

Appendix A: correlation analysis

Table 1 displays bivariate correlation coefficients of the relevant variables. The table shows particularly large correlations between the interactions of physical ICT capital and labor cost for ICT personnel ($\ln(ICT - physical) \cdot \ln(ICT - labor)$) and labor cost for ICT personnel ($\ln(ICT - labor)$), the interaction of physical ICT capital and ICT services ($\ln(ICT - physical) \cdot \ln(ICT - services)$) and ICT services ($\ln(ICT - services)$) as well as the interact of physical ICT, ICT services and labor cost for ICT personnel ($\ln(ICT - physical) \cdot \ln(ICT - services) \cdot \ln(ICT - labor)$) and the interaction of ICT services and labor cost for ICT personnel (and $\ln(ICT - services) \cdot \ln(ICT - labor)$). In order to reduce dimensions, the empirical analysis therefore estimates a simple Cobb–Douglas production function without any interactions to identify input factors are insignificant first. Those factors are left out in the estimation of the extended Cobb–Douglas function. I also replace the natural logarithm of ICT services by its inverse ($1/\ln(ICT - services)$) to reduce the correlation between ICT services and the interaction of physical ICT and ICT services. The corresponding correlation coefficient drops from 0.8330 to -0.0237. I also leave out the interaction of all three input factors since it turned out to be insignificant in all specification I have tried.

Table 1: Bivariate correlation coefficients between production function input factors

	$\ln(L_i)$	$\ln(K_i)$	$\ln(ICT_p)$	$\ln(ICT_i)$	$\ln(ICT_s)$	$\frac{\ln(ICT_p) \cdot \ln(ICT_i)}{\ln(ICT_i)}$	$\frac{\ln(ICT_p) \cdot \ln(ICT_s)}{\ln(ICT_s)}$	$\frac{\ln(ICT_s) \cdot \ln(ICT_i)}{\ln(ICT_i)}$	$\frac{\ln(ICT_p) \cdot \ln(ICT_i) \cdot \ln(ICT_s)}{\ln(ICT_s)}$
$\ln(L_i)$	1								
$\ln(K_i)$	0.7606	1							
$\ln(ICT_p)$	0.4786	0.4250	1						
$\ln(ICT_i)$	0.4158	0.3796	0.4884	1					
$\ln(ICT_s)$	0.3526	0.2963	0.3251	0.3180	1				
$\frac{\ln(ICT_p) \cdot \ln(ICT_i)}{\ln(ICT_i)}$	0.45+34	0.4255	0.3043	0.7574	0.2851	1			
$\frac{\ln(ICT_p) \cdot \ln(ICT_s)}{\ln(ICT_s)}$	0.3661	0.3222	0.2397	0.2537	0.8330	0.4396	1		
$\frac{\ln(ICT_s) \cdot \ln(ICT_i)}{\ln(ICT_i)}$	0.2308	0.1807	0.1081	0.0383	0.3083	0.2391	0.5322	1	
$\frac{\ln(ICT_s) \cdot \ln(ICT_i) \cdot \ln(ICT_s)}{\ln(ICT_s)}$	0.3447	0.3062	0.4629	0.2569	0.4993	0.2509	0.5058	0.7366	1

Table 1 shows bivariate correlation coefficients between the input factors and their interactions. A total of 984 observations is used in the analysis. The abbreviations used are: ICT_p for physical ICT expenditures, ICT_i for labor cost for ICT and ICT_s for ICT services.