Summary for non-specialists
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The Economic Impact of Digital Structural Reforms

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This work aims to assess the economic impact of structural reforms either already undertaken or imminently foreseen in Europe in the field of digital markets. In fact, even more so in the wake of the economic crisis, the policy debate on how to spur "digital growth" in Europe has thus become increasingly topical, and ambitious digital structural reforms have been either undertaken by the Member States or foreseen for the imminent future in line with the broad policy agenda set by the *Digital Agenda for Europe* (DAE) and with the European Semester exercise. This debate also hinges upon the well-acknowledged economic relevance of electronic communications in light of their role as general purpose technology.

Assessing digital reforms in a unitary framework is challenging, due to a variety of reasons such as the marked heterogeneity of these reforms, their mostly "soft" nature, and the general lack of data on some aspects of EU digital markets. For these reasons, only four types of digital reforms are hereby considered: i) assigning rights of use of radio spectrum frequencies to mobile operators; ii) enhancing e-skills in a professional setting; iii) fostering the take-up of eCommerce; iv) increasing availability and take-up of high-speed fixed broadband. Since these policy areas are markedly different, each is analysed separately, yet following a common twofold methodological approach that represents the main value added of this work with respect to previous estimations on the same topic, especially due to a close interplay between microeconomic foundations and macroeconomic simulations.

Namely, as a first step, partial equilibrium econometric analysis –mostly at sectoral level– is carried out, or drawn from existing literature, to estimate a direct impact of a relevant "reform variable", proxying each Member State's reform effort, on either prices or productivity. These economic outcomes directly affected by the reform effort are assumed to be the "transmission channels", through which the scrutinised reforms can finally exert their overall economic impact. In particular:

a) progress in spectrum assignment is found to be associated with lower retail prices for mobile services, including indirectly through decreased sectoral market concentration;
b) enhanced digital skills in a professional setting are found to be associated with higher intra-sectoral allocative efficiency of resources in the economy, likely due to the better capacity of firms to react to changes in the competitive environment;
c) increased take up of eCommerce EU-wide is found to be associated to higher total factor productivity, due to the enhanced efficiency of the production process entailed by firms' recourse to online sales, and to lower final goods prices, due to competitive pressures in online trade;
d) increased take-up of high-speed fixed broadband is found to be associated with higher TFP, due to the increased efficiency in the production process related to the firms' actual use of these technologies.

As a second step, the estimated elasticity from the first step and the observed variation of the reform variable are used to compute a price/productivity shock related to the considered digital reform effort, either already observed or foreseen for the future. A further step includes feeding the estimated shocks into the European Commission's DSGE model *QUEST III* to obtain macroeconomic

impacts on GDP: while the analysis is conducted separately for each policy area, the advantage of considering them together lies in the possibility to add up the long-run GDP impacts and thereby provide a unitary indication of the overall effect of achieving specific aspects of the Digital Single Market. Not least, in simulating the impact of further reform effort in line with the DAE targets, the use of QUEST allows to account for further transmission channels that data availability issues prevent from being econometrically tested, such as the impact of capital deepening. The Table below summarises, for all analysed policy areas, the identified transmission channel(s), the outcome variable(s) found to be directly affected by them, the type of shock(s) fed into QUEST III, and the simulated long-run impact(s) on EU GDP:

Table: Summary table of reform areas, tested transmission channels and direct economic impact

Structural Reform area	Economic outcome variable directly affected	Transmission channels tested through econometric analysis	Partial equilibrium estimation of observed policy changes in EU27	Simulated GDP impact (already achieved from actually observed effort)	Simulated GDP impact of closing the gap with the Digital Agenda for Europe targets
Assigning Radio Spectrum Frequencies	Final retail price of mobile voice services	Impact of increased assignment of radio spectrum frequencies on sectoral retail prices, both direct (through innovation) and indirect (through reduced market concentration)	Average decrease in sectoral prices between 21% and 22% EU-wide due to observed spectrum progress between 2007 and 2013	0.2% long-run	0.3% - 0.4% long-run
	Capital deepening	Only simulated through QUEST: leverage effect on private capital of deepened public capital due to spectrum revenues, and efficiency effects due to measures reducing deployment costs	N.A.	N.A.	
Enhancing professional e-skills	Intra sectoral allocative efficiency	Impact of increased sectoral share of ICT skilled employment on allocative efficiency	0.65 p.p. average increase in sectoral allocative efficiency (and close to 0.5 p.p. increase in labour productivity) EU-wide	0.6% long-run	0.4% long-run
Reinforcing the integration of the Digital Single Market and e-business models	Total factor productivity and final prices (mark-ups and consumer surplus)	Impact of increased recourse to e-sales among firms on productivity and impact on consumer surplus of higher recourse to e-sales (through a competition effect).	Average increase in TFP by 0.07% over 2010-2012 and increase in consumer surplus by 1.3% GDP p.a. over 2009-2012	0.1% long-run (plus the impact on consumer surplus)	1.9% long-run
Incentivizing fixed broadband deployment	Total factor productivity	Impact of increased use of broadband technologies in a professional setting on firm-level productivity and thereby on TFP	TFP increase by 0.17% due to more broadband take-up among workers	0.2% long-run	0.43% long-run
	Capital deepening	Only simulated through QUEST: externality effects of private capital increase due to public incentives and efficiency effects due to measures reducing deployment costs	N.A.	N.A.	

Overall, the findings highlight the significant growth potential of both already observed efforts and of further ambition in terms of digital structural reforms. Namely, the already observed reform effort in the four considered policy fields correspond to a long-run GDP impact of some 1% over the baseline; besides, further foreseen structural reform efforts in the four policy areas could entail additional GDP increase of up to 3.1% over the baseline in the long run. Last but not least, these findings are relevant from a methodological viewpoint, in that the present work hints at the importance of analysing the actual functioning of microeconomic transmission channels, through which digital reforms can exert their overall macroeconomic impact.