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A further analysis of Manning and Fink (2020)

In a very interesting recent paper, Manning and Fink [1] establish a positive relationship between 2D:4D (relative length of index and ring fingers) and case fatality rates of national COVID-19. Manning and Fink also find a positive association between 2D:4D and the percentage of male death from COVID-19. However these results, especially association between 2D:4D and percentage of male death from COVID-19, are challenged by Jones et.al [2].

Estimation results of the present study show that while there is a positive association between male 2D:4D and case fatality rates of national COVID-19, unlike Manning and Fink (2020) there is a negative and statistically significant association between female 2D:4D and case fatality rates. We find these results not only by using a most recent data set [3] by also using a different econometric specification. So we believe our results are robust.

In their analysis both Manning and Fink and Jones et.al seems not to take one important element into consideration, which is the size of the countries. The size of the countries can be measured with different variables in different disciplines such gross domestic products in economics. For the present study the most proper variable could be population or total number of cases.

We extend the regression equation of Manning and Fink in two fronts. First, we add single dummy variables to control for EURO and Non-EURO regions. Second, we use the size variable of the total number of cases as weights in estimation.

Our equation is $y_i = x_i'\beta + z_i'\gamma + \varepsilon_i$, $i = 1, 2, \ldots, N$ where y_i is a dependent variable, x and z are a vector of main and control variables (in our case 2D:4D, a region dummy variable, respectively), ε is an error term with zero mean and heteroscedastic variance, $\varepsilon_i \sim \left(0, \frac{\sigma^2}{w_i}\right)$. β and γ are unknown parameters. In Manning and Fink, the regression equation does not contain z and variance of error term is simply σ^2. Estimation results of the regression equation with stated assumptions are given in Table 1. It is clearly seen that both male and female 2D:4D significantly different from zero however, with opposite signs.

Another and better alternative is to use logit transformation of the dependent variable as suggested by Theil [4] and Hanushek and Jackson [5] By considering the fatality rate as an estimated mean and total number of case as a part of weight, we can estimate a regression equation. This type of transformation of the dependent variable is especially useful if the model would be used for prediction purposes at a later stage. Unlike the previous regression model, predicted values of this model lies between zero and one, which is the range of values of the fatality rates. The model is defined as follows (see Hanushek and Jackson for details)

$$L_i = x_i'\beta + z_i'\gamma + u_i \quad i = 1, 2, \ldots, N$$

where $L_i = log\left(\frac{y_i}{1-y_i}\right)$ and $Var(u_i) = 1/(N_i y_i(1 - y_i))$.

Estimation results of this model is given Table 2, which show that both variables are in each case are significantly different from zero, albeit with different signs. As an additional analysis we also used data

Table 1
Estimation results of fatality rates with weights and no weights, the dependent variable in each cases is logfatality.

	(1) No Weights	(2) With weights	(3) No Weights	(4) With weights
Right_mean_2d4d_male	49.74*	48.16**		
	(22.63)	(14.82)		
Right_mean_2d4d_female	−10.15	−43.22*		
	(17.62)	(18.26)		
EURO		0.0561		0.0939
		(0.0978)		(0.109)
Left_mean_2d4d_male			67.85**	37.74
			(22.83)	(21.08)
Left_mean_2d4d_female			−21.70	−57.19***
			(16.38)	(11.74)
_cons	−38.20	−3.650	−44.65*	20.30
	(22.68)	(20.59)	(20.35)	(20.48)
N	41	41	41	41
adj. R^2	0.067	0.214	0.146	0.349

Standard errors in parentheses.
Fatality rates are of June 14th 2020. 2D:4D from Manning and Fink (2020).
Weight is the total number of cases in each country.
The base region is Non-EURO countries.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Table 2
Estimation results of logit transformation of fatality rates with and without regional dummy.

	(1) No dummy	(2) With dummy
Right_mean_2d4d_male	100.5***	64.90***
	(0.658)	(0.738)
Right_mean_2d4d_female	−174.4***	−134.2***
	(0.717)	(0.811)
EURO		0.426***
		(0.00400)
_cons	72.10***	66.94***
	(0.760)	(0.761)
N	41	41

Standard errors in parentheses.
The dependent variable is logit transformation of fatality rates.
Fatality rates are of June 14th 2020. 2D:4D from Manning and Fink (2020).
The base region is Non-EURO countries.
*** $p < 0.001$.

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Table 3
Estimation results of logit transformation of male fatality rates with and without regional dummy.

	(1)	(2)
	No dummies	With dummies
Right_mean_2d4d_male	1.559***	13.09***
	(0.398)	(0.436)
Right_mean_2d4d_female	−34.46***	−48.75***
	(0.411)	(0.466)
EURO		−0.160***
		(0.00246)
_cons	33.04***	35.96***
	(0.426)	(0.428)
N	31	31

Standard errors in parentheses.
The dependent variable is logit transformation of male deaths rate.
Data from Jones et.al (2020).
The base region is Non-EURO countries.
*** $p < 0.001$.

provided by Jones et.al [2] to estimate male death rates as a function of the independent variables. We find that same quantitative results hold, which is given in Table 3.

Declaration of competing interest

None declared.

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