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TRUST AND INNOVATION IN EUROPE: CAUSAL, SPATIAL AND NON-LINEAR FORCES

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OBJECTIVE

There is an extensive literature on the impact of social capital on outcome variables. Social capital and trust have been associated with economic growth, innovation, education, value creation by firms and crime. In this research our objective is specifically to look at whether (i) there is a causal relationship between trust and innovation, (ii) other forms of trust (e.g., general, personal etc.) are conducive to innovation, (iii) non-linearity of trust is a factor to consider, and (iv) spatial forces are important in the relation between trust and innovation. These issues have been tackled individually in the literature previously. However, this is the first research that takes all these issues as a package. We also provide a survey regarding the policy implications that drive from the empirical literature specific to cross-country or regional regressions that use social capital and/or trust as independent and economic growth and/or innovation as dependent variable.

SCIENTIFIC/RESEARCH METHODS

This research investigates recent issues regarding the social capital / trust and innovation link. We specifically focus on three forces that could affect the trust-innovation link: causality, non-linearity and spatiality. The roles of these forces have been investigated by using data from 135 EU regions. Our data come from two main sources. Most of the innovation related data comes form eurostat. Trust related data is from the European Social Survey 2004 round. We specifically used the 2004 round because there are questions on generalised trust and detailed questions on self experiences and own acts regarding trust.

The findings show that trust is an important determinant of innovation measured by patent applications per million inhabitants.

Of all other 21 trust related indicators from the ESS we showed that the only two robust indicators are generalised trust (TRUST) and whether most people are fair (FAIR). This result is a strong finding regarding the robustness of the general trust question used in various surveys like the ESS or European Values Survey. After we set up a link between trust and innovation we looked at some issues in a more detailed way. First, we dealt with causality issue using historical state of universities in European regions and estimated regressions using and instrumental variable approach (IV). The IV approach is commonly used in the literature to address causality issue between social capital/trust and outcome variables such innovation and economic growth. Our findings show that with IV estimation we can capture the exogenous general trust element and show that trust is conducive to innovation.

Second, we look at non-linearity. It could be the case that at very high trust levels the trust-innovation link breaks down or even turns into negative. For instance closed networks or family networks have very high social capital but generally prove to be bad for personal outcomes. To investigate the existence of such forces we included squared terms of TRUST and FAIR into the regression. The squared terms turn out to be negative but not significant. While we report signs of non-linearity we cannot report statistically significant findings.

Third, we investigate the impact of spatial forces. It could be the case that just as R&D, innovation and human capital of neighbouring regions could have effects on regional factors, trust of the surrounding regions could affect regional outcomes. Our estimates using spatial lag models confirm previous studies that spatiality is an important force.

In general we find that a one standard deviation rise in general trust (a 12.5% rise in trust level) increases patents per million inghabitants on average by 2%.

POLICY VALUE-ADDED

Various investigations are conducted on the impact of social capital and/or trust on outcome indicators since the seminal paper of Knack and Keefer (1997, *Quarterly Journal of Economics*, Vol.112, Issue: 4, p.1251-1288). Using cross-country and regional data the literature show that social capital/trust and innovation/growth link is statistically significant. However, the literature is generally silent on one issue: what policy?

We summarize about 15 papers that investigate the link between social capital and economic outcomes that use similar methodology (growth or patent regression that use data at the country or regional level). The main message out of this summary is

that policy implications that come out of this literature are generally weak and mostly indirect.

The literature generally makes statements but does not really provide in-depth policy implications. If we find that trust is conducive to innovation we have to think about what this finding actually means. We cannot tell people or firms to trust others more because this is important for innovation. At this stage the literature turns into more indirect policy implications by looking at the factors that create social capital and trust. Two observation stands out. First, the literature is developed in many different aspects but not on the policy aspect. In most cases the word "policy" appears several times but not in effective terms (i.e., a real policy implication suggested by the authors). Disturbing as it sounds the Knack and Keefer (1997) paper is one of the best in the literature in terms of policy implications despite many papers on this specific topic (social capital-economic outcome link).

Second, there are two types of policy conclusion. If indicators that represent associational activity and participation to networks are used as independent variables and their effects are positive then the policy conclusion is obvious: social networks are good for economic outcomes so the government should enhance participation in networks. The EU framework projects are good examples because most applications require a consortium. In this way professional and social links are established throughout the continent (and sometimes outside the continent) which in the long run is very important for diffusion of knowledge. Through this channel social capital can be tied to innovation. So fostering (especially vertical) networks is a policy outcome. If the general trust or social capital index is used as an indicator then the literature either benefits from complementarity effects to argue that governments should invest in human capital as education has great socialising element or looks at the variables that form social capital/trust in the long run. If the research has a long run view then establishing formal institutions as well as education would create good social capital in the future.

This research is about the trust-innovation link so our policy implications are akin to the second observation (i.e., the complementarities and institutions as first best solutions). But in general current EU policies that support forming networks (e.g., framework project), fostering education (e.g., lifelong learning) and reducing heterogeneity (e.g., policies on social inclusion, inclusive growth) can foster trust in an indirect way. The new Horizon 2020 set up is also conducive to social capital and trust since interdisciplinarity is a strong aspect of the program. Forcing scientists of different back ground and policy makers to come together would result in links across disciplines between and within regions, which is very important for the diffusion of knowledge.