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The impact of cultural orientation towards secrecy on innovation

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ABSTRACT

Our empirical analyses, based on a large international dataset of private firms, show that a cultural orientation towards secrecy significantly negatively affects the likelihood of investing in innovation. This finding is robust to a host of concerns and suggests that cultural orientation towards secrecy explains a significant portion of the cross-country variations in private firms' innovation.

1. Introduction

Previous studies have identified various factors at the firm and country levels that influence innovation, such as access to finance, cash reserves, firm size, ownership structure, economic growth, and institutional development.[1] In addition, recent research has also explored the impact of informal institutional factors like culture, religion, trust and language on innovative activity (Bénabou et al., 2015; Bischoff et al., 2023; Chi et al., 2020; El Ghoul et al., 2023).

This short paper aims to build on and extend this literature by empirically examining the effect of cultural orientation towards secrecy, a unique cultural trait, on innovation in private firms across countries. Our focus on cultural orientation towards secrecy (secrecy henceforth) is motivated by several emerging studies reporting its significant impact on investment efficiency (Mazboudi and Hasan, 2018), initial price offerings (Chen et al., 2022), conservatism (Doupnik and Riccio, 2006), financial constraints (Oyekola and Odewunmi, 2023), stock market reactions to earnings announcements (Wijayana and Gray, 2018) and external auditor choice (Hope et al., 2008). However, the potential negative impact of secrecy on innovation, to the best of our knowledge, has yet to be explored.

According to Gray (1988)'s conceptual framework, a culture that emphasises secrecy can lead to decreased transparency and fewer disclosures of information. In turn, this can exacerbate information asymmetry within (managers/employees) and outside (investors) a company (Ascioglu et al., 2008; Gray and Vint, 1995; Mazboudi and Hasan, 2018), impeding innovation through various channels, including limited information sharing, slow responses to market changes, and impaired decision-making. It can also result in inefficient resource allocation, as decision-makers may lack crucial information about the risks and benefits associated with innovative projects (Baxamusa et al., 2015; Mazboudi and Hasan, 2018; Tsai, 2008).

Furthermore, a lack of transparency can limit access to external finance (Baxamusa et al., 2015; Chen et al., 2022; Krishnaswami and Subramaniam, 1999; Oyekola and Odewunmi, 2023; Tsai, 2008), as potential investors may be wary of investing in firms that are not forthcoming with information (Ascioglu et al., 2008). Secrecy can also hinder the establishment of trust and collaborative partnerships both within a company and with external entities such as other firms, research institutions, and universities (Saeed and Riaz, 2021). Lastly, a culture of secrecy can lead to low employee morale and engagement (Montag-Smit and Smit, 2021), as employees may feel disconnected and less motivated to contribute innovative ideas if they are not well informed about the company's strategic goals, ongoing projects, and market conditions. Taken together, we hypothesise that secrecy negatively affects innovation.

To test the above conjecture and provide new insights into the impact of cultural orientation towards secrecy on innovation, we have combined firm-level data from private companies in 55 countries between 2006 and 2021, as provided by the World Bank Enterprise Surveys (WBES), with country-level data from the World Bank and

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[1] See, for example, Gorodnichenko et al. (2010), Gorodnichenko and Schnitzer (2013) and Machokoto et al. (2023).

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cultural indicators from sources such as Hofstede (2001) and Schwartz (1992). We focus on private firms, as they are more innovative than public firms (Nett, 1994; Gao et al., 2018; Machokoto et al., 2023), and at the same time account for over two-thirds of global corporate assets and approximately 97.5% of all firms (see Bigelli et al., 2014), despite being understudied. Furthermore, information disclosures and external audits are not mandated for private firms (see Minnis and Shroff, 2017), potentially making the increase in information asymmetry with a cultural orientation towards secrecy more pronounced.

Using probit models, we confirm our predictions, as we find a consistently significant negative effect of secrecy on the likelihood of investing in innovation. Specifically, a one standard deviation increase in secrecy is associated with a 18% to 40% decrease in the likelihood of investing in innovation compared to the mean. These findings are robust to a host of concerns, including alternative variable definitions, model specifications and estimation techniques, and they pass the falsification tests of firms randomly assigned firms to high and low-secrecy subgroups of countries. Our findings suggest that cultural orientation towards secrecy explains a non-trivial proportion of cross-country variations in innovation, in addition to the other factors studied thus far.

This study makes three contributions to the literature. First, we add new insights to the growing literature documenting the significant effects of informal institutional factors on economic behaviour and outcomes (Bénabou et al., 2015; Bischoff et al., 2023; El Ghoul et al., 2023). Our study contributes to this literature by showing that cultural orientation towards secrecy might impede innovation, which is an essential catalyst for economic growth. Second, we contribute to the debate on why some less-developed countries may never catch up to others.[2] In this regard, we show that cultural orientation towards secrecy, which is relatively time-invariant and inherited from the distant past, might explain such a lack of progress in some countries *via* its significant negative effects on innovation. Finally, our findings also suggest cultural orientation towards secrecy might explain the observed and seemingly persistent cross-country differences in innovation.

The following sections discuss our methodology, data, findings, robustness tests and conclusions.

2. Methodology and data

To examine the effects of cultural orientation towards secrecy on innovation, we estimate the following probit model:

$$Pr\left(y_{ijkt}=1\right)=\alpha_0+\alpha_1 SECRECY_k+\boldsymbol{\beta X}_{ijkt}+\boldsymbol{\theta Z}_{kt}+\eta_j+\eta_t+\epsilon_{ijkt} \quad (1)$$

where i, j, k and t index for enterprise, industry, country and year, respectively. y is a dummy variable that equals one if an enterprise invests in innovation and zero otherwise. α_0 is a constant. α_1, $\boldsymbol{\beta}$ and $\boldsymbol{\theta}$ are the coefficients to be estimated. η_i and η_t denotes the industry and year fixed effects, respectively. *SECRECY* measures cultural orientation towards secrecy. $\boldsymbol{X}$ and $\boldsymbol{Z}$ denotes the vector of firm-specific and country-specific control variables. Finally, ξ_{ijk} denotes the error term.

The dataset used in this study is drawn from the World Bank Enterprise Surveys (WBES).[3] Based on this dataset and following the literature, we construct four proxies of innovation.[4] *INNOV1* is a dummy variable that equals one if an enterprise invests in research and development and zero otherwise. *INNOV2* is a dummy variable that equals one if an enterprise has introduced a new product and zero otherwise. *INNOV3* is a dummy variable that equals one if an enterprise has introduced a new process and zero otherwise. *INNOV4* is a dummy variable that equals one if *INNOV1*, *INNOV2* and *INNOV3* are all equals one and zero otherwise.[5]

Our four proxies of secrecy are based on cultural indicators drawn from Hofstede (2001) and Schwartz (1992) and are defined as follows. *SECRECY1* is the *sum* of uncertainty avoidance and power distance *minus* individualism.[6] *SECRECY2* is the *sum* of uncertainty avoidance and power distance *minus* individualism *minus* masculinity. *SECRECY3* is the *sum* of uncertainty avoidance *minus* individualism. *SECRECY4* is embeddedness *minus* egalitarianism. The construction of these four proxies of cultural orientation towards secrecy is informed by the literature.[7] In our probit models, we include several firm-level and country-level control variables that informed by the literature (see Gorodnichenko and Schnitzer, 2013; Gorodnichenko et al., 2010; Machokoto et al., 2021, 2023; Wellalage and Fernandez, 2019; Wellalage et al., 2020) and defined in the Online Appendix — Table A.1. In addition, we estimate the models with industry and year fixed effects to address potential omitted-variable bias.

3. Results and discussions

Table 1 presents the results of the multivariate probit models depicted in Eq. (1). Columns (1)–(4) indicate that the coefficient of secrecy is negative and statistically significant at the 1% level, suggesting a negative association between secrecy and the likelihood of investing in innovation.[8] However, these results should be interpreted with caution as the sample largely excludes developed countries and mostly consist of developing countries which are the focus of the World Bank Enterprise Survey. This focus may result in fewer firms and instances of innovation compared to those in developed countries, and thus the disparity we observe in innovation may not be solely attributed to secrecy, but rather to the fact that the firms in our sample are mostly from developing countries. Additionally, omitted variables may bias our univariate regression results.

To address the above concerns, we present, in Columns (5)–(8), the results for models that include a complete set of control variables at the firm and country levels, accounting for differences in firm-specific attributes and institutional and levels of economic development across countries. As expected from our initial analyses, secrecy continues to exhibit a negative and significant effect on the likelihood of investing in innovation at the 1% level, with consistent signs and point estimates across all the specifications.[9] Our analyses provide suggestive evidence for the negative relationship between secrecy and the likelihood

[2] See, Gorodnichenko et al. (2010) and Gorodnichenko and Schnitzer (2013).

[3] This dataset is available from https://www.enterprisesurveys.org/.

[4] See, Machokoto et al. (2023), Gorodnichenko et al. (2010) and Gorodnichenko and Schnitzer (2013).

[5] We acknowledge that utilising a survey-based dataset, which solely measures the existence of innovation without taking into account its extent or depth, may present certain limitations and result in an incomplete comprehension of the intricacies of innovation. This approach neglects to account for the magnitude and variety of various forms of innovation.

[6] In the robustness analysis, we additionally utilised *SECRECY DUMMY*, a binary variable that takes on a value of one for enterprises situated in countries boasting above-median secrecy and zero otherwise, as an alternative variable.

[7] Extant studies that inform our the construction of our proxies, such as Doupnik and Riccio (2006), Hope et al. (2008), Makrychoriti and Pasiouras (2021), Oyekola and Odewunmi (2023), and Wijayana and Gray (2018), assert that high uncertainty avoidance, high-power distance, and low individualism are correlated with secrecy. In cultures characterised by these traits, there is a propensity to avoid risk-taking and preserve social hierarchies, which typically involves limiting access to information to specific individuals or groups.

[8] The results of the multivariate probit models align with the descriptive statistics and correlations presented in the Online Appendix — Table A.1. Moreover, the Online Appendix — Table A.2 shows a consistent trend where firms located in countries with high levels of secrecy have lower propensities for investing in innovation. Additionally, the Online Appendix — Table A.3 shows significant variation in innovation across the 55 countries in our sample.

[9] A one standard deviation increase in secrecy leads to a decrease in the likelihood of investing in innovation between 0.1000 [0.1712 × 0.4347] and 0.164 [0.3773 × 0.4347], implying a decrease in the likelihood of investing in innovation of between 18% [0.1712 × 0.4347/0.4194 × 100]

Table 1
The effects of secrecy on innovation.

Dependent variables	INNOV1	INNOV2	INNOV3	INNOV4	INNOV1	INNOV2	INNOV3	INNOV4
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SECRECY1	−0.2605***	−0.3111***	−0.3773***	−0.3381***	−0.2504***	−0.1712***	−0.2393***	−0.2302***
	(0.0238)	(0.0221)	(0.0227)	(0.0287)	(0.0270)	(0.0245)	(0.0257)	(0.0332)
Financial constraints					0.2039***	0.0900***	0.1552***	0.1159***
					(0.0136)	(0.0126)	(0.0127)	(0.0158)
Medium firms					0.3366***	0.2185***	0.2921***	0.3448***
					(0.0151)	(0.0138)	(0.0139)	(0.0180)
Large firms					0.6945***	0.4238***	0.5711***	0.6737***
					(0.0178)	(0.0169)	(0.0171)	(0.0207)
Sole proprietorship					−0.2828***	−0.1529***	−0.0801***	−0.2188***
					(0.0183)	(0.0163)	(0.0164)	(0.0212)
Partnership					−0.1517***	−0.2046***	0.0321	−0.1608***
					(0.0248)	(0.0230)	(0.0229)	(0.0288)
Female ownership					0.0244*	0.1058***	0.1046***	0.0568***
					(0.0140)	(0.0130)	(0.0132)	(0.0162)
City location					0.1615***	0.1869***	0.1896***	0.1948***
					(0.0212)	(0.0191)	(0.0193)	(0.0249)
Firm's age					−0.0208**	0.0085	−0.0319***	−0.0210*
					(0.0100)	(0.0093)	(0.0095)	(0.0114)
Manager experience					0.0146	0.0591***	0.0396***	0.0289**
					(0.0096)	(0.0090)	(0.0091)	(0.0112)
Informal competition					0.0881***	0.0905***	0.0812***	0.0957***
					(0.0148)	(0.0136)	(0.0137)	(0.0172)
Political connections					−0.0289*	0.0595***	0.1531***	−0.0382*
					(0.0173)	(0.0160)	(0.0160)	(0.0200)
Inflation					−1.2903***	−1.6692***	−1.1242***	−1.0555***
					(0.1904)	(0.1716)	(0.1802)	(0.2219)
GDP Growth					3.1752***	3.9482***	5.5980***	3.7415***
					(0.4268)	(0.3984)	(0.4018)	(0.4906)
LogGDP					−6.2752***	−12.2320***	−10.2900***	−6.2773***
					(0.7461)	(0.6813)	(0.7068)	(0.8818)
Private credit/GDP					0.0558*	0.0776***	0.2637***	0.1667***
					(0.0307)	(0.0288)	(0.0289)	(0.0360)
Stock Mkt Cap/GDP					0.0227	−0.3604***	−0.1893***	−0.1879***
					(0.0215)	(0.0194)	(0.0193)	(0.0244)
Constant	−0.0461	0.7351***	0.7005***	−0.1648***	1.1070***	3.2746***	2.5145***	0.8252***
	(0.0394)	(0.0377)	(0.0381)	(0.0453)	(0.1950)	(0.1777)	(0.1850)	(0.2303)
# of observations	52,836	52,836	52,836	52,836	52,836	52,836	52,836	52,836
Pseudo-R^2	0.098	0.097	0.110	0.113	0.143	0.134	0.147	0.156

***, **, * indicate significance at the one, five, and ten percent levels, respectively.

of investing in innovation, which sheds light on the importance of transparency and knowledge sharing in fostering innovation activities.

Table 2 presents a battery of robustness tests that we implemented, but only the coefficients of secrecy are reported for brevity. In Panel A, we use alternative measures of cultural orientation towards secrecy, namely, *SECRECY2*, *SECRECY3* and *SECRECY4*. In Panel B, we employ alternative estimation techniques to assess the robustness of our findings. By implementing Lewbel (2012)'s methodology, which entails instrumenting for the potentially endogenous secrecy variable using internally generated instruments derived from moments within the dataset, we can mitigate any potential endogeneity issues to some extent. However, we acknowledge that endogeneity, in particular reverse causality, is unlikely to be a major concern in our study, as societal secrecy, our primary variable of interest, is time-invariant and inherited from a distant past, rendering it unlikely to be influenced by the decisions of the firms in our sample. As expected, Table 2 shows that secrecy retains a consistently significant negative effect on the likelihood of investing in innovation in all specifications, indicating the robustness of our results to alternative variable definitions, alternative model specifications, alternative estimation techniques, and an expanded set of control variables.[10]

In addition to the reported results, untabulated analyses suggest that our findings are robust to using a dummy variable for countries with above median secrecy and a propensity score matched sample. Furthermore, our results pass the falsification test, where we randomly assign firms to low and high secrecy sub-groups.

4. Conclusion

This study investigates the impact of cultural orientation towards secrecy on private firms' investment in innovation. Probit estimates indicate that secrecy consistently has a negative impact on the likelihood of investing in innovation. These findings suggest that a higher orientation towards secrecy may impede innovation by reducing transparency, increasing information asymmetry, resulting in inefficient resource allocation, limiting access to external funding, hindering collaborative partnerships, and negatively affecting employee morale. The study

and 40% [0.3773 × 0.4347/0.4054 × 100], compared to the mean. The one standard deviation and implied changes in the likelihood of investing in innovation due to secrecy are calculated as *Coefficient* × *Standard Deviation* and *Coefficient* × *Standard Deviation/Mean*, respectively.

[10] The Online Appendix — Table A.5 shows that secrecy exhibits a consistent and significant negative correlation with innovation, both in developing and developed nations. However, it is crucial to exercise caution when interpreting these results, given the limited number of developed countries in our sample. This is due to the World Bank Enterprise Survey's primary focus on developing economies, which restricts the scope of our analysis.

Table 2
Additional analyses of the effects of secrecy on innovation.

Panel A: Alternative variable definitions												
Dependent variables	INNOV1	INNOV2	INNOV3	INNOV4	INNOV1	INNOV2	INNOV3	INNOV4	INNOV1	INNOV2	INNOV3	INNOV4
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SECRECY2	−0.2275***	−0.0218	−0.1102***	−0.1521***								
	(0.0213)	(0.0195)	(0.0202)	(0.0258)								
SECRECY3					−0.2791***	−0.1326***	−0.4241***	−0.2153***				
					(0.0415)	(0.0376)	(0.0396)	(0.0512)				
SECRECY4									−0.0330	−0.3333***	−0.1459***	−0.0925***
									(0.0279)	(0.0248)	(0.0256)	(0.0341)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of observations	52,836	52,836	52,836	52,836	52,836	52,836	52,836	52,836	45,595	45,595	45,595	45,595
Pseudo-R^2	0.143	0.134	0.147	0.155	0.142	0.134	0.148	0.155	0.144	0.140	0.152	0.155
Panel B: Alternative estimation techniques												
Dependent variables	Logistic				OLS—(Lewbel, 2012)				GMM—(Lewbel, 2012)			
	INNOV1	INNOV2	INNOV3	INNOV4	INNOV1	INNOV2	INNOV3	INNOV4	INNOV1	INNOV2	INNOV3	INNOV4
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SECRECY1	−0.4479***	−0.2916***	−0.4055***	−0.4392***	−0.0560***	−0.0314***	−0.0635***	−0.0279***	−0.0388***	−0.0343***	−0.0687***	−0.0132***
	(0.0474)	(0.0411)	(0.0436)	(0.0629)	(0.0085)	(0.0094)	(0.0093)	(0.0070)	(0.0069)	(0.0092)	(0.0085)	(0.0045)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of observations	52,836	52,836	52,836	52,836	52,836	52,836	52,836	52,836	52,836	52,836	52,836	52,836
Pseudo-R^2	0.143	0.134	0.147	0.155								
Adj.R^2					0.925	0.925	0.925	0.925	0.925	0.925	0.925	
First Stage F Statistic					2,654.00***	2,654.00***	2,654.00***	2,654.00***	2,654.00***	2,654.00***	2,654.00***	2,654.00***

Lewbel (2012)'s strategy enables the identification of structural parameters in regressions with endogenous regressors in the absence of traditional identifying information (i.e. external instruments or repeated measurements). ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

emphasises the importance of promoting transparency and information disclosure to stimulate innovation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any organisation with which the authors are affiliated. All errors remain ours.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.econlet.2023.111509.

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