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Social trust and patterns of growth

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Abstract

The association between social trust and long-run economic growth is well documented. However, which determinants of growth are affected by social trust remains an open question. This paper therefore explores to which extent social trust affects the rate of factor accumulation versus productivity improvements. Previous studies indicate that social trust could affect both the accumulation of physical and human capital and the rate of productivity increases. Existing literature also indicates that part of the growth effects may be due to how trust affects the quality of formal institutions. The effects of trust are estimated in a panel of 64 countries observed in 5-year periods between 1977 and 2017, using growth accounting to separate patterns of growth. The results unequivocally show that social trust predominantly affects long-run growth by affecting the growth of productivity and that only a small share of that effect runs through the effects of trust on formal institutions.

KEYWORDS

economic development, economic growth, institutions, social trust

JEL CLASSIFICATION

O10, N40, Z13

1 | INTRODUCTION

Since the seminal work by Knack and Keefer (1997), economists have recognized that social trust is a robust determinant of long-run economic growth. Subsequent research has elaborated on the association, shown that it is at least as robust as other more broadly accepted determinants of growth, and explored under which conditions it applies (Beugelsdijk et al., 2004; Horváth, 2013; Whiteley, 2000; Zak & Knack, 2001). Putnam's (1993) claim that social trust contributes to good governance and the quality of formal institutions has also held up in subsequent research, indicating that part of the trust effect may run through the consequences of formal governance institutions (Bjørnskov, 2018; Knack, 2002).

Yet, it remains an open question *how* social trust affects long-run economic growth and in particular if the effects mainly work through factor accumulation or factor productivity. This is not a trivial question, as effects working through the former mechanisms would shift steady state income while effects working through the latter mechanisms would affect the dynamism of the economy (cf., Solow, 1957). It is therefore the purpose of this paper to fill this gap in the literature by providing a full assessment of how social trust affects long-run growth. The fundamental question in this paper is thus not how much social trust contributes to growth but uniquely how it affects the *growth pattern*. I provide an answer to these questions by employing growth accounting to decompose economic growth into factor accumulation and productivity growth in order to assess how social trust affects the composition of growth.

The approach in this paper is new in the literature although it is arguably necessary to shed more light on how social trust "works." The problem at hand is that the evidence in the existing research is mixed with studies finding indications of both types of growth patterns (Akçomak & ter Weel, 2009; Bjørnskov & Méon, 2015; Dearmon & Grier, 2011; Zak & Knack, 2001). In addition, as noted by Bjørnskov (2012), it also remains an open question if trust affects economic performance directly, or if the effect is mainly indirect through the association between trust and the characteristics and performance of formal institutions. Specifically, social trust is known to be a determinant of judicial quality and regulatory performance, both of which may arguably affect growth and productivity (Aghion et al., 2010; Boix & Posner, 1998; Knack, 2002).

Instead of providing more evidence for a specific mechanism, this paper therefore assesses the effects of trust in a unified empirical framework. In the long run, growth rates in income and productivity and capital accumulation are likely to be highly correlated. This potentially makes it difficult to separate different mechanisms through which social trust works and may have contributed to the mixed evidence in the literature. I argue that such problems are alleviated by the approach in this paper, which thereby provides more accurate knowledge of the effects of trust.

In the following, I first discuss how social trust might theoretically affect long-run growth. After describing the panel dataset covering 64 countries and a 40-year period, and outlining the simple estimation strategy, I present the results. The final section of the paper discusses the results and concludes.

2 | HOW DOES SOCIAL TRUST AFFECT DEVELOPMENT?

The potential importance of cultural factors such as social trust was already realized by classical economists, including Adam Smith, David Hume, and John Stuart Mill. In modern parlance, these economists emphasized the importance of transaction costs for economic performance, and the importance of trust for transaction costs (Luigi & Sugden, 2000). With the change of

economics after World War I and the Keynesian and Samuelsonian revolutions, such topics disappeared from research in economics for a long time. Yet, with Putnam's (1993) successful emphasis on features such as trust as explanations of the Italian North–South divide and beginning with Knack and Keefer's (1997) seminal work, cross-country differences in social trust were back on the research agenda in economics and political science.

2.1 | Mechanisms connecting social trust and growth

As surveyed in Bjørnskov (2018), the subsequent literature has argued for a range of different mechanisms through which social trust might affect economic growth. The overall association was quickly corroborated in cross-country analysis by Whiteley (2000) and Zak and Knack (2001), as well as by Dincer and Uslaner (2010) for the US states, and later papers have successfully dealt with the inherent causality problem in different ways (Algan & Cahuc, 2010; Bjørnskov, 2012). A budding literature also deals with the conditions under which social trust have effects on growth, institutional quality and other aspects of society.

A number of papers since Knack and Keefer (1997) have taken Arrow's (1972) conceptual paper as their starting point, associating social trust directly with reduced general transaction costs. An early example of formal theorizing is Torsvik (2000) who hypothesizes that "social capital," defined as some form of voluntary associational network activity, can produce two forms of trust that both reduce transaction costs. While Putnam's (1993) idea that social trust is created in voluntary associations has since been debunked, subsequent studies build on Arrow and Torsvik's idea of lower *general* transaction costs leading to more productivity. The common theoretical idea is that the additional resources available in industries facing lower transaction costs are likely to be invested productively, and thus lead to more growth. In addition, van Hoorn (2017) shows that social trust affects the particular comparative advantages that countries have and thus their export structure. Specifically, high-trust countries tend to have comparative advantages in production that is more costly to monitor and niche products with non-contractable features. While the particular contents of a country's exports do not necessarily change its growth rate, this line of research suggests that social trust affects the structure of the economy. Several other papers also suggest that trust affects the efficiency of management and use of delegation of decision-making authority in the private sector, which also affects economic performance (e.g., Bloom & van Reenen, 2010). Recent research also associates social trust with more extensive use of external sourcing in small and medium-sized firms, which may allow them more access to productive resources and knowledge (Vaneste & Gulati, in press).

However, another strand of the literature has explored the growth effects arising from the influence of trust on a set of *specific* transaction costs. Zak and Knack (2001) provided the first growth model with social trust as a constitutive element, focusing on the potential effect of trust on productive investments. In their model, a group of investment brokers work as financial intermediaries connecting individual savings with investment opportunities. However, with some probability reflecting the degree of trust or honesty in society, these brokers cheat their clients. Individual clients therefore face a choice between investing resources and using part of them to investigate brokers before choosing one. In low-trust societies, more resources are therefore spent investigating brokers—and thus ensuring that one is not cheated out of one's savings—and fewer resources are effectively invested. Higher levels of social trust in other words reduce a specific form of transaction costs by alleviating an information problem in the financial markets. In an AK-type growth framework, this implies that trust is positively

associated with economic growth through its effects on the rate of capital accumulation. Evidence presented both in Zak and Knack (2001) as well as the later study by Dearmon and Grier (2011) show support for an association between trust and investments in physical capital.

Bjørnskov (2009) presents a semi-endogenous growth model with similar features but focuses on the accumulation of human capital instead of physical capital. He likewise develops a model in which social trust reduces transaction cost although in the context of human capital, the cost is associated with screening applicants for jobs that are not easily monitorable. In the model, firms bear the cost of screening applicants, as they otherwise risk employing individuals who will shirk in non-monitorable jobs. As this risk is decreasing in social trust, the screening costs are lower in high-trust countries and firms' demand for education will therefore be higher in such countries. The main implication that the long-run growth of human capital will be higher in high-trust societies is confirmed in a set of empirical tests. Likewise, several studies find that education is causally associated with social trust (Dearmon & Grier, 2011; Papagapitos & Riley, 2009; Williamson & Mathers, 2011).

However, Knack and Keefer (1997) already in their original contribution emphasized yet another type of mechanism that focused on the length of individuals' effective time horizons instead of transaction costs. Knack and Keefer implicitly assumed that social trust is also reflected in the degree to which citizens can trust their politicians to pursue stable, sensible policies and maintain fair and effective judiciaries. Both features would enable individuals and firms to plan on longer time horizons, which would allow them to invest in new technology, human capital and additional skills. In this type of model, the particular type of costs affected by social trust are thus not transaction costs per se but economic costs associated with handling political uncertainty.

These models thus provide a mix of theoretical transmission mechanisms working through both factor accumulation and factor productivity. Yet, Whiteley (2000, p. 451) alternatively suggested that trust works by "reducing transaction costs and offsetting the effects of malign externalities. But it also works via interactions with human capital, physical investment, and catch-up, all of which make a greater contribution to economic growth in a high trust society." Whiteley's first claim was that an environment of trust both facilitates other-regarding behavior and Coasean bargaining solutions to common pool and other coordination problems (cf., Coase, 1960). These types of mechanisms are similar to those covered by other studies, but his second claim was that trust also affects the marginal efficiency of factor inputs such as education and physical capital. While Whiteley only tested direct effects and left the question open whether trust also makes investments more effective, only Bergh and Bjørnskov (2020) have explored his second claim. They find no robust evidence that private investments are more effective in creating growth in high-trust countries, and even show that public investments in such countries are probably *less* effective.

Finally, a few more recent studies suggest that social trust mainly affects overall factor productivity instead of the rate of accumulation of production factors (Akçomak & Müller-Zick, 2018; Akçomak & ter Weel, 2009; Bjørnskov & Méon, 2015). A similarly diverse set of theories applies to the association between trust and productivity development. While some focus on the effects of transaction costs on the resources available for investments in innovation, others have hypothesized that social trust enables the sharing of knowledge through loose networks and weak ties, which in turn is conducive to innovative activity (Ikeda, 2008). However, the empirical results in Bjørnskov and Méon (2015) indicate that the major effects of trust on productivity are indirect, as trust affects institutional quality and good institutions protecting private property rights incentivize innovative activity.

As such, their study is an example of a different strand of the literature that instead explores whether the effects of trust on growth are mainly indirect. Boulila et al. (2008) for example find

that the long-run effects of trust run through institutional quality while Bjørnskov (2012) identifies both a mechanism through institutions as well as another transmission mechanism through human capital investments. Similarly, as regulatory activity is known to affect productivity (Bjugren, 2018; Crafts, 2006; Égert, 2016), the much-cited study by Aghion et al. (2010), which shows that low-trust countries tend to implement more and more cumbersome regulations, indicates that social trust may be associated with higher levels of productivity through a regulatory policy mechanism.

Finally, a small literature deals with a question related to institutional characteristics: whether the full effects of social trust on economic development are conditional on certain features of society. Knack and Keefer (1997) originally suggested that the effects of trust are largest in poor countries, which recent research in Jalil and Rabab (2017) corroborates. These studies thus suggest that social trust mainly affects the rate of catching up with richer economies, which could both occur through faster factor accumulation as well as a higher rate of adoption of modern technology. However, Peiró-Palomino and Tortosa-Ausina (2013) find the opposite result, Ahlerup et al. (2009) suggest that the effects are largest in countries with poor institutions—such that social trust and good formal institutions are substitutes—and Bjørnskov (2018) discusses indications that the main effects may be conditional on democracy.

2.2 | Types of mechanisms and patterns

Overall, the trust literature includes a rather diverse array of theoretical considerations and thus provides distinctly mixed evidence of how social trust affects long-run growth. Some of the contributions to the literature indicate that social trust mainly affects investments and education—that is, growth through factor accumulation—while others either are consistent with or directly show an association between trust and productivity development. Overall, the theoretical mechanisms can be sorted into three groups with different implications.

First, a number of contributions to the literature suggest that social trust affects factor accumulation directly by lowering specific transaction costs (e.g., Zak & Knack, 2001, Bjørnskov 2009, Dearmon & Grier, 2011). Trust lowers monitoring costs when choosing investment brokers and hiring new educated employees, that is, when undertaking investments in physical and human capital that are not easily monitorable. The same type of mechanism is consistent with Vaneste and Gulati's (in press) finding that firms in high-trust societies use more external sourcing instead of keeping all production in-house.

Second, trust may indirectly affect both factor accumulation and productivity by affecting the quality of formal institutions and property rights protection. Such institutions reduce general transaction costs and affect capital accumulation as well as productivity (e.g., Klein & Luu, 2003). High-trust societies may also tend to have more foreseeable policies and less policy uncertainty, which would both affect the investment rate per se, and thus factor accumulation, but also firms' ability to adopt a long-term horizon and thereby the likelihood that some of those investments are innovative and contribute to productivity.

Finally, a number of contributions find that social trust is associated with less regulation of markets and business, which provides an indirect mechanism through which social trust mainly affects productivity. Reducing regulation often implies reducing barriers to innovation or the implementation of new ideas and processes, which appears more likely in high-trust societies. Similarly, high-trust populations may be better at forming weak ties through which they gain access to and share information, which are necessary components of any innovative,

productivity-enhancing activity. Both of these mechanisms revolve around barriers to innovative activity and not transaction costs.

A set of theoretical mechanisms thus connect social trust to both factor accumulation and productivity. The next section therefore outlines how to separate these sources using growth accounting and the approach to estimating the relative contribution of trust through accumulation versus productivity.

3 | DATA AND ESTIMATION STRATEGY

In order to answer the main question posed in this paper, it is necessary to decompose sources of long-run economic growth. One-way of doing so, which I use in the following, is growth accounting. Following Solow (1956, 1957), productivity is in principle easy to conceptualize through a Solow residual—the unexplained part of economic growth when the effects of the accumulation of capital, labor, and other factor inputs have been accounted for. Yet, all assessments and thus all decomposition of economic growth in practice must rest on strong assumptions. For example, it remains uncertain how best to measure education, whether to account for quality differences in capital, and which functional form to employ. Fortunately, previous studies show that the practical consequences of different assumptions about the functional form of production are relatively limited (Aiyar & Dalgaard, 2009).

I therefore follow what currently appears as the most transparent practice by using the Penn World Tables, version 9.1 (Feenstra et al., 2015), which offers a measure of the capital stock as well as an education index and data on both the number of equivalent full-time employees and the average number of annual work hours. This implies that the elements in the growth accounting identity in Equation (1) can all be calculated from the Penn World Tables where y is real, purchasing power adjusted GDP per capita, k is capital per full-time employee, h is the education index, l is the number of hours worked per capita, and a is calculated as a Solow residual from the rest. As in previous studies, I assume that $\alpha = .4$ although I also provide robustness tests in which α is set at either .3 or .5 (Bjørnskov & Méon, 2015; Caselli, 2005).

$$\widehat{y} = \widehat{a} + \alpha\widehat{k} + (1-\alpha)\left(\widehat{l} + \widehat{\beta h}\right) + \varepsilon \tag{1}$$

In the following, I estimate the determinants of the growth rate (the hatted variables) of y, k, h, l, and a separately, and in particular the association between social trust and the growth of these factors. To do so, I use the standard questionnaire-based measure of social trust: the share of respondents who state that most people can be trusted when asked "In general, do you think most people can be trusted or do you have to be careful?" Although early studies questioned the survey approach to measuring social trust, and specifically which type of trust it effectively measures, more recent studies have supported it.

Social trust as measured in surveys for example correlates with individual behavior in anonymized laboratory experiments (Cox et al., 2009; Sapienza et al., 2013) and real-life wallet-drop experiments (Bjørnskov, 2021; Knack & Keefer, 1997). Trust also persists over time, and potentially across several generations, as it appears to be transmitted stably from parents to children (Katz & Rotter, 1969; Uslaner, 2008), and is shaped by deep historical differences (Nunn & Wantchekon, 2011). Finally, several studies document that most respondents declare

their trust in strangers when answering the question instead of trust in known others (Naef & Schupp, 2009; Uslaner, 2002).

I supplement the trust data with the initial values of y, l, h, k, and a in order to account for convergence effects. In addition, I also include the total trade volume and government spending, both as percentages of GDP, as most studies find that they are important long-run drivers of growth that are independent of social trust. These data are also from the Penn World Tables (Feenstra et al., 2015).

Finally, as a number of studies suggest that social trust mainly affects economic growth and performance through its effects on the quality of formal institutions, I add the overall index of rule of law from the *Varieties of Democracy* project, version 9 (Coppedge et al., 2016). In further robustness tests, I alternatively use either the political corruption index from the same source or areas 2 and 5—the legal quality and regulatory freedom components—of the Economic Freedom of the World index (Gwartney et al., 2020). The inclusion of these additional results in the following thus effectively tests for the potential importance of indirect mechanisms through which trust might affect growth. I also provide additional robustness tests controlling for a set of approximately time-invariant factors that might affect growth patterns and which have been associated with social trust in earlier research. This set includes climatic conditions captured by the average temperature in the coldest month of the year (from Bjørnskov & Méon, 2015), which Buggle and Durante (2021) suggests may be important, a set of dummies for the predominant religion in the country including Orthodox, Catholic or Protestant Christianity, Islam, and Eastern religions (Buddhism and Hinduism) coded from CIA (2020), ethnic diversity as reported in Alesina et al. (2003), positive and negative reciprocity from Gorodnichenko and Roland (2011), and individualism from Hofstede et al. (2010). In these tests, I also exclude communist and postcommunist countries in order to ensure that results are not driven by a spurious association between the lower trust levels and particular economic development of these countries since transition.

All data are organized into consecutive nine 5-year periods between 1972 and 2017, that is, 1972–1977, 1977–1982, 1982–1987, 1987–1992, 1992–1997, 1997–2002, 2002–2007, 2007–2012, and 2012–2017, and are summarized in Table 1. The full sample includes the 64 countries with available trust data and full data necessary for the growth accounting exercise in the Penn World Tables; these countries are listed in Table A1 in the Appendix .

The estimation strategy is dictated by the approximate time invariance of the main variable, social trust. Given this problem, fixed effects models cannot be used as the fixed effects would perfectly capture the large time invariant part of national trust scores. I therefore apply a random effects OLS estimator with a full set of period fixed effects, regional fixed effects (postcommunist countries, Asia and the Pacific, Latin America and the Caribbean, and Sub-Saharan Africa) and regime fixed effects (single-party autocracy, multi-party autocracy and democracy as coded in Bjørnskov and Rode, 2020). As noted, all data are organized into a panel dataset between 1972 and 2017 where I opt for reporting standard errors clustered at the country level.

In the following, I interpret all trust estimates as evidence of causal effects. While several papers have established that the association between social trust and long-run economic growth is causal, it may still be subject to simultaneity bias. Ananyev and Guriev (2019) for example find that substantial economic crises may lower social trust, which suggests that persistently negative growth could affect overall trust levels and thus lead to endogeneity bias in the following estimates. However, causality can nevertheless be gauged from the estimates despite the absence of credible instruments or other direct approaches to establishing causality. First, if endogeneity is a serious problem, estimates excluding observations in which growth was negative should be substantially different from estimates using the entire sample.

TABLE 1 Descriptive statistics

	Mean	*SD*	Observations
Δ log y	0.114	0.127	554
Δ log a	0.044	0.099	477
Δ log l	0.010	0.066	477
Δ log h	0.142	0.334	576
Δ log k	0.105	0.116	544
Log initial y	9.568	0.905	544
Log initial l	6.695	0.185	481
Log initial h	2.604	0.602	553
Log initial k	11.807	1.045	553
Log initial a	4.376	0.318	476
Social trust	0.291	0.153	576
Single-party regime	0.104	0.306	576
Multi-party autocracy	.134	0.340	576
Democracy	0.703	0.457	576
Trade volume	0.669	0.641	552
Government size	0.176	0.065	552
Rule of law	0.798	0.243	566
Individualism	0.468	0.227	558
Political corruption	0.284	0.259	560
Minimum temperature	7.536	9.826	576
Positive reciprocity	−0.031	0.294	396
Negative reciprocity	0.024	0.284	396
Ethnic diversity	0.306	0.210	567
Religion: Islam	0.078	0.269	576
Religion: Orthodox	0.078	0.269	576
Religion: Catholic	0.391	0.488	576
Religion: Protestant	0.281	0.450	576
Religion: Eastern	0.109	0.312	576
Communist	0.101	0.301	585
Post-communist	0.119	0.325	585

Second, even if overall economic development affected social trust, the bias ought to affect all estimates equally and not only separate patterns of growth. As such, endogeneity or simultaneity bias, as it becomes reflected in the *average* social trust scores across the sample, would yield an approximately similar bias in all estimates and thus preserve any effects of trust on specific patterns.[1]

[1]As such, the second argument is equivalent to causal identification through effect heterogeneity (Nizalova & Murtazashvili, 2016). The main difference is that the heterogeneity is not captured by an interaction but by differences across structurally similar regressions.

4 | MAIN RESULTS

I present the main results in Table 2, where the dependent variables in columns (1)–(5) are $\Delta \log y$, $\Delta \log l$, $\Delta \log h$, $\Delta \log k$, and $\Delta \log a$, respectively. In column (1), the estimates show that the growth of labor and capital both are highly significant determinants of income growth while the development of education is not (however, see Pritchett, 2001). The estimate of the log to initial y is also negative and weakly significant, and thus shows standard convergence (cf., Hauk & Wacziarg, 2009). The significantly positive association with trade and negative association with government spending are also consistent with the broader empirical literature on growth. Finally, social trust is positive and highly significant; indicating that at least a substantial part of the effect of trust must run through productivity growth. As argued above, this is highly unlikely to simply reflect simultaneity or endogeneity bias as trust only clearly affects a single source of growth.

In the following columns, social trust proves insignificant for the accumulation of labor, l, while the estimates on education, h, and physical capital, k, are even significantly negative. In column (5) in which the growth of total factor productivity, $\Delta \log a$, is the dependent variable, the estimates reflect the general growth literature: the growth of the effective labor force, the initial level of productivity, trade, and government spending are all significant. However, as indicated in column (1), social trust is strongly significant in the productivity regression with a coefficient that is also economically meaningful.

These estimates change only little and insignificantly so when controlling for the quality of formal institutions in the form of the rule of law. As reported in the lower panel of Table 2, the rule of law is significantly associated with the growth of h and k, yet its inclusion does not significantly affect the point estimate of social trust. As such, the first results suggest that trust clearly affects not only economic growth per se, but also the pattern of growth. Intriguingly, trust appears to be negatively associated with capital accumulation and positively with productivity development, which may be consistent with Whiteley's (2000) hypothesis that trust affects the marginal productivity of capital. The size of the estimate is also approximately similar to those found in previous research, indicating that a 10 percentage-point trust difference is associated with a 1% higher productivity growth, all other things being equal.

5 | HOW ROBUST ARE THE PATTERNS?

Table 3 repeats these estimates but excluding all observations in which a country was not fully democratic according to a minimalist definition.[2] This first takes care of worries that some development effects—and specifically those applying to consequences of formal institutions—may only apply to democracies (Bjørnskov, 2018). Second, it also handles the potential problem that autocracies may rig their national accounts and thus report misleading growth rates (Magee & Doces, 2015; Martinez, 2019). The estimates nevertheless remain similar and

[2]The minimalist definition rests on the existence of "properly contested, repeated and repeatable elections are free and fair – as assessed by international observers from democratic countries – and create ex ante uncertainty for the incumbent government and de facto ex post irreversibility of election results" (Bjørnskov and Rode, 2020, p. 532–533). This definition is operationally equivalent to the much-used dataset in Cheibub et al. (2010), which Bjørnskov and Rode (2020) update.

TABLE 2 Main results

	Δ log y	Δ log l	Δ log h	Δ log k	Δ log a
Δ log l	1.079*** (.082)				.818*** (.079)
Δ log h	.055 (.057)				.046 (.057)
Δ log k	.544*** (.054)				.009 (.056)
Log initial y	−.017* (.010)	−.017** (.007)	.034*** (.011)	.151*** (.029)	
Log initial l		−.066*** (.023)			
Log initial h			−.017 (.013)		
Log initial k				−.149*** (.027)	
Log initial a					−.094*** (.019)
Trade volume	.017*** (.006)	.015** (.007)	.002 (.009)	−.004 (.013)	.012**(.005)
Government spending	−.149* (.083)	−.126* (.073)	.211***(.078)	−.079 (.178)	−.182** (.081)
Social trust	.056*** (.020)	.037 (.027)	−.072** (.033)	−.171*** (.061)	.102*** (.026)
Region FE	Yes	Yes	Yes	Yes	Yes
Regime FE	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes
Observations	477	477	477	477	477
Countries	64	64	64	64	64
R squared within	.580	.237	.077	.397	.605
R squared between	.763	.263	.583	.458	.476
Wald chi-squared	745.87	123.08	106.49	287.98	640.01
Including formal institutions					
Rule of law	.054 (.041)	−.015 (.029)	.081** (.040)	.158*** (.047)	.025 (.031)
Social trust	.047** (.021)	.038 (.027)	−.079** (.035)	−.202*** (.060)	.095*** (.027)

Note: ***, **, * denotes significance at $p < .01$, $p < .05$, $p < .10$; all regressions include a constant term. Numbers in parentheses are *SE* clustered at the country level.

particularly the effect of social trust on productivity development remains highly significant and quantitatively similar to that in Table 2.

The main findings also hold up to a number of additional tests documented in Table A2 in the Appendix . First, a common concern when employing Solow residuals is that results can be

TABLE 3 Results, only democracies

	Δ log y	Δ log l	Δ log h	Δ log k	Δ log a
Δ log l	1.066*** (.097)				.839*** (.095)
Δ log h	.076 (.095)				.046 (.085)
Δ log k	.504*** (.061)				.065 (.057)
Log initial y	−.029** (.013)	−.006 (.006)	.031*** (.011)	.149*** (.030)	
Log initial l		−.081*** (.019)			
Log initial h			−.025* (.014)		
Log initial k				−.151*** (.027)	
Log initial a					−.109*** (.022)
Trade volume	.015 (.010)	.017 (.011)	−.006 (.009)	−.025 (.019)	−.004 (.010)
Government spending	−.235** (.101)	−.111 (.082)	.171** (.083)	.004 (.183)	−.243** (.104)
Social trust	.057** (.029)	−.007 (.028)	−.073** (.031)	−.135** (.058)	.108*** (.032)
Region FE	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes
Observations	371	371	371	371	371
Countries	58	58	58	58	58
R squared within	.620	.269	.094	.392	.667
R squared between	.636	.077	.264	.349	.191
Wald chi-squared	-	-	-		
Including formal institutions					
Rule of law	.108** (.046)	−.020 (.039)	.101*** (.038)	.278*** (.083)	.096*** (.035)
Social trust	.040 (.031)	.009 (.028)	−.081** (.032)	−.187*** (.061)	.047 (.041)

Note: ***, **, * denotes significance at $p < .01$, $p < .05$, $p < .10$; all regressions include a constant term. Numbers in parentheses are *SE* clustered at the country level.

sensitive to the particular assumption of α (in Equation (1)), that is, of the particular assumption of production function. Yet, tests in which α is set at either .3 or .5 reveal qualitatively similar and strongly significant effects of social trust in the TFP regression. Second, tests reveal that the main results are also robust to excluding the 10% observations with the lowest and highest

TABLE 4 Robustness tests

	Δ log y	Δ log l	Δ log h	Δ log k	Δ log a
Full baseline included					
Smallest estimate					
Social trust	.018 (.034)	−.018 (.035)	−.092*** (.035)	−.203** (.095)	.069*** (.023)
Including	Dominant religion	Dominant religion	Excluding communist	Positive reciprocity	Minimum temperature
Observations	477	477	411	341	477
Countries	64	64	59	44	64
R squared within	.581	.272	.045	.449	.606
R squared between	.785	.353	.681	.376	.514
Full baseline included					
Largest estimate					
Social trust	.075*** (.026)	.075* (.044)	−.004 (.042)	−.116** (.057)	.116*** (.031)
Including	Negative reciprocity	Negative reciprocity	Negative reciprocity	Excluding communist	Negative reciprocity
Observations	341	341	341	411	341
Countries	44	44	44	50	44
R squared within	.562	.261	.170	.366	.567
R squared between	.857	.333	.513	.409	.605

Note: ***, **, * denotes significance at $p < .01$, $p < .05$, $p < .10$; all regressions include a constant term. Numbers in parentheses are *SE* clustered at the country level.

trust scores, thereby corroborating that they are not driven by extreme trust observations. This test even results in a substantially larger point estimate of social trust.[3]

Omitted variable bias is also a potential problem, not least in the present context in which a fixed effects estimator cannot be used. Table 4 therefore summarizes the results of adding winter temperature (the "minimum temperature"), dummies for dominant religions, ethnic diversity, and two survey-based measures of positive and negative reciprocity, as well as excluding communist and post-communist countries from the sample.

I report the smallest and largest estimate for social trust in each regression in Table 2 as a test of the bounds of the estimates. Doing so reveals that the overall effect on economic growth is sensitive to controlling for dominant religions while the somewhat puzzling negative effect on human capital development is rendered small and insignificant when adding a measure of negative reciprocity. Conversely, although the size of the estimates varies, both the negative association between trust and physical capital accumulation and the positive association with productivity development remain statistically significant and economically

[3]Conversely, deleting the 10% observations with the lowest growth rates (all negative) results in a smaller point estimate, although not significantly so. Combining this with deleting the smallest and largest trust observations as in Table A2 yields larger estimates that are nevertheless all well within the confidence interval of the basic estimates.

TABLE 5 Interaction tests

	Δ log a	Δ log a	Δ log a	Δ log a	Δ log a
Full baseline included					
Social trust	.264*** (.075)	.115 (.338)	.112 (.118)	.307*** (.114)	.408*** (.134)
Democracy	.066*** (.023)				
Log initial a		−.095*** (.037)			
Rule of law			.029 (.042)		
EFW area 2				.017*** (.006)	
EFW area 5					.022*** (.007)
Democracy * trust	−.185** (.076)				
Log initial a * trust		−.003 (.076)			
Rule of law * trust			−.018 (.134)		
EFW area 2 * trust				−.032** (.014)	
EFW area 5 * trust					−.046*** (.018)
Region FE	Yes	Yes	Yes	Yes	Yes
Regime FE	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes
Observations	477	477	477	466	466
Countries	64	64	64	64	64
R squared within	.607	.606	.606	.615	.614
R squared between	.494	.474	.475	.442	.439
Wald chi-squared	650.39	639.65	639.67	640.73	636.59

Note: ***, **, * denotes significance at $p < .01$, $p < .05$, $p < .10$; all regressions include a constant term. Numbers in parentheses are *SE* clustered at the country level.

meaningful.[4] As shown in Table A3, the main findings are also robust to controlling for individualism, as measured by the Hofstede index, although this is perhaps the conceptually closest alternative indicator.

Similarly, a set of tests in Table A4 shows that the main results are also robust to accounting for an estimated autocorrelation disturbance, which is inevitable with time invariant variables.

[4]An additional result of these robustness tests, which may be consistent with Weber's thesis of a Protestant work ethic, is that predominantly Protestant countries as well as those with predominantly Eastern religions tend to have larger labor supplies.

These tests also render the human capital effect insignificant while the positive association between social trust and productivity development remains strongly significant.

6 | ARE THE EFFECTS CONDITIONAL?

However, a final question is if the effects are conditional and whether the degree of conditionality depends on the particular measure of formal institutions. As noted in Section 2, a number of papers hypothesize and find evidence that some effects of social trust are conditional on either democracy or initial levels of development. Others hypothesize that social trust and the quality of formal institutions are substitutes such that social trust is less important for growth when the formal institutions are good. In addition to the robustness tests documented here and in the Appendix, I therefore provide tests of the productivity effects in Table 5 where I interact social trust with a set of conditions.

The results in column (1) indicate that trust may have a significantly smaller (but still significant) effect on productivity in democracies. The point estimate of trust in autocracies is .264 while the conditional estimate in democracies is .079; both are significant at $p < .05$. However, other interactions with the initial level of TFP—testing conditional convergence—and the rule of law index reveal no substantial differences. Conversely, consistent with the findings in Ahlerup et al. (2009), the interactions with institutional quality as measured by the Fraser Institute in columns (4) and (5) indicate substantial and clearly significant interaction terms (Gwartney et al., 2020). For both judicial quality (area 2) and regulatory freedom (area 5), social trust is significant at conventional levels at low levels of institutional quality while the conditional point estimates become small and insignificant for high levels of quality. As is evident in Figure 1, which depicts the conditional point estimates of social trust at all levels of regulation observed in the sample surrounded by the conditional 95% confidence interval, the effect is

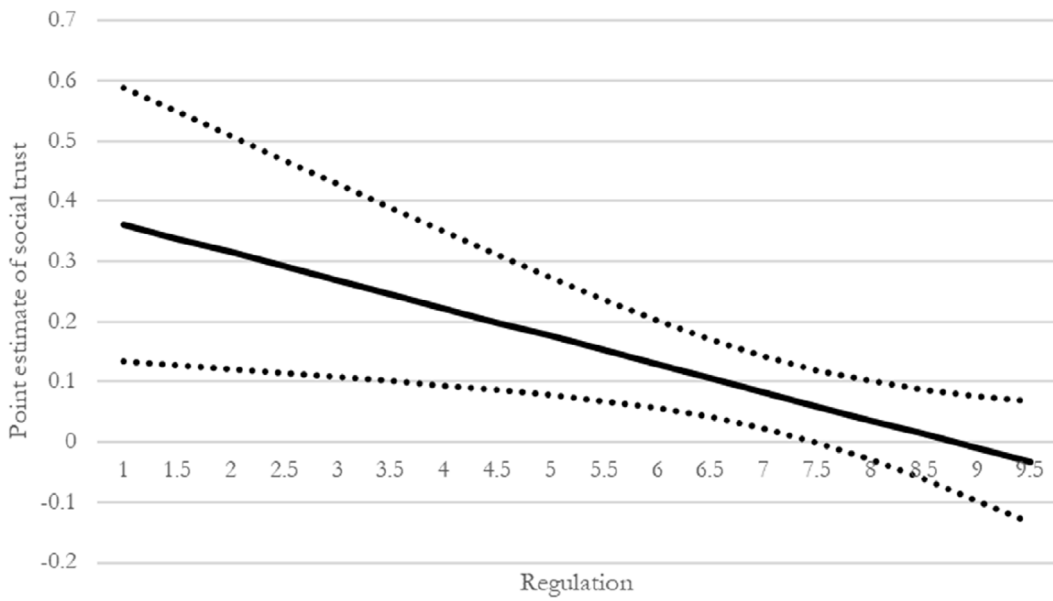

FIGURE 1 Productivity effects of social trust, conditional on regulation

substantial and precisely identified for most values of regulation. It becomes insignificant at regulatory freedom above ~7.7, which is approximately the current level of Germany.

As shown in Table A5, the identified heterogeneity is not a consequence of the specific source as an alternative institutional indicator capturing political corruption yields similar results across the growth accounting exercise. While the conditional effects thus depend crucially on the choice of indicator, they suggest that social trust and institutional quality may be substitutes in the determination of productivity growth. This nevertheless does not reduce the role of social trust in societies with good institution, as the effects of trust on institutional quality are well-documented.[5]

Overall, these as well as further tests show that the conditional trust effects on productivity growth pass the same standard robustness tests as in Section 5. In summary, the effects of social trust appear to run mainly through productivity development and may be indirect in countries with relatively good political and judicial institutions.

7 | CONCLUSIONS

This paper returns to the literature on social trust and long-run economic growth. While the overall association between trust and growth is well documented, it remains an open question whether the effects of trust on long-run growth are mainly due to effects on the rate of factor accumulation or on productivity development. In other words, this paper uniquely explores the effects of social trust on the *pattern* of long-run growth.

While this may appear to ask a rather specific question, it is far from irrelevant for our understanding of long-run development. The question is important, as effects through factor accumulation are subject to decreasing marginal returns and thus signify different rates of catch up in the long-run and imply permanently different steady states while effects through factor productivity reflect different degrees of economic dynamism (Solow, 1956; Swan, 1956). Different *patterns* of growth may therefore have markedly different consequences for long-run *levels* of development. In addition, different patterns of growth leave different environmental footprints with those dominated by productivity increases leaving the smallest footprints, all other things being equal.

The findings here strongly suggest that social trust mainly affects the development of productivity and only weakly affects the rate of factor accumulation, if at all. Analyses of overall growth suggest that social trust is significantly positively associated with growth, which is not the case for the growth of labor supply, physical capital, or education. Conversely, trust is strongly associated with the development of productivity, measured as a Solow residual. The main results are also of economic significance, as they suggest that a one-*SD* of social trust—approximately the difference between France and Germany—is associated with a productivity increase of about 20% of a *SD*. These findings are robust to a set of standard tests and appear conditional on the quality of formal institutions. This latter finding is nevertheless sensitive to the specific measure of institutional quality and thus requires more research.

The findings may shed more light on which theoretical mechanisms are at play and inform ongoing theoretical discussions regarding how trust matters for economic productivity.

[5]A complicating factor in this respect is that social trust primarily appears to be a strong determinant of institutional quality in democracies (cf., Bjørnskov, 2018), Hence, the degree of substitutability between institutions and trust and the specific transmission mechanism may also differ with the regime type.

Contrary to much theorizing the last two decades, the results are for example inconsistent with any importance of the specific transaction costs hypothesized by Zak and Knack (2001) and Bjørnskov (2009) for the accumulation of physical and human capital. Second, noting that social trust is strongly associated with productivity growth but negatively associated with capital accumulation may, for example, be consistent with Whiteley's (2000) idea that trust affects the marginal efficiency of factor inputs. However, recent evidence in Bergh and Bjørnskov (2020) does not support Whiteley's suggestion that capital accumulation is more strongly associated with growth in high-trust societies. What one is left with is therefore a smaller set of theoretical mechanisms that are not inconsistent with the evidence. These mechanisms include lower general transaction costs that allow firms to use a larger share of their resources productively and to plan on longer time horizons (Knack & Keefer, 1997). They also include the possibility that a high-trust culture is more conducive to weak ties through which potentially productive information can flows and enable innovative activity (cf. Ikeda, 2008) and that part of the effect runs through well-known consequences of easier regulation and better property rights institutions.

Yet, a number of other questions related to the development effects of trust still remain. For example, one might consider if there are specific conditions under which social trust becomes more important—as indicated in the last section—and whether there might be an optimal level of trust (cf., Butler et al., 2016). Similarly, for countries with poor formal institutions, it remains an open question exactly how trust affects their quality, and particularly whether trust mainly affects voters' policy preferences or the reform ability of the political institutions (Bjørnskov, 2018; Pitlik & Rode, 2017). This paper only takes a single step towards understanding the broader consequences of cross-country differences in social trust.

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APPENDIX

TABLE A1 Countries included

Argentina	Hong Kong	Portugal
Australia	Hungary	Romania
Austria	Iceland	Russia
Bangladesh	India	Singapore
Belgium	Ireland	Slovakia
Brazil	Israel	Slovenia
Bulgaria	Italy	South Africa
Cambodia	Jamaica	South Korea
Canada	Japan	Spain
Chile	Latvia	Sri Lanka
Colombia	Lithuania	Sweden
Costa Rica	Luxembourg	Switzerland
Croatia	Malaysia	Taiwan
Cyprus	Malta	Thailand
Czechia	Mexico	Turkey
Denmark	Netherlands	United Kingdom
Ecuador	New Zealand	United States
Estonia	Norway	Uruguay
Finland	Pakistan	Venezuela
France	Peru	Vietnam
Germany	Philippines	
Greece	Poland	

TABLE A2 Robustness tests

	Δ log a No extremes	Δ log a Area 2	Δ log a Area 5	Δ log a α = .3	Δ log a α = .5
Full baseline included					
Social trust	.167*** (.059)	.079** (.037)	.094*** (.033)	.102*** (.027)	.094*** (.025)
EFW area 2		.008 (.005)			
EFW area 5			.008 (.005)		
Region FE	Yes	Yes	Yes	Yes	Yes
Regime FE	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes
Observations	374	466	466	477	477
Countries	52	64	64	64	64
R squared within	.645	.612	.612	.674	.522
R squared between	.437	.423	.412	.493	.487
Wald chi-squared	579.02	630.35	625.06	825.18	484.81

Note: ***, **, * denotes significance at $p < .01$, $p < .05$, $p < .10$; all regressions include a constant term. Numbers in parentheses are *SE* clustered at the country level.

TABLE A3 Main results including individualism

	Δ log y	Δ log l	Δ log h	Δ log k	Δ log a
Social trust	.053*** (.023)	.039 (.029)	−.065** (.034)	−.151** (.072)	.090*** (.027)
Individualism	.020 (.029)	−.014 (.022)	−.017 (.023)	−.045 (.047)	.029 (.031)
Region FE	Yes	Yes	Yes	Yes	Yes
Regime FE	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes
Observations	469	469	469	469	469
Countries	62	62	62	62	62
R squared within	.576	.236	.078	.401	.598
R squared between	.744	.181	.589	.446	.462
Wald chi-squared	706.54	112.33	103.80	284.71	611.34

Note: ***, **, * denotes significance at $p < .01$, $p < .05$, $p < .10$; all regressions include a constant term. Numbers in parentheses are *SE* clustered at the country level.

TABLE A4 Results, only democracies, autocorrelation disturbance

	Δ log y	Δ log l	Δ log h	Δ log k	Δ log a
Δ log l	1.211*** (.065)				.986*** (.059)
Δ log h	.093 (.084)				.011 (.081)
Δ log k	.501*** (.051)				−.019 (.049)
Log initial y	−.033** (.009)	−.002 (.009)	.029*** (.009)	.195*** (.024)	
Log initial l		−.154*** (.029)			
Log initial h			−.047*** (.012)		
Log initial k				−.235*** (.023)	
Log initial a					−.100*** (.016)
Trade volume	.017 (.011)	.028** (.012)	−.007 (.009)	−.030 (.019)	.007 (.010)
Government spending	−.303*** (.097)	−.272*** (.095)	.120* (.065)	.231* (.134)	−.308*** (.095)
Social trust	.059* (.034)	.015 (.035)	−.028 (.033)	−.115* (.069)	.088*** (.035)
Region FE	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes
Observations	371	371	405	405	371
Countries	58	58	58	58	58
R squared within	.561	.303	.048	.288	.597
R squared between	.615	.025	.224	.317	.153
Wald chi-squared	495.59	48.67	28.13	130.93	583.14
Including formal institutions					
Rule of law	.130*** (.047)	.030 (.047)	.108*** (.037)	.346*** (.078)	.065 (.042)
Social trust	.040 (.037)	.007 (.034)	−.048 (.032)	−.195*** (.070)	.072** (.037)

Note: ***, **, * denotes significance at $p < .01$, $p < .05$, $p < .10$; all regressions include a constant term. Numbers in parentheses are *SE*.

TABLE A5 Main results, political corruption

	Δ log y	Δ log l	Δ log h	Δ log k	Δ log a
Social trust	.038* (.021)	.043 (.029)	−.084** (.033)	−.183*** (.065)	.079*** (.027)
Political corruption	−.040 (.025)	.015 (.024)	−.033* (.018)	−.022 (.050)	−.046* (.025)
Region FE	Yes	Yes	Yes	Yes	Yes
Regime FE	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes
Observations	476	476	476	476	476
Countries	64	64	64	64	64
R squared within	.582	.240	.082	.396	.605
R squared between	.775	.256	.579	.467	.476
Wald chi-squared	752.32	123.32	107.17	287.44	640.01
Including formal institutions					
Social trust	.018 (.026)	.028 (.029)	−.106*** (.035)	−.292*** (.081)	.071** (.032)
Political corruption	−.076** (.036)	−.015 (.029)	−.069*** (.021)	−.188*** (.063)	−.059 (.037)
Trust * corruption	.177* (.107)	.153 (.123)	6.964*** (2.119)	.821*** (.252)	.068 (.113)

Note: ***, **, * denotes significance at $p < .01$, $p < .05$, $p < .10$; all regressions include a constant term. Numbers in parentheses are *SE* clustered at the country level.