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Culture, diffusion, and economic development: The problem of observational equivalence

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HIGHLIGHTS

- Direct and barrier effects of culture on economic development are explored.
- Conditions for observational equivalence are identified.
- Establish observational equivalence between absolute and relative cultural distances.
- Observational equivalence affects identification of cultural effects.
- Difficulties beyond issues of reverse causality or omitted variables.

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ABSTRACT

This research explores the direct and barrier effects of culture on economic development. It shows both theoretically and empirically that whenever the technological frontier is at the top or bottom of the world distribution of a cultural value, there exists an observational equivalence between absolute cultural distances and cultural distances relative to the frontier, preventing the identification of its direct and barrier effects. Since the technological frontier usually has the "right" cultural values for development, it tends to be in the extremes of the distribution of cultural traits, generating observational equivalence and confounding the analysis. These results highlight the difficulty of disentangling the direct and barrier effects of culture. The empirical analysis finds suggestive evidence for direct effects of individualism and conformity with hierarchy, and barrier effects of hedonism.

1. Introduction

Economists have been studying the effects of culture on economic development at least since Weber (1930) proposed his famous "protestant ethic" thesis, which posited that protestantism was conducive to capitalist development due to its emphasis on thrift, hard work, and human capital accumulation (Andersen et al., 2013; Becker and Woessmann, 2009). Additional cultural determinants of comparative development have been suggested in the literature, including differences in levels of trust, cooperation, family ties, individualism, obedience, and attitudes towards work and other individuals (Alesina and Giuliano, 2010, 2014; Giuliano, 2007; Gorodnichenko and Roland, 2016; Guiso et al., 2006, 2009; Knack and Keefer, 1997; Zak and Knack, 2001).

This literature has focused mainly on the *direct effects* of culture on development, i.e. how having a certain *absolute* level of a cultural trait affects economic development. Thus, for example, analyzing whether being more or less patient affects development through its impact on human and physical capital accumulation (Dohmen et al., 2015; Galor and Özak, 2016). On the other

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hand, a more recent strand of the literature has emphasized a potential *barrier effect* of culture on development, i.e. how *relative* levels of a cultural trait affect economic development (Basso and Cuberes, 2016; Guiso et al., 2009; Spolaore and Wacziarg, 2009). In particular, cultural differences relative to the technological frontier, like not sharing its religion or language, might act as cultural barriers to technological diffusion and thus lower economic development (Spolaore and Wacziarg, 2012, 2013).

These two types of effects of culture have been identified largely by exploring the differential effects of absolute and relative cultural distances in pairwise country regressions. In particular, if absolute differences in a cultural trait between countries are significantly associated with absolute differences in development then, it is argued, culture has a direct effect. On the other hand, if differences between countries in a cultural trait relative to the technological frontier are significantly associated with absolute differences in development then, it is argued, culture has a barrier effect. The literature has focused on addressing potential threats to identification like reverse causality and omitted variable bias, but it has failed to recognize the problem of observational equivalence between absolute and relative cultural distances, i.e., conditions when these cultural distances are indistinguishable from each other.

This paper identifies the necessary and sufficient conditions for observational equivalence in a cultural trait to hold. In particular, it establishes that observational equivalence holds in a cultural trait if, and only if, the technological frontier is at the top or at the bottom of the global distribution of this cultural trait. Thus, the problem of observational equivalence is created by the location of the technological frontier in the global distribution of cultural values. Importantly, since the technological frontier usually has the "right" cultural values for development, it tends to be in the extremes of the distribution of cultural traits, hence generating observational equivalence and confounding the analysis. While the perfect multicollinearity behind observational equivalence may not hold perfectly, large correlations between absolute and relative cultural distances may still prevent the correct identification of these effects.

The observational equivalence of absolute and relative cultural distances could play an important role in the identification, understanding and implications of the direct and barrier effects of culture. In particular, since these effects might generate completely different policy recommendations it seems important to further understand and disentangle these cultural mechanisms. Interestingly, this observational equivalence and the issues it raises have not been previously identified in the literature. Partly, this omission may be due to the use of genetic distances to proxy for cultural differences. For example, Spolaore and Wacziarg (2009) have shown that differences in contemporary income per capita are associated with relative genetic distances to the United States, thus suggesting a barrier effect of culture. A major drawback of this approach is that it does not identify the cultural values behind these associations and, as will be apparent below, it may be confounding the true channel through which culture affects development.

This research advances the understanding of the relation between differences in contemporary income per capita levels and cultural differences between countries and their cultural differences relative to the contemporary technological frontier, i.e. the United States. It establishes that absolute differences in levels of individualism and vertical hierarchy across countries are statistically and economically significantly associated with differences in contemporary income per capita.[1] On the other hand, linguistic distances and differences in hedonism are the only cultural differences relative to the United States that are statistically and economically significantly associated with differences in contemporary income. Moreover, once these cultural traits are accounted for, genetic distances relative to the US cease to be robustly associated with development. In particular, genetic distances are not significant when differences in individualism are accounted for. Thus, suggesting that the use of genetic distances as proxies for cultural differences may hide the observational equivalence problem and misrepresent the true effects of culture.

The rest of the paper is structured as follows. Section 2 studies the problem of observational equivalence in a general theoretical setting and identifies the necessary and sufficient conditions for its presence. Section 3 explores the problem of observational equivalence empirically. Specifically, it introduces the data and presents the main empirical results. Section 4 concludes.

2. Observational equivalence in theory

This section shows the problem of observational equivalence in the study of the relation between cultural differences and economic development. In particular, it establishes the necessary and sufficient conditions for observational equivalence to hold.[2] Moreover, it shows that whenever observational equivalence holds, an empirical researcher may draw wrong conclusions about the effect of culture.

Assume income per capita in country i in a balanced growth path depends monotonically on two cultural traits, $\theta_i \in [\underline{\theta}, \bar{\theta}]$ and $\sigma_i \in [\underline{\sigma}, \bar{\sigma}]$. Specifically, assume that income per capita in country i is given by

$$y_i = h(\theta_i, |\sigma_i - \sigma_f|), \tag{1}$$

where σ_f is the level of σ in the technological frontier f. Without loss of generality assume that h is strictly increasing in the first component and strictly decreasing in the second component. These assumptions capture the idea that θ has only a direct effect on development, while σ only has a barrier effect on development.

Given a cultural value θ, let θ_{ij} denote the absolute cultural distance in θ between countries i and j and θ^R_{ij} denote their relative cultural distance to the frontier in θ. Thus,

$$\theta_{ij} = |\theta_i - \theta_j|, \quad \theta^R_{ij} = |\theta_{if} - \theta_{jf}|. \tag{2}$$

Similarly, let σ_{ij} denote the absolute cultural distance in σ between countries i and j and σ^R_{ij} denote their relative cultural distance in σ. Thus, one can rewrite income per capita as $y_i = h(\theta_i, \sigma_{if})$, which highlights the different effects these two cultural traits have. Let $N = \{1, \ldots, N_c\}$ denote the set of countries.

Definition 2.1. Given a cultural trait c, observational equivalence in cultural trait c holds whenever $c_{ij} = c^R_{ij}$ for all $i, j \in N$.[3]

Theorem 2.2. *Observational equivalence in cultural trait c holds if, and only if, the technological frontier f is at the top or bottom of the distribution of c, i.e., if $c_f \leq c_i$ for all $i \in N$ or $c_f \geq c_i$ for all $i \in N$.*

Proof. First, let us prove that if $c_f \geq c_i$ for all $i \in N$, then observational equivalence holds. In particular, by definition

$$c^R_{ij} = |c_{if} - c_{jf}|,$$

[1] Individualism has also been linked to the timing of the fertility transition (Basso and Cuberes, 2016).

[2] The analysis focuses on observational equivalence in pairwise regressions, but it is easy to show using the same type of arguments that the similar necessary and sufficient conditions are required for observational equivalence to hold in country-level regressions.

[3] Given the literature's emphasis on pairwise regressions, the analysis focuses on observational equivalence in this setting. It is not difficult to see that similar problems arise in country-level analyses.