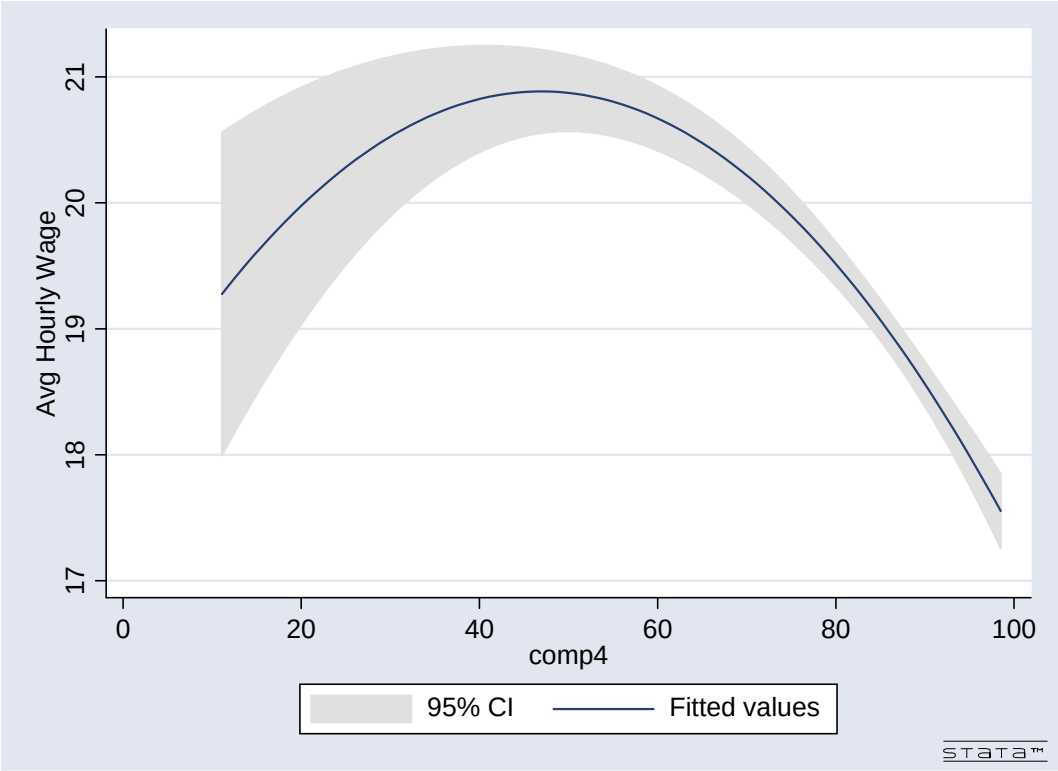
Figures 9 and 10 plot the relationships between the residual variation in "gdjobsec" and the residual variation in both competition measures, together with 95% confidence intervals. Once again, these residuals are obtained by regressing the full set of controls listed above on each of "gdjobsec" and the competition measures separately. The plots are consistent with the relationship predicted by the model. Job insecurity increases with both Comp50 and Comp4 initially, reaches a peak, and then declines. However here the error bands are relatively large for low and high values of residual competition. The upward sloping point estimate for low values of the residuals is not statistically significantly different from a flat line, however the downward sloping part at higher values is. Though not extremely tightly estimated, the relationship is consistent with the model's predictions, and is a relationship that would not be expected on prior grounds.

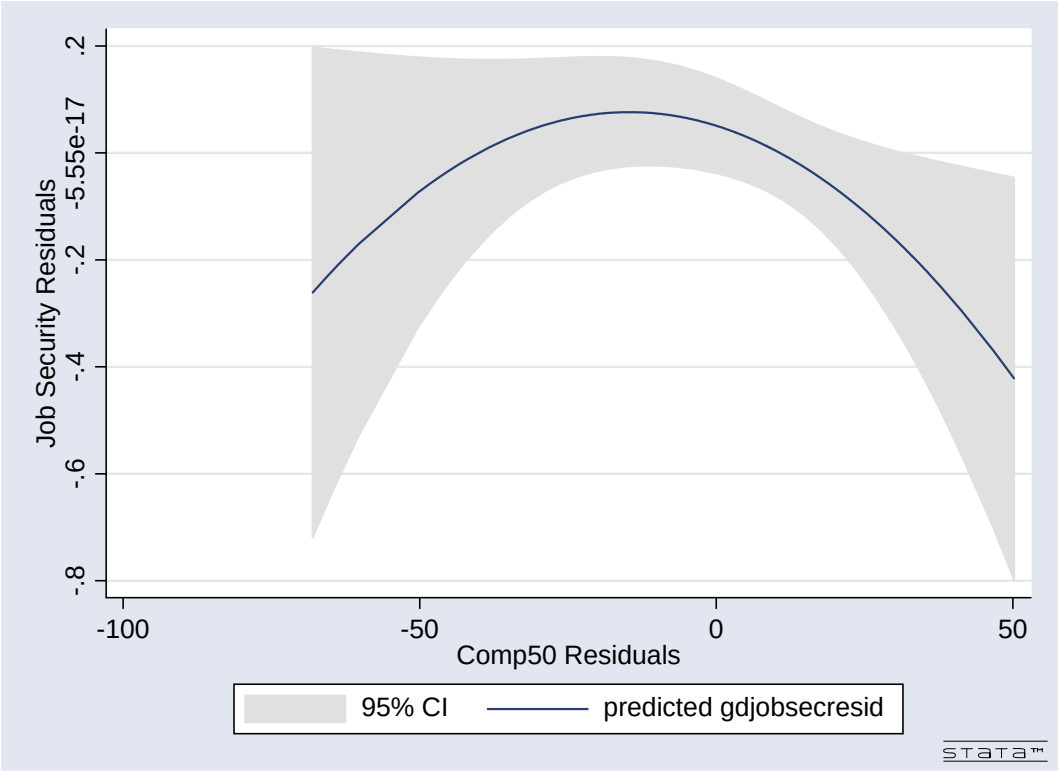
[Insert Figures 9 and 10]

Government Worker Prediction. The final prediction we consider is that related to government employees. Since the effect of competition is to make it less likely that poor performing groups of workers will survive, we should expect this effect to be weaker amongst government workers. These individuals have greater job security than their private sector counterparts. In the raw data, government workers are less than 10% of respondents. Table 12 reports the results from introducing a government employee dummy variable. It is included directly with Comp50 (column 1), and interacted with Comp50 (column 2). Columns 3 and 4 repeat this for Comp4. In all specifications, the government dummy enters negatively as is consistent with the prediction, but it is not significant enough to drawn any conclusions in support of the model from it.

[Insert Table 12]


Avg Hourly Wage
24
22
20
18
16
0
20
40
60
80
100
comp50
95% CI
Fitted values
stata™


Avg Hourly Wage
17
18
19
20
21
0
20
40
60
80
100
comp4
95% CI
Fitted values
stata™


Job Security Residuals
.2
-5.55e-17
-.2
-.4
-.6
-.8
-100
-50
0
50
Comp50 Residuals
95% CI
predicted gdjobsecresid
Stata™

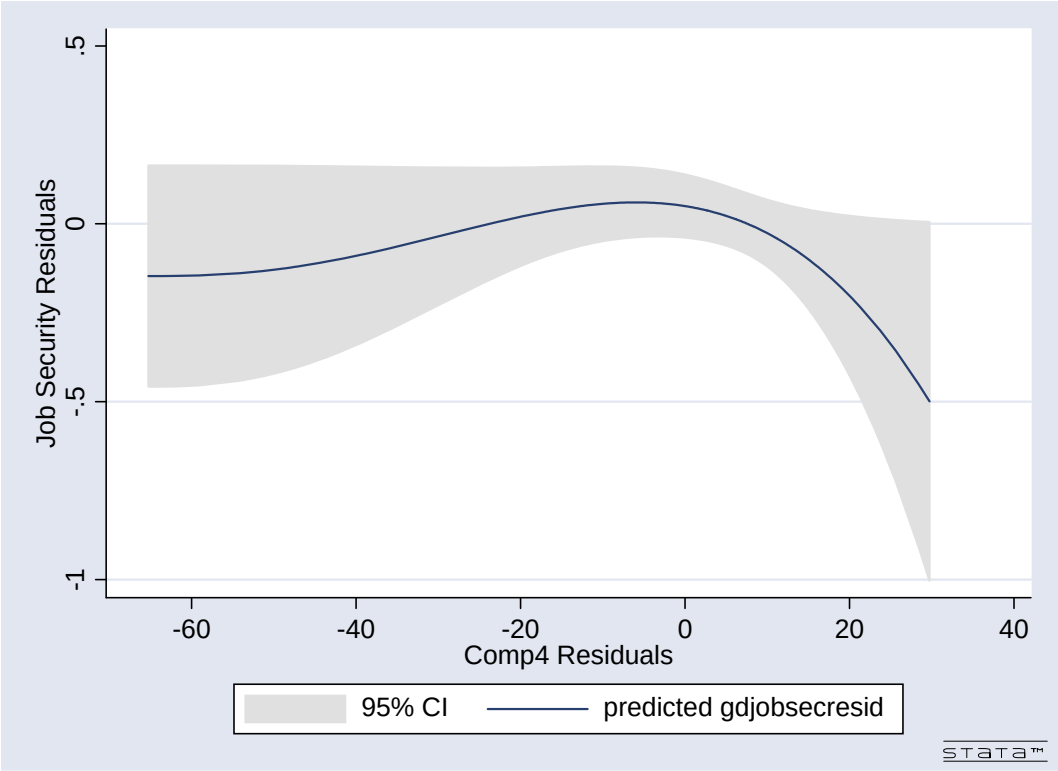

Job Security Residuals
.5
0
-.5
-1
-60
-40
-20
0
20
40
Comp4 Residuals
95% CI
predicted gdjobsecresid
stata™

Table 12

VARIABLES	(1) trust2	(2) trust2	(4) trust2	(5) trust2
comp50	0.00198*** (0.000731)	0.00181** (0.000742)		
wrkgovt1	-0.0282 (0.0738)	-0.409 (0.293)	-0.0315 (0.0782)	-0.291 (0.817)
comp50wrkgovt1		0.00645 (0.00515)		
comp4			0.00182* (0.00106)	0.00178* (0.00106)
comp4wrkgovt1				0.00312 (0.00947)
age	-0.00989 (0.00727)	-0.0100 (0.00719)	-0.0106 (0.00727)	-0.0106 (0.00725)
agesquare	0.000130* (7.05e-05)	0.000131* (6.99e-05)	0.000136* (7.05e-05)	0.000135* (7.03e-05)
educ	0.0240*** (0.00772)	0.0234*** (0.00769)	0.0241*** (0.00781)	0.0239*** (0.00781)
female	-0.0516 (0.0409)	-0.0556 (0.0417)	-0.0488 (0.0411)	-0.0492 (0.0411)
size	-4.88e-05*** (1.71e-05)	-4.79e-05*** (1.72e-05)	-4.77e-05*** (1.72e-05)	-4.76e-05*** (1.72e-05)
union	-0.0660 (0.108)	-0.0710 (0.110)	-0.0729 (0.108)	-0.0731 (0.108)
Constant	0.402 (0.263)	0.429 (0.267)	0.395 (0.276)	0.402 (0.282)
Observations	608	608	608	608
R-squared	0.211	0.213	0.207	0.207

Note: i) Clustered standard errors in parentheses, ii) ***,**,* Significant at the 1%, 5% and 10% levels respectively, iii) the regression includes a constant and Income, Occupation, Religion, Ethnic, Sex and Marital status dummies.

6 Conclusion

Individuals working in sectors that are more competitive have significantly higher levels of reported trust than individuals working in less competitive sectors. To our knowledge, this is the first time a relationship between industry level competition and employee trust levels has been analyzed. This correlation persisted in all specifications, and is not due to competitive sectors having more supervision, smaller workplaces, or more congenial relations between work colleagues. It also does not appear to be due to individuals with high trust being selected into competitive sectors, or these sectors attracting people with low levels of risk aversion. The existence of this relationship is robust, statistically significant and large – in variance normalized terms, it is slightly smaller than the effect of years of education on trust: a one standard deviation increase in our more significant measure of competition, Comp50, leads to around five percentage points higher probability that a worker will answer that they "usually trust" as opposed to "usually don't trust" others. It seems highly unlikely that causation could be going the other way (i.e., from high levels of trust to high sectoral competition).

We explain these patterns with a model in which discretionary, non-contractible worker contributions that generate non-excludable benefits for all workers are induced by higher inter-firm competition. This model generates a positive correlation between competition and trust at the sectoral level, but only for sufficiently high levels of trustworthiness. That pattern is also seen in the data. The model generates a number of other predictions relating to job-security, wages and government employees. The data is generally consistent with these additional predictions though the large error bounds on some of the estimates suggests caution in assessing the model.

The results here are generally not consistent with the findings from much of the previous experimental literature. With rare exceptions, that literature tends to find increased competition undermines trust. But these experiments have been concerned with the competitiveness of elements of an individual's environment on an individual's trust. We instead document the relationship between the competitiveness of the environment in which groups of individuals find themselves, and trust within the group. The experimental literature, to our knowledge, has not explored such settings, and it would be interesting to see if the effects we find would be replicated there.

A tempting conclusion to draw from many recent studies that have established strong inter-generational persistence in trust (and other attitudes) is that such factors, to the extent that they matter for economic outcomes, are not amenable to policy influence, since trust is determined by the distant past. While the past clearly matters, our results cast doubt on a conclusion that policy does not. Policy clearly affects competition levels, and our evidence suggests that competition levels also affect trust.

The correlation between country level trust and competition with which this paper started, and the individual level correlation between trust and competition in US sectors are suggestive of some pieces that

may be important in understanding the puzzle of economic development. Given the centrality and magnitude of measured effects of social capital (and trust more narrowly) on development outcomes, these previously ignored benefits from market competition have the potential to be as important for economic outcomes as the already well studied effects of competition in improving allocative efficiency.[34] If the findings we have unearthed here generalize to other contexts, then what may be happening in the process of development is a self-reinforcing pattern whereby extension of the market increases competition and trust, increases in trust facilitate further market extension, and the interplay between the two leads to a dynamic process of continuous improvement.

There is already considerable work outlining mechanisms whereby increases in trust may facilitate market extension. One way would be in solving chicken and egg problems between trust and complementary economic activities like investment. These have been highlighted in many of the theoretical models of social capital formation which tend to exhibit the coexistence of both high and low social capital equilibria. Examples are Francois and Zabojnik (2005), Carlin, Dorobantu, Viswanathan (2007), Francois (2007), Tabellini (2008), Aghion, Algan and Cahuc (2008) and Aghion, Algan, Cahuc and Shleifer (2008). With sufficient trust generated by the work environment, economies would then be more likely to converge to the (usually) higher welfare, high social capital equilibria that these models exhibit.

It is prudent to hold off these broader speculations until the relationship between trust and competition has been tested in other settings. It would be of considerable interest to explore it within countries that have experienced dramatic changes in the competitiveness of their sectors. One candidate set of countries are the European ones. For these countries, trust attitudes could be explored using Eurobarometer data, which has been asked annually for 35 years of residents of some European Union countries. Specific events where large changes in market competition occurred for some sectors, and which can be used as quasi-experiments are; European Union trade harmonization and German Unification. Future work will also examine time-varying information on trust levels within sectors across US states that have experienced changes in within state competition regulation.[35]

[34] Such benefits to competition could also act to temper the extension of other morally objectionable acts arising from competition. Shleifer (2004) identifies a type of race to the bottom through the spread of commercial practices. If morality is a normal good, the stress on profits that arises with increased competition, raises the opportunity cost of providing that good.

[35] Levine, Levkov and Rubinstein (2008) use bank deregulation to identify an exogenous intensification of competition in the nonfinancial sector. Their focus is its effect on the racial wage gap, but since it is possible to access restricted state level information for individuals in the GSS, we are working on linking these changes to changes in trust across differing waves of the GSS.

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Appendix A: Data

Cross-Country Data

The trust question used in the World Values survey is: "Generally speaking, would you say that people can be trusted or that you can't be too careful in dealing with people?" This question is asked of individuals and aggregated up to obtain a country measure. The variable takes on a value between 0 and 100, with the percentage of individuals answering "Yes people can be trusted" in a country denoting the country's measure of trust. The other response cateories are "no, you can't be too careful in dealing with people" and "it depends".

Measures of institutions: Polity (2000, -10 Autocratic +10 Democratic) which is a measure of democracy scaled from measures concerning competitiveness of political participation and executive recruitment, regulation of political participation and constraints on the executive; Constraints on the Executive (2000, 1 Weak Constraints -7 Strong) variable. This measure is defined as "the extent of institutionalized constraints on the decision making powers of chief executives"; The Risk of Expropriation (1995, ICRG, 1 - 10 low) from the Political Risk Services Group's International Country Risk Guide. This is a ten point measure of the risk of expropriation of private investment, where lower scores indicate countries "where expropriation of private foreign investment is a likely event"; The World Bank's Government Effectiveness (1999, World Bank -2.5 low, +2.5 high) variable measures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The means by which this index is created from a range of disparate indicators is described in Kaufmann, Kraay and Mastruzzi (2008); "Rule of Law" from the Political Risk Services group,[36] which is a six point measure, where a low score indicates "a tradition of depending on physical force or illegal means to settle disputes". and historical (Post-WWII) measures of political institution quality from the Polity group.

As additional controls variables which are typically correlated with trust such as GDP/Capita (PWT 2004), Years of Education (2000, Barro/Lee), and a regional dummy for Scandinavian countries which persistently score higher as a group than all others in the world.

For all of these variables there are only forty countries in the sample.[37] The main problem is that the World Values Survey is patchy in covering some regions. Specifically, in the 2004 wave, it covers almost none of Central America and the Caribbean, little of East Asia, and only three countries from Sub-Saharan Africa.[38] It also excluded some large countries in this wave, e.g. Brazil, and a number of OECD countries

[36] Described in detail at http://www.prsgroup.com/

[37] The countries for which competition measures, trust and institutional controls were available are: Argentina, Belgium, Bulgaria, Canada, Chile, China, Czech Republic, Denmark, Egypt, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Mexico, Netherlands, Peru, Philippines, Poland, Portugal, Romania, Russia, Singapore, South Africa, Spain, Sweden, Turkey, United Kingdom, United States, Venezuela, Vietnam and Zimbabwe.

[38] Malaysia, Taiwan, Hong Kong and South Korea were not covered, Venezuela is the only country included from Central America.

– Australia, New Zealand, Norway and Switzerland. The WVS was more comprehensive in eastern and Central Europe, but the Global Competitiveness Reports were not extensive there.

Table 1 reports the summary statistics of the variables used in the cross country estimations.

Table A1. Summary Statistics for aggregate variables

	Means (SD)
GDP/Capita (PWT 6.2, 2004)	15474 (11643)
Years of Education >25 (Barro/Lee 2000) (2.4-12.25)	7.88 (2.29)
Polity (2000) (Polity, -10, 10)	6.01 (5.53)
Constraints on Exec (2000) (Polity, 1-7)	5.75 (1.75)
Risk of Expropriation (1995) (ICRG 1-10)	8.58 (1.83)
Trust (2004) (WVS, 0-100)	27.98 (14.4)
Rule of Law (1995) (ICRG, 2-6)	4.77 (1.21)
Government Effectiveness WB (-2.5, +2.5)	0.296 (.869)
Market Dominance WEF (Avg. 03-07) (1-7)	3.44 (0.68)

Trust04 from World Values Survey, Local Competition from World Economic Forum Global Competitiveness Reports 2003-2007, ,GDP/Capita 2004 from Penn World Tables 6.2, Education 2000 from Barro and Lee, Years of Education for individuals over the age of 25, Polity 2000 from Polity IV, Risk of Expropriation 1995 from International Country Risk Guide, Rule of Law from International Country Risk Guide, Executive Constraint 2000 from Polity IV, Autocracy 45-98 and Executive Constraints 45-98 from Polity, Law and Order Tradition from International Country Risk Guide 1995.

[Insert table of competition measures by sector, Table A2.]

Details on Creation of Categorical Dummies:

Income dummy variables are generated for each of the 24 categories (including refused) of the "income98" (total family income) variable.

Ethnicity dummy variables are generated for groupings of the "ethnic" (country of family origin) variable:

- Northern European (Austria, Czechoslovakia, Denmark, Finland, Germany, Hungary, Netherlands, Norway, Poland, Sweden, Switzerland, Lithuania, Yugoslavia, Other European)
- Anglo (Other (English) Canada, England and Wales, Ireland, Scotland)
- Southern European (French Canada, France, Greece, Italy, Spain)
- Hispanic (Mexico, Puerto Rico, Other Spanish)
- Asian (China, Japan, Philippines, Russia, India, Arabic, Other Asian)
- African
- Other Ethnicity (West Indies, Other, American Indian, Non-Spanish West Indies, American only)

Religion dummy variables are generated for groupings of the "relig" (religious preference) variable:

- Protestant
- Catholic
- Jewish
- No religion (None)
- Other Religion (Other, Buddhism, Hinduism, Other Eastern, Moslem/Islam, Orthodox-Christian, Christian, Native American, Inter-denominational)

Occupation dummy variables are generated for groupings of the "occ80" (census occupation code (1980)" variable. Dummy variables are assigned to each range of 100 (0-99, 100-199, etc.)

Table A2: Sectoral Competition

Column1	Column2	Column3
sector	**comp4**	**comp50**
admin	91.05769	76.51539
agminut	83.9	22.2
artacc	94.41667	84.11282
educ	92.86667	80.03333
hlth	88.45354	70.3874
infinreal	82.86102	48.17458
manwtw	69.8025	34.36583
othserv	91.33947	80.31842
profsci	88.03384	70.27539
ret	74.26848	50.78043
Total	83.17078	60.61461

- Professional, Technical and Kindred Workers 33% (Occupation codes 001-196)
- Managers and Administrators Except Farm 14% (Occupation codes 201-296)
- Clerical and Kindred Workers 12% (Occupation codes 301-396)
- Craftsmen and Kindred Workers 21% (Occupation codes 401-590a)
- Operatives Except Transport 2% (Occupation codes 601-696)
- Transport Equipment Operatives 5% (Occupation codes 701- 796)
- Farmers, Farm Managers, Farm Laborers and Farm Foreman 6% (Occupation codes 801-846)
- Other Service Workers 6% (Occupation codes 900+)

The binary measure of trust equals one for respondents who answered "usually trusted" and zero for respondents who answered "usually not trusted" to the question "Generally speaking, would you say that people can be trusted or that you can't be too careful in dealing with people?".

The union dummy variable equals one for respondents who indicated that they belong or that they and their spouses belong to a union in response to the question "Do you (or your spouse) belong to a labor union?"

(Note references to spouses are asked only "if applicable". That is, these apply only if answering questions relating to the spouse's occupation. Since our data uses Respondent's who are employed and uses respondent's industry and occupation codes, the relevant individual is the respondent and not the spouse.)

Dummies related to the workplace variables are constructed by collapsing responses into two categories.

For the following variables, responses of "often" and "sometimes" are assigned one and responses of "rarely" and "never" are assigned zero:

- Heated arguments occur in workplace (hotargus)
- People at work can be relied on (reliedon)
- How often respondent finds work stressful (wkstress)
- Some people hold standards in workplace that others don't (difstand)
- People feel free to report problems in workplace (rptprobs)
- Other people take credit for respondents work or ideas (othcredt)
- People at work treat respondent in a manner that puts respondent down (putdown)
- People at work fail to give respondent necessary information (lackinfo)
- People at work get in respondent's personal space to intimidate (perspace)
- Respondent has been threatened with physical harm at work (physharm)
- People at work throw things when upset with respondent (actupset)
- People at work shout at respondent in hostile manner (shout)
- How often respondent stayed at home or left work early (skipwork)

For the following variables, responses of "strongly agree" and "agree" are assigned one and responses of "disagree" and "strongly disagree" are assigned zero:

- People are treated with respect (treatres)
- People look the other way when others are threatened (lookaway)
- On the whole I am satisfied with myself (satself)
- I am always optimistic about my future (optimist)
- I expect more good things to happen to me than bad (moregood)

For the following variable, responses of "very true" and "somewhat true" are assigned one and responses of "not too true" and not at all true" are assigned zero.

- Job security is good (gdjobsec)

Dummy variables for size of workplace are generated for each of the seven categories of the "localnum" (number of employees at respondents' work site) variable.

The job-finding dummy variable equals one for respondents who answered "very easy" or "somewhat easy" to the question "About how easy would it be for you to find a job with another employer with approximately the same income and fringe benefits you now have?"

The supervision dummy variable equals one for respondents who answered "yes" to the question "Do you or your spouse have a supervisor to whom you are directly responsible?"

(Note references to spouses are asked only "if applicable". That is, these apply only if answering questions relating to the spouse's occupation. Since our data uses Respondent's who are employed and uses respondent's industry and occupation codes, the relevant individual is the respondent and not the spouse.)

The government worker dummy variable equals one for respondent who answered "government" to the question "Are/were you employed by the federal, state or local government or by a private employer (including non-profit organizations)?"

There are three dummy categories for Race, White (79%), Black (13%) and Other (8%)

Table A3. Means, Response Categories and Standard Deviations for extended workplace variables:

Variable	Response Categories	Mean (SD)
Others Credit	1. Often, 2. Sometimes, 3. Rarely, 4. Never	3.10 (0.96)
Put Down	1. Often, 2. Sometimes, 3. Rarely, 4. Never	3.43 (0.92)
Heated Arguments	1. Often, 2. Sometimes, 3. Rarely, 4. Never	3.21 (0.89)
Lack Information	1. Often, 2. Sometimes, 3. Rarely, 4. Never	2.93 (0.97)
Helpful	1. V. True, 2. Somewhat T. 3. Not too True, 4. Not at all	1.46 (0.66)
Treat Respect	1. Strong Agree, 2. Agree, 3. Disagree, 4. S. Disagree	1.70 (0.66)
Act Upset	1. Often, 2. Sometimes, 3. Rarely, 4. Never	3.76 (0.62)
Shout	1. Often, 2. Sometimes, 3. Rarely, 4. Never	3.68 (0.68)
Look Away	1. Strong Agree, 2. Agree, 3. Disagree, 4. S. Disagree	3.18 (0.78)
Work Stressful	1. Always, 2. Often, 3. Sometimes, 4. Hardly Ever, 5. Never	2.74 (1.00)
Skip Work	1. Often, 2. Sometimes, 3. Rarely, 4. Never	3.75 (0.57)
Personal Space	1. Often, 2. Sometimes, 3. Rarely, 4. Never	3.57 (0.75)
Standards	1. Often, 2. Sometimes, 3. Rarely, 4. Never	2.38 (1.10)
Report Probs	1. Often, 2. Sometimes, 3. Rarely, 4. Never	1.74 (0.94)
Harm Threat	1. Often, 2. Sometimes, 3. Rarely, 4. Never	3.88 (0.43)
Job Secure	1. V. True, 2. Somewhat T. 3. Not too True, 4. Not at all	1.64 (0.82)
Work Size	7 categories (1-9, 10-49, 50-99, ..,2000+)	2.92 (1.82)
Union Member	1. Yes, 2. No	1.90 (0.29)

Using the Herfindahl/Hirschman Index (HH Index) instead of Comp4/Comp50

The HH index is calculated by squaring the market share of each firm competing in the sector and then summing the resulting numbers. It is defined in the opposite direction to Comp50 and Comp4, i.e., the index approaches zero if the sector consists of a large number of firms of equal size. The US census reports this index for manufacturing sectors only (sectors 31-33). Consequently the sample size falls to 124 not allowing the full set of controls to be run. The table below reports on multinomial logit regressions with the omission of the occupation dummies specification due to insufficient observations.

Variable	U. Trust. / U. Not	U. Trust. / U. Not	U. Trust. / U. Not
HH Index	-0.00065 (.238)	-0.00074 (0.173)	-0.00078 (0.148)
Income	.053 (.296)	.054 (.290)	.054 (.341)
Education	.115* (.097)	0.106 (.139)	0.108 (.143)
Marital	-.066 (.706)	-.067 (0.735)	-.072 (0.727)
Age	.0016 (.919)	-.0018 (.910)	-.0008 (.959)
City Size	-.0000 (.938)	-.0004 (.631)	.0002 (.708)
Race Dummies	No	Yes	Yes
Ethnicity Dummies	No	No	Yes
Observations	124	124	124
Psuedo R^2	.09	0.113	0.165

Multinomial logit regressions, errors clustered at sectoral level, including a constant

Proof of Lemma 1.

Part A: Assume $\phi_j = 1$; i.e., all agents contribute effort. Then $\alpha_j = 1$, so that not contributing effort yields w_j which strictly exceeds $w_j - c$ if effort is contributed. Which contradicts all agents setting $\phi_j = 1$.

Part B. If $\phi_j = 0$, $\alpha_j = 0$ so that the probability of w_j being paid equals $1 - \gamma_j$. Therefore, for a given w_j, a participant sets $\phi_j = 0$ if and only if

$$\begin{aligned} w_j - c &< \left(1 - \gamma_j\right) w_j \\ w_j &< \frac{c}{\gamma_j}. \end{aligned} \tag{4}$$

It can be directly verified that when $\gamma_j \geq \frac{c}{W+c}$, (2) is not compatible with (4).■

Proof of Proposition 2.

Consider the relationship between w_j^* and competition, γ_j. A simple examination of condition (3) shows that the RHS is a decreasing function of w_j^* and γ_j. So that w_j^* is a decreasing function of γ_j. The firm's optimal wage is then given by $\max\{w_j^*, W + c\}$. We define $\overline{\gamma}$, such that $\gamma_j = \overline{\gamma}$ implies that $w_j^* = W + c$. When $\gamma_j < \overline{\gamma}$, the firm pays w_j^* while when $\gamma_j > \overline{\gamma}$ the firm pays $W + c$.When $\gamma < \frac{c}{W+c}$, firm profits may be non convex, it is strictly decreasing for $w_j \in [\frac{W}{(1-\gamma_j)}, W + c]$ and may have a second maximum for $w_j > W + c$. Formally, the firm's problem is:

$$\begin{aligned} \max E\left(\Pi_j\right) \text{ subject to } &: \\ w_j &\geq \frac{W}{\left(1 - \gamma_j\right)} \end{aligned}$$

The firm chooses between paying w_j^* ensuring that some workers contribute effort or paying $\frac{W}{(1-\gamma_j)}$, foregoing effort contributions and minimizing wages. In the latter case, $\phi_j = 0$ and $w_j = \frac{W}{(1-\gamma_j)}$, and we denote expected profit by

$$\begin{aligned} \pi\left(W/\left(1 - \gamma_j\right)\right) &= \left(R - N w_j\right)\left(1 - \gamma_j\right) \\ &= R\left(1 - \gamma_j\right) - NW. \end{aligned} \tag{5}$$

which is clearly decreasing in γ_j. In the former case, we denote expected profit by $\pi\left(w_j^*\right)$. Using $E\left(\Pi_j\right)$ and applying the envelope theorem, we have that $\pi\left(w_j^*\right)$ is increasing in γ_j. Therefore, there necessarily exists a $\tilde{\gamma}$ such that $\pi\left(w_j^*\right) = \pi\left(W/\left(1 - \gamma_j\right)\right)$. Where w_j^* is chosen if and only if $\gamma_j > \tilde{\gamma}$. The values of w_j and ϕ_j in the statement of the proposition, directly follow. The values of p_j ensure that condition (2) is satisfied with equality. Finally, note that using the implicit function theorem one can easily show that $\overline{\gamma}$ is an increasing function of R and $\tilde{\gamma}$ is a decreasing function of R. One can also easily verify that when $R = \tilde{R}$, $\frac{dE(\Pi_j)}{dw_j}|_{w_j = W+c,\ \gamma = c/W+c} = 0$ and $\pi\left(W + c\right) = \pi\left(W/\left(1 - \gamma_j\right)\right)$. This implies that when $R = \tilde{R}$, $\overline{\gamma} = \tilde{\gamma} = \frac{c}{c+W}$.■

Proof of Proposition 3.

Part 1.

Clearly, in both cases, $\phi_j = 0$ below the respective threshold. We now show that $\frac{d\phi_j}{d\gamma_j} > 0$ beyond a threshold in both cases. For case 2 it is immediate since γ_j is increasing and wages are constant beyond the threshold. For case 1, ϕ_j is increasing in γ_j, if $\gamma_j w_j$ is increasing in γ_j. Define the variable $x_j \equiv w_j \gamma_j$, then the equation implicitly defining w_j^* (3) becomes:

$$\left(\frac{R}{x_j} - \frac{1}{\gamma_j}\right)\left(\frac{1}{N-1}\left(\frac{c}{x_j}\right)^{\frac{N}{N-1}}\right) = 1$$

one can easily chech that the LHS is decreasing in x_j and increasing in γ_j so that $\frac{d\phi_j}{d\gamma_j} > 0$ here as well.

Part 2.

For γ below the threshold in both cases 1 and 2, the probability of shut down equals $\gamma_{j.}$, so job insecurity is rising in γ below the threshold. In case 2, $w = W + c$ beyond the threshold, so that the probability of production equals $1 - \gamma_j \left(1 - \phi_j\right)^N \equiv 1 - \gamma_j \left(\frac{c}{w_j \gamma_j}\right)^{\frac{N}{N-1}} = 1 - \gamma_j \left(\frac{c}{(W+c)\gamma_j}\right)^{\frac{N}{N-1}} = 1 - \gamma_j^{\frac{-1}{N-1}} \left(\frac{c}{(W+c)}\right)^{\frac{N}{N-1}}$ which is clearly increasing in γ, so that job insecurity falls with γ. In case 1, beyond the threshold the probability of production is again given by $\left(1 - \gamma_j \left(\frac{c}{w_j \gamma_j}\right)^{\frac{N}{N-1}}\right)$ with w_j now determined by (3). Let P denote the probability of production occuring. We then have:

$$\begin{aligned} P &= 1 - \gamma_j \left(1 - \phi_j\right)^N \\ &\text{so that} \\ \frac{dP}{d\gamma_j} &= \left(1 - \phi_j\right)^N \left(\frac{N\gamma_j}{1 - \phi_j} \frac{d\phi_j}{d\gamma_j} - 1\right). \end{aligned} \tag{6}$$

From the first order condition, which binds in this case w_j^* solves $1 = \left(\frac{R}{w_j^*} - 1\right) \left(\frac{\gamma_j^{-\frac{1}{N-1}}}{N-1} \left(\frac{c}{w_j^*}\right)^{\frac{N}{N-1}}\right)$, which can be re-written as: $1 = \left(\frac{R}{w_j^*} - 1\right) \left(\frac{1}{N-1} \gamma_j \left(1 - \phi_j\right)^N\right)$. Totally differentiating this condition with respect to γ_j yields:

$$\begin{aligned} 0 &= \left(\frac{R}{w_j^*} - 1\right) \left(\frac{1}{N-1} \left(1 - \phi_j\right)^N - \frac{N}{N-1} \gamma_j \left(1 - \phi_j\right)^N \frac{d\phi_j}{d\gamma_j}\right) - \frac{dw_j^*}{d\gamma_j} \frac{R}{\left(w_j^*\right)^2} \left(\frac{1}{N-1} \gamma_j \left(1 - \phi_j\right)^N\right), \\ &\Leftrightarrow \frac{N}{N-1} \gamma_j \left(1 - \phi_j\right)^N \frac{d\phi_j}{d\gamma_j} = -\frac{dw_j^*}{d\gamma_j} \frac{R}{\left(w_j^*\right)^2} \left(\frac{1}{N-1} \gamma_j \left(1 - \phi_j\right)^N\right) \frac{1}{\left(\frac{R}{w_j^*} - 1\right)} + \frac{1}{N-1} \left(1 - \phi_j\right)^N, \\ &\Leftrightarrow \frac{N}{N-1} \gamma_j \left(1 - \phi_j\right)^N \frac{d\phi_j}{d\gamma_j} = K + \frac{1}{N-1} \left(1 - \phi_j\right)^N, \\ \textit{where } K &\equiv -\frac{dw_j^*}{d\gamma_j} \frac{R}{\left(w_j^*\right)^2} \left(\frac{1}{N-1} \gamma_j \left(1 - \phi_j\right)^N\right) \frac{1}{\left(\frac{R}{w_j^*} - 1\right)}. \end{aligned} \tag{7}$$

Note that since since it has already been demonstrated that for these values of γ, $\frac{dw_j^*}{d\gamma_j} < 0$ the constant K which denotes the first expression on the right hand side of (7) is strictly greater than zero. Equation (7) then rearranges to:

$$\begin{aligned} \frac{d\phi_j}{d\gamma_j} &= \frac{K}{\frac{N}{N-1} \gamma_j \left(1 - \phi_j\right)^N} + \frac{1}{N\gamma_j} \\ &\Rightarrow \frac{d\phi_j}{d\gamma_j} > \frac{1}{N\gamma_j}, \text{ since } K > 0. \end{aligned}$$

Substituting this into (6) implies

$$\frac{dP}{d\gamma_j} > \left(1 - \phi_j\right)^N \left(\frac{1}{1 - \phi_j} - 1\right) > 0.$$

Part 3. was proved in the previous proposition. ■