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The Size of the Digital Economy in Finland and Its Impact on Taxation

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Abstract

This report sheds light on the size and composition of the digital economy in Finland and its impact on the tax gap and tax system. No generally agreed definition of digital economy exists, and only a few prior studies have assessed the size of the digital economy quantitatively.

We measured the size of the digital economy by the value added generated by digitally produced goods and services. We first replicated the analysis of the US Bureau of Economic Analysis (BEA) using Finnish data by assessing the value added of fully digital products. Secondly, we also took into account in our calculations the value added of partly digital products. Our analysis shows that the share of value added generated by the digital economy in Finland has grown at a relatively slow pace during the 2010s. Our calculations indicate that the digital economy comprised 10.9% of the GDP in Finland in 2017, or over EUR 21 billion euros.

We further aimed at assessing the size of the corporate income tax (CIT), the value added tax (VAT) and the personal income tax (PIT) gaps generated by the digital economy in Finland. An attempt to make a full CIT gap analysis failed due to the unavailability of industry-level national accounts data. Data on the accrued VAT from the most recent years was not available but the observations from the earlier years did not reveal tax gaps. Our data collected via a survey targeted at digital freelance workers hints that, in general, Finnish digital freelancers comply with taxation rather well and no notable PIT tax gap is generated.

Tiivistelmä

Suomen digitaalitalouden koko ja sen vaikutus verotukseen

Tässä raportissa arvioidaan Suomen digitaalitalouden kokoa ja sen vaikutusta verovajeeseen sekä verojärjestelmään. Digitaalitaloudelle ei ole olemassa yksiselitteistä määritelmää, ja digitaalitalouden kokoa on mitattu vain harvoissa tutkimuksissa.

Mittasimme digitaalitalouden kokoa digitaalisten tavaroiden ja palveluiden tuotannon tuottamalla arvonlisällä. Ensiksi toistimme US Bureau of Economic Analysis eli BEA:n laskelmat suomalaisilla aineistoilla. Tässä laskelmassa huomioitiin vain täysin digitaalisten tuotteiden synnyttämä arvonlisä. Toiseksi huomioimme laskelmissamme myös osittain digitaalisia tuotteita tuottavilta toimialoilta kertyvän digitaalisen toiminnan arvonlisän. Digitaalisen tuotannon suhteellinen osuus bkt:sta on kasvanut Suomessa verrattain hitaasti 2010-luvulla. Digitaalisten tavaroiden ja palveluiden tuotannon arvonlisä oli vuonna 2017 yli 21 miljardia euroa, eli 11 prosenttia bkt:sta.

Arvioimme myös digitaalisesta toiminnasta syntyvää verovajetta yhteisöveron, arvonlisäveron ja henkilöverotuksen osalta. Digitaalisen tuotannon yhteisöverovajeen arviointi osoittautui mahdottomaksi saatavilla olevaan dataan liittyvien puutteiden vuoksi. Digitaalisten tuotteiden arvonlisäveron osalta merkittävää verovajetta ei havaittu. Alustatyöntekijöille tehty kyselytutkimus antoi viitettä siitä, ettei alustatyöhön liity merkittävää veronkiertoa, vaan pääsääntöisesti verot maksetaan lainsäädännön mukaisesti.

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Keywords: Digitalization, Digital economy, Taxation, Tax gap

Avainsanat: Digitalisaatio, Digitaalitalous, Verotus, Verovaje

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Contents

Preface

This is the final report of the project 'The development and implementation of a study for assessing the impact of the digital economy on taxation in Finland', agreement number: SRSS/SC2019/020 Lot 1. The project is funded by the European Union via the Structural Reform Support Programme and implemented by PwC, in cooperation with the European Commission's Directorate-General for Structural Reform Support (DG REFORM).

+The project was undertaken by PwC (by the Project Leader) and Etla Economic Research. Both partners have contributed production of the 'Executive summary', 'Introduction' and 'Conclusions'. Jyrki Ali-Yrkkö has written Section 2 and, together with Heli Koski and Mika Pajarinen, Sections 3.1–3.2. Tarmo Valkonen is responsible for Sections 4.2–4.3, 5.2–5.6, 6.2–6.6 and 7.1–7.2. Otto Kässi has written Sections 7.3–7.6. The team of PwC has written Sections 3.3, 4.1, 5.1 and 6.1.

List of abbreviations

Abbreviation	Definition
ATAD	Anti-Tax Avoidance Directive
API	Application programming interface
BEA	The US Bureau of Economic Analysis
BEPS	Base Erosion and Profit Shifting
CIT	Corporate income tax
DST	Digital services tax
C-NTB	Current-year net tax base
C-TB	Current-year tax base
EBITDA	Earnings before interest, taxes, depreciation and amortisation
ECJ	European Court of Justice
EU	European Union
FAP	Financial accounting profit
FISIM	Financial intermediation services indirectly measured
FLEED	Finnish longitudinal employer–employee data
FTA	Finnish Tax Administration
GOS	Gross operating surplus
GDP	Gross domestic product
ICT	Information and communication technology
IT	Information technology
IMD	International Institute for Management Development
IMF	International Monetary Fund
ISP	Internet service packages
OECD	Organisation for Economic Co-operation and Development
PE	Permanent establishment
PIT	Personal income tax
RA-GAP	Revenue Administration Gap Analysis Program
R&D	Research and development
TB	Tax base
VAT	Value added tax

Executive summary

This report aims at shedding light on the concept, size and composition of the digital economy in Finland and its impact on the tax gap and tax system. Various international rankings place Finland among the top countries in terms of digitalisation. However, no generally agreed definition of *digital economy* exists, and only a few prior studies have assessed the size of the digital economy quantitatively.

Digitalisation transforms the way in which people, businesses and the public sector operate and perform everyday tasks. Digitalisation has created a field for completely new business models, such as e-commerce, mobile applications, the games industry, cloud services, online platforms and social media. As the world becomes more digitised, this can be seen to be only the beginning of new technology-based innovations. Digitalisation is also a vital part of traditional industry and service sector as it may enhance the efficiency of operations and has made it possible to develop new features, such as the remote diagnostics of industrial machinery and autonomous vehicles.

Markets for digital products are global and typically involve marginal costs of production that are close to zero. Consequently, digitalisation radically changes the business landscape as it, and particularly the exploitation of artificial intelligence and data, enables firms to rapidly scale up their business processes. Various digitised businesses can further be connected, generating the benefits of the economies of scope for the company.

Digitalisation has high potential to become the major driver of economic growth and increase capital income's share of national income. These trends influence the composition and size of tax revenues. The higher growth increases overall tax revenues. The increasing capital income share emphasises the ability of countries to tax the profits in the country in which the value is created. At the same time, the European value added tax (VAT) system is developing further in order to tax the value added of the supply of a commodity (including digitalised goods and digital services) in the country where the commodity is utilised (i.e. consumed). Consumption is regarded to take place in the country to which the commodity is delivered for the use of the purchaser.

Based on the US Bureau of Economic Analysis's method, the relative size of the digital economy in Finland is at the same level as in the US

Our first assessment of the digital economy is based on the replicate analysis of the US Bureau of Economic Analysis (BEA) using Finnish data. In short, the method proposed by the BEA is based on the idea of classifying goods and services groups into digital and non-digital goods based on expert views, and then using statistics given by a national statistical authority to assess the value added of goods and services that have been defined as being digital.

Based on the BEA method, in 2017, the digital economy created EUR 12.3 billion in value added, accounting for 6.4% of the Finnish gross domestic product (GDP). The relative size of the digital economy in Finland is at approximately the same level as in the US (6.5%). In Canada and Australia, the relative sizes of the digital economy are slightly smaller, accounting for 5.5% and 5.7% of GDP (in base prices) respectively. However, the figure concerning Canada is not fully comparable to other countries.

The major shortcoming of the BEA method is that it excludes goods and services that are partly digital. To fill this gap, a new method (the Etla method) was developed wherein information and communication technology (ICT) workers' wages and the share of e-commerce are used to assess the role that digitality plays in non-ICT industries.

According to the new method, the digital economy accounts for 10.9% of Finnish GDP

The Etla method, which also considers partly digital products when assessing the size of the digital economy, suggests that the digital economy comprised 10.9% of the GDP in Finland in 2017. As expected, this share is higher than the figure generated by the BEA method because, unlike the BEA calculation, the Etla method takes into account goods and services that are partly digital.

To test the robustness of our baseline estimate, we used alternative firm-level indicators of digitalisation. The results of these assessments generated figures (10.9–13.1% of GDP) that were in line with our baseline results.

All the assessment methods generated results that showed that the relative size of the digital economy has increased during the past decade.

PricewaterhouseCoopers (i.e., PwC) interviewed five of the largest Finnish companies operating in the machinery and equipment industry in order to analyse their use of digitalisation in their business. These companies cover over 26% of the personnel in the industry and have an extensive number of subcontractors. The interviews focused on scoping and estimating direct or indirect use of digital economy in the business. The companies interviewed were Kone Oyj, Metso Oyj, Outotec Oyj, Ponsse Oyj and Valmet Oyj. Digitalisation has a growing role in the business of these companies, either as part of the main business products or as by-products (which are mostly services connected to the use of machinery). However, the companies could not offer an exact date based on the turnover or the costs connected to digitalisation as such.

All the companies disclosed that digitalisation has had very little or no impact on the business of the company in the sense that the revenue streams would have shifted from one country to another. One company reported that the revenue streams stemming from services have slightly shifted to Finland.

Altogether, the research and development (i.e., R&D) costs at the group level amounted to EUR 378.3 million, accounting for 1.99% of the combined turnovers from 2019. Costs allocated to digital solutions comprised 0.23% of the combined turnovers, whereas 0.69% is allocated to new products and services and 0.32% to process innovations.

Tax gaps and digitalisation

The major motivation and objective of a tax gap estimation is to provide numerical information about the compliance of taxpayers. The broadest definition of *tax gap* considers the gap as a difference between the tax theoretically due from taxpayers and the amount actually collected. A narrower and a more common definition is to consider the tax gap as a sum of the compliance gap and the policy gap. The causes of tax gaps can be classified as the following: information problems, mistakes, insolvency, tax planning, tax avoidance, tax evasion and fraud.

We employed the Revenue Administration Gap Analysis Program (RA-GAP) method of the International Monetary Fund to calculate the corporate income tax (CIT) gap in the Finnish ICT sector. An attempt to make a full tax gap analysis failed due to the unavailability of industry-level national accounts data. We introduced alternative indicators, based on operating profits, that were used to approximate the trends in tax compliance. The results of a detailed industry-level analysis among the ICT industries showed wide annual fluctuations in financial flows and extraordinary items. Such fluctuations would challenge the accuracy of the RA-GAP results even if the required data for the analysis were available. The less sophisticated indicators of CIT compliance, such as CIT efficiency, did not show any marked changes in the compliance trends in recent years.

The VAT compliance related to digital products was studied by simulating the RA-GAP model of the Finnish Tax Administration. Data on the accrued VAT from the most recent years was not available but the observations from the earlier years did not reveal tax gaps. The common trends in the potential VAT generated by the model and the value added of the digital products indicate that the method suits well the VAT gap assessments of the digital products regardless of the data problems that limit the preciseness of the yearly tax gap estimates.

Taxation and the digital economy

Tax gap related to corporate income can be understood as an issue of fair taxation – that is, where should the profits be allocated and on what basis? – as well as an issue of tax compliance.

The modernisation of the existing international tax regime is essential in order to safeguard fair taxation and tax revenues in the location where they mostly belong.

The Organisation for Economic Co-operation and Development (OECD) has been working on digitalisation and its impact on tax revenues since 2013 under its Base Erosion and Profit Shifting (BEPS) project. The OECD continues negotiations on the final content of Pillars 1 and 2, which concern the new profit allocation method and global minimum CIT rate, and has agreed to keep working towards an agreement by mid-2021. Unlike the

current OECD guidance, the new guidance will take into account the features of digitalised business as well.

The European VAT system is under reform, one of the main drivers of this is to consider the interest of the exchequer in the best possible manner. In the future VAT will be payable on all the supplies in the country of the purchaser. However, the liability to pay VAT lies with the supplier, who will report and pay VAT to all European Union countries via the tax authority of the country in which the supplier has her or his fixed establishment. The VAT system as such is well planned to consider the fact that the VAT is payable in the country where the digital commodities or commodities are generally used. This is a logical consequence of a tax on consumption. Only the future will show how well the system will work in practice and what kind of adjustments might be needed. Cooperation with the tax authorities will have an important role in making sure that the reporting obligations are fulfilled and that VAT is paid accordingly. The amount of information reported by the taxable persons is significant and will be even more significant, and a question for the tax authorities is how well the information can and may be used in terms of supervision.

Survey results suggest high tax compliance among digital freelancers

From a personal income tax point of view, potential tax avoidance relating to the digital economy most likely arises in situations where the platform provider is not subject to any reporting or tax-withholding obligations in the country where the services are generated, and the individual taxpayer and the other party involved (i.e. the party purchasing the service) neglect their reporting responsibilities either deliberately or inadvertently, without the tax authorities having any visibility of the said income generated in the digital economy.

We approached the question of the personal income gap arising from digitalisation via a survey targeted at Finnish digital freelancer workers. The survey results suggest that freelance workers are on the lower end of the income distribution, and they get a fairly modest share of their income from platform work. The survey data further hints that, in general, Finnish freelancers comply with taxation rather well. Depending on the question probe, the results point to a compliance rate of between 80–95%.

While the tax gap due to digitally mediated work is small, we find suggestive evidence of a non-trivial minority of workers who fail to pay their relevant taxes. We argue that, to the extent that non-payment is inadvertent, there are low-cost interventions available for the reduction of tax non-compliance.

The digitisation of the economy poses challenges for the future of taxation

Our results suggest that the share of value-added generated by the digital economy in Finland grew at a relatively slow pace during the 2010s. The structural change towards digital value creation is noticeable (e.g. the ongoing trend of the digital servitisation of manufacturing sectors), though the speed is uncertain. In Finland, the relative size of knowledge-intensive service sectors (i.e. information and communication; financial and insurance activities; professional, scientific and technical activities; and administrative and support service activities) at the frontier of digitalisation have witnessed relatively slow growth. The rate of structural change from non-digital to digital value creation intertwined with investments in ICT and digitalisation, and changes in consumer preferences will, by and large, determine how the relative size of the digital economy evolves in the future.

Going forward, we expect that both online trading, as well as digital services, will keep growing. Survey information indicates that online stores and digital sales are also becoming a common sales channel for Finnish companies. According to Statistics Finland, in 2018, about 23% of Finnish companies sold goods or services via e-commerce. The ongoing COVID-19 pandemic will most likely accelerate growth in e-commerce.

Digitally mediated work remains nascent in Finland, and we expect it to stay relatively small in the future too. At the same time, the COVID-19 pandemic has caused a boom in the global market for online labour. We expect that new means of generating income through digital platforms will arise. As such, the amount of income generated in the digital economy will also most likely increase, which underscores the importance of development ini-

tiatives that focus on facilitating efficiently reporting the income from platform work.

With regard to the impact of digitalisation on tax gaps, it is clear that digitalisation enables certain types of tax planning, and thus, digitalisation might potentially have an effect on decreasing tax revenues. However, due to data issues, we have not been able to verify this empirically. On the other hand, digitalisation has and will change the business environment; hence, the modernisation of the existing international tax regime is essential in order to safeguard the fair taxation and tax revenues in the location where they mostly belong.

Raportin yhteenveto

Tässä raportissa arvioidaan Suomen digitaalitalouden kokoa ja sen vaikutusta verovajeeseen sekä verojärjestelmään. Suomi nousee digitalisaation kärkimaksi useissa kansainvälisissä vertailuissa. Digitaalitaloudelle ei kuitenkaan ole olemassa yksiselitteistä määritelmää, ja digitaalitalouden kokoa on mitattu vain harvoissa tutkimuksissa.

Digitaalisuus leikkaa läpi yhteiskunnan ja vaikuttaa jokapäiväiseen elämäämme. Digitalisaation myötä on syntynyt uudenlaista liiketoimintaa kuten verkkokauppa, matkapuhelinsovellukset, peliteollisuus, pilvipalvelut, verkkoalustat ja sosiaalinen media. Digitalisaatio muodostaa myös olennaisen osan perinteistä teollisuutta ja palvelusektoria tehostaen niiden toimintaa ja on lisäksi mahdollistanut monien uusien toimintojen kuten koneiden ja laitteiden etädiagnostiikan ja autonomisten ajoneuvojen kehittämisen.

Digitaalisten tuotteiden markkinat ovat globaalit, ja tyypillisesti niiden tuotantoon liittyvät lähellä nollaa olevat rajakustannukset. Tekoälyn ja datan hyödyntäminen mahdollistavat liiketoiminnan nopean skaalautumisen. Monet digitaaliset liiketoiminnot kytkeytyvät toisiinsa ja luovat yritykselle tuotevarioinnin etuja.

Digitalisaation potentiaali talouskasvun lähteenä on merkittävä ja se voi myös kasvattaa pääomatulojen osuutta kansantulosta. Kasvutrendeillä on vaikutusta verotulojen koostumukseen ja määrään. Talouskasvu tuo lisää verotuloja. Pääomatulojen osuuden kasvaessa korostuu eri maiden kyky verottaa voittoja niissä maissa, joissa arvo on luotu. Euroopan arvonlisäverojärjestelmää kehitetään parhaillaan niin, että tuotteita (ml. digitaaliset tuotteet) verotettaisiin maissa, joissa niitä käytetään tai kulutetaan. Kulutuksen määritellään tapahtuvan maassa, jossa tuote on toimitettu ostajalle.

Digitaalitalouden suhteellinen koko on Suomessa samaa luokkaa kuin Yhdysvalloissa

Mittasimme digitaalitalouden kokoa digitaalisten tavaroiden ja palveluiden tuotannon tuottamalla arvonlisällä. Ensiksi toistimme US Bureau of Economic Analysis eli BEA:n laskelmat suomalaisilla aineistoilla. BEA:n menetelmä perustuu tavaroiden ja palveluiden luokitteluun digitaalisiin ja ei-digitaalisiin asiantuntija-arvioiden perusteella ja tämän jälkeen digitaalisiksi arvioitujen tuotteiden arvonlisän laskemiseen kansallisen tilastoviranomaisen tilastojen avulla.

BEA:n menetelmällä laskettuna digitaalitalouden luoma arvonlisä oli Suomessa vuonna 2017 12,3 miljardia euroa eli 6,4 % bkt:sta. Digitaalitalouden suhteellinen koko oli samaa luokkaa kuin Yhdysvalloissa (6,5 %). Kanadassa ja Australiassa digitaalitalouden suhteelliseksi kooksi on arvioitu noin 5,5 % ja 5,7 % bruttokansantuotteesta. Kanadaa koskevat laskelmat eivät kuitenkaan ole täysin vertailukelpoisia muiden maiden laskelmien kanssa. BEA-menetelmän suurin puute on, että se ei huomioi osittain digitaalisia tuotteita ja palveluita. Kehitimme tarkemman digitaalitalouden koon mittarin, joka käyttää tieto- ja viestintätekniikkatyöntekijöiden palkkoja sekä sähköisen kaupankäynnin osuutta arvioimaan digitaalista osuutta tuotannosta muilla kuin ICT-aloilla.

Uusi menetelmä arvioi digitaalitalouden kooksi 10,9 % Suomen bkt:sta

Kehitetty uusi, myös osittain digitaaliset tuotteet huomioiva menetelmä arvioi digitaalitalouden kooksi 10,9 % Suomen bkt:sta vuonna 2019. Arvion robustisuutta testattiin käyttämällä vaihtoehtoisia yritystason digitalisaatioasteen indikaattoreita. Tulokset eri indikaattoreita käytettäessä (10,9–13,1 %) eivät poikenneet huomattavasti perustuloksesta, ja kaikki osoittivat digitaalitalouden koon kasvaneen viimeisen vuosikymmenen aikana.

PricewaterhouseCoopers (PwC) haastatteli viittä suurta koneita ja laitteita valmistavaa yritystä analysoidakseen niiden liiketoiminnan digitalisoitumista. Haastatellut yritykset työllistävät yli 26 % toimialan työntekijöistä ja niillä on laaja alihankkijoiden verkosto. Haastatteluissa keskityttiin kartoittamaan ja arvioimaan digitaalitalouden suoria ja epäsuoria vaikutuksia yrityksiin. Haastateltuja yrityksiä olivat Kone Oyj, Metso Oyj, Outotec Oyj, Ponsse Oyj ja Valmet Oyj. Digitalisaatiolla on kasvava rooli näiden yritysten liiketoiminnassa joko osana pääliiketoiminnan tuotteita tai sivutuotteina (jotka ovat enimmäkseen koneiden käyttöön liittyviä palveluita). Yritykset eivät kuitenkaan pystyneet arvioimaan tarkasti digitalisaatioon liittyvää liikevaihtoa tai kustannuksia. Kaikki yritykset il-

moittivat, että digitalisaatiolla on ollut vain vähän tai ei lainkaan vaikutusta yrityksen liiketoimintaan siinä suhteessa, että tulovirrat olisivat siirtyneet maasta toiseen. Yksi yritys kertoi, että palveluista johtuvat tulovirrat ovat jossain määrin siirtyneet Suomeen.

Yritysten tutkimus- ja kehityskustannukset (t&k) olivat konsernitasolla yhteensä 378,3 miljoonaa euroa eli 1,99 % vuoden 2019 yhteenlasketuista liikevaihdoista. T&k-panostukset digitaalisiin ratkaisuihin kattoivat 0,23 % yritysten kokonaisliikevaihdosta, kun taas uusien tuotteiden ja palveluiden kehittämiseen oli allokoitu 0,69 % ja prosessi-innovaatioihin 0,32 % liikevaihto-osuus.

Verovajeet ja digitalisaatio

Verovajeen arvioinnin tärkein päämäärä on antaa numeerista tietoa verolakien noudattamisesta. Laajimmalla verovajeen määritelmällä vaje lasketaan veronmaksajien teoreettisesti maksettavaksi tulevan veron ja tosiasiallisesti perityn määrän välisenä erotuksena. Kapeampi ja yleisemmin käytetty määritelmä on verovajeen laskeminen verolakien noudattamatta jättämisestä johtuvan ja politiikkapoikkeuksista johtuvan verovajeen summana. Verovajeiden syyt voidaan luokitella seuraavasti: informaatio-ongelmat, virheet, maksukyvyttömyys, verosuunnittelu, verojen välttely, veronkierto ja veropetokset.

Tarkoituksenamme oli arvioida yhteisöverovajetta Suomen ICT-sektorilla käyttäen Kansainvälisen valuuttarahaston kehittämää RA-GAP-menetelmää. Kattavaa verovajeanalyysiä ei kuitenkaan voitu tehdä, koska kansantalouden tilinpito ei tarjoa riittävän tarkkaa toimialakohtaista tietoa. Käytimme vaihtoehtoisia varsinaisen toiminnan tulokseen perustuvia indikaattoreita verovajeen trendien arvioimiseen. Lisätarkastelut osoittivat suurta vuosittaista vaihtelua rahoituserissä ja satunnaiserissä ICT-sektorin alatoimialoilla. Nämä mittavat vaihtelut olisivat todennäköisesti heikentäneet RA-GAP-menetelmän tulosten luotettavuutta, vaikka aineisto olisikin ollut riittävän yksityiskohtaista. Yksikertaisemmat indikaattorit, kuten yhteisöverotehokkuus, eivät osoittaneet merkittäviä trendinomaisia muutoksia verolakien noudattamisessa viime vuosina.

Toisessa vaiheessa simulointiin arvonlisäverolakien noudattamista digitaalisten tuotteiden osalta Verohallinnon RA-GAP-mallilla. Tuotteista saatua arvonlisäverokertymää ei ollut saatavilla aivan viime vuosilta, mutta aiempien vuosien havainnoissa ei ollut alv-verovajetta. Mallin tuottaman potentiaalisen alv-kertymän ja digitaalisten tuotteiden arvonlisän vertailu osoitti menetelmän sopivan hyvin digitaalisiin tuotteisiin liittyvän arvonlisävajeen arviointiin, vaikka aineisto-ongelmat heikentävätkin yksittäisten vuosihavaintojen tarkkuutta.

Verotus ja digitaalitalous

Yritysten voittoihin liittyvässä verovajeessa kyse on toisaalta verotuksen oikeudenmukaisuudesta (ts. monikansallisten yritysten voittojen jakamisesta eri maiden kesken) ja toisaalta verolainsäädännön noudattamisesta. Nykyisen kansainvälisen verojärjestelmän nykyaikaistaminen on välttämätöntä, jotta voidaan turvata oikeudenmukainen verotus ja verotulojen jako eri valtioiden kesken arvonmuodostuksen mukaan.

Taloudellisen yhteistyön ja kehityksen järjestö, OECD, on työskennellyt digitalisaation ja sen verotulovaikutuksiin liittyvien kysymysten parissa vuodesta 2013 lähtien Base Erosion and Profit Shifting (BEPS) -hankkeessa. OECD jatkaa neuvotteluja nk. ensimmäisen ja toisen pilarin lopullisesta sisällöstä. Ne koskevat uutta voitonjakomenetelmää ja maailmanlaajuista vähimmäisverokantaa. Tavoitteena on päästä sopimukseen vuoden 2021 puoliväliin mennessä. Uudessa ohjeistuksessa, toisin kuin aiemmissa, otetaan huomioon digitalisoidun liiketoiminnan ominaispiirteet.

Eurooppalaista arvonlisäverojärjestelmää ollaan myös uudistamassa niin, että verottajan edut huomioidaan parhaalla mahdollisella tavalla. Tulevaisuudessa arvonlisäverotulot kertyvät kuluttajan asuinvaltioon. Alv-maksuvelvollisuus on myyjällä, joka raportoi ja maksaa arvonlisäveron kaikille Euroopan unionin maille sen maan veroviranomaisen kautta, jossa myyjällä on kiinteä toimipaikka. Alv-järjestelmä sinänsä on suunniteltu ottamaan huomioon, että arvonlisävero on maksettava maassa, jossa digitaalisia hyödykkeitä tai hyödykkeitä yleensä käytetään. Tämä on looginen seuraus kulutusverosta. Kuinka hyvin järjestelmä toimii käytännössä ja millaisia muutoksia voidaan tarvita, tullaan näkemään tulevaisuudessa. Veroviranomaisten yhteistyötä tarvitaan varmistamaan, että raportointivelvoitteet täytetään ja arvonlisävero makse-

taan niiden mukaisesti. Verovelvollisten itse ilmoittamien tietojen merkitys tulee kasvamaan. Veroviranomaisten näkökulmasta olennainen kysymys on, kuinka hyvin näitä tietoja voidaan käyttää valvontaan.

Kyselytutkimuksen tulosten mukaan alustatyöntekijät eivät juuri välttele henkilöveroja

Digitalisaation aiheuttama henkilöveron vaje liittyy usein tilanteisiin, jossa työtä tai palvelua välitetään digitaalisen alustan kautta. Jos alusta ei tee ennakonpidätyksiä tai raportoi sen kautta työskentelevien ihmisten ansioita verottajalle, jää raportointivastuu työntekijälle.

Työntekijät saattavat jättää saamansa tulot raportoimatta joko epähuomiossa tai veronkiertotarkoituksessa veroviranomaisen valvonnalta piilossa.

Digitalisaatio aiheuttaa potentiaalisesti henkilöverovajetta tilanteissa, joissa verotettavaa työtä välittävä alusta raportoi sen kautta välitettävistä transaktioista verottajalle. Tutkimme tätä alustatyön aiheuttamaa verovajetta satunnaisesti valituille suomalaisille alustatyöntekijöille suunnatulla kyselyllä. Kyselyn tulosten mukaan alustatyöntekijät ansaitsevat keskimäärin pienempiä kuukausiansioita kuin työntekijät keskimäärin, ja vain verrattain pieni osuus heidän tuloistaan tulee alustatyöstä. Tuloksemme viittaavat siihen, että alustatyöntekijät yleisesti ottaen huolehtivat verovelvoitteistaan – kysymyksestä riippuen noin 80–95 % vastaajista maksaa tuloveronsa.

Vaikka digitalisesti välitettyyn työhön liittyvä verovaje on kokonaisuutena pieni, viittaavat tuloksemme siihen, että huomattava vähemmistö työntekijöistä ei maksa veroja täysmääräisesti. Jos verojen maksamatta jättäminen tapahtuu epähuomiossa, pystyy veroviranomainen tekemään edullisia ja kustannustehokkaita toimia verovajeen pienentämiseksi.

Talouden digitalisoituminen haastaa verotuksen

Laskelmiemme mukaan digitaalitalouden tuottama arvonlisäys kasvoi Suomessa suhteellisen hitaasti 2010-luvulla. Rakennemuutos kohti digitaalista arvonluontia on nähtävissä (esim. teollisuuden digitaalinen palveluistuminen), mutta sen nopeus on epävarma. Suomessa tietointensiivisten palvelualojen (eli tiedotus ja viestintä, rahoitus- ja vakuutustoiminta, ammatillinen, tieteellinen ja tekninen toiminta sekä hallinto- ja tukipalvelutoiminta) suhteellinen koko on kasvanut verrattain hitaasti. Rakennemuutoksen nopeus ei-digitaalisesta digitaaliseen arvonluontiin ja se, miten digitaalitalouden suhteellinen koko kehittyy tulevaisuudessa, määräytyvät monen tekijän summana. Tärkeitä tekijöitä ovat tieto- ja viestintätekniikkaan ja digitalisaatioon tehtävät investoinnit sekä kuluttajien mieltymysten muutos.

Odotettavissa on, että sekä verkkokaupan että digitaalisten palvelujen osalta kasvu jatkuu. Kyselytutkimukset viittaavat siihen, että verkkokaupoista ja digitaalisesta myynnistä on tulossa yleinen myyntikanava suomalaisille yrityksille. Tilastokeskuksen mukaan vuonna 2018 noin 23 % suomalaisista yrityksistä myi tavaroita tai palveluita verkkokaupan kautta. Käynnissä oleva COVID-19-pandemia on nopeuttanut verkkokaupan kasvua.

Digitaalisesti alustojen kautta välitetty työ on edelleen vähäistä Suomessa, ja odotamme sen muodostavan verrattain pienen osan työmarkkinaa myös tulevaisuudessa. COVID-19-pandemia on toisaalta aiheuttanut huomattavan kasvun globaaleilla alustatyön markkinoilla. Odotettavissa on, että syntyy uusia tapoja hankkia tuloja digitaalisten alustojen kautta. Siten myös digitaalitalouden tuottamien tulojen määrä todennäköisesti kasvaa, mikä korostaa alustatyötulojen tehokkaaseen ilmoittamiseen pyrkivien kehityshankkeiden merkitystä.

On selvää, että digitalisaatio mahdollistaa tietyntyyppisen verosuunnittelun erityisesti yhteisöverotuksessa ja siten voi mahdollisesti vähentää verotuloja. Saatavilla olevaan dataan liittyvien puutteiden takia emme ole kuitenkaan pystyneet todentamaan tätä ilmiötä. Digitalisaation liiketoimintaympäristössä aiheuttamien muutosten takia kansainvälisen verojärjestelmän nykyaikaistaminen on joka tapauksessa välttämätöntä.

1 Introduction

1.1 The purpose of the study

This report aims at shedding light on the concept, size and composition of the digital economy in Finland and its impact on the tax gap and tax system. Various international rankings place Finland among the top countries in terms of digitalisation. However, no generally agreed definition of *digital economy* exists and only a few prior studies have assessed the size of the digital economy quantitatively.

Digitalisation transforms the way people, businesses and the public sector operate and perform everyday tasks. Digitalisation has created a field for completely new business models, such as e-commerce, mobile applications, the games industry, cloud services, online platforms and social media.[1] As the world becomes more digitised, this can be seen as only the beginning of new technology-based innovations. Digitalisation is also a vital part of traditional industry as it may enhance the efficiency of operations and, further, has made it possible to develop new features, such as the remote diagnostics of industrial machinery and autonomous vehicles.

Markets for digital products are global and typically involve marginal costs of production that are close to zero. Consequently, digitalisation radically changes the business landscape as it, and particularly the exploitation of artificial intelligence and data, enables firms to rapidly scale up their business processes. Various digitised businesses can be further connected, generating the benefits of the economies of scope for the company.

Digitalisation has high potential to become the major driver of economic growth, to increase capital income's share of national income and change market prices. These trends influence the composition and size of tax revenues. In addition to these direct effects of digitalisation on tax bases (TBs), digitalisation influences tax revenues via affecting tax systems and tax compliance. Examples of the impact of digitalisation on taxation rules are, on the one hand, intensified tax competition (e.g. patent boxes) and, on the other hand, increased co-operation between countries (e.g. the Anti-Tax Avoidance Directive [ATAD] of the European Commission and the Base Erosion and Profit Shifting [BEPS] project of the Organisation for Economic Co-operation and Development [OECD]). Thus, digitalisation has been one of the key drivers developing the current tax systems in order to take into account the developments that digitalisation has incurred to business in general.

The impact of the special tax rules on the tax revenues can be measured by the policy gap (i.e. the difference between the potential tax revenues, assuming no exceptions and special allowances, and the revenues collected with the current rules). This calculation presumes that taxpayers do not react to the changes in tax rules. Correspondingly, the tax compliance gap measures the difference between potential tax revenues collected following the current rules and full compliance and the actual tax revenues. It is worth noting that the policy gap and the compliance gap measure the additional revenues that can only be collected if the households and firms do not change their behaviour as a reaction to the efforts of closing the gaps.

Digital business models have properties that especially have an influence on corporate income tax (CIT) and capital income tax revenues but also challenge the functioning of value added tax (VAT) systems and the classification of non-standard employment either as self-employment or work under an employment contract.

Global digital markets make tax revenues less predictable and complicate the collection of CIT. The generation of new digital products often involves a risky and lengthy research and development (R&D) phase, and a firm may make large losses for several years before new products start to yield net income. After that, successful products can create huge profits. This implies that the CIT revenue has a large variance. Inputs into R&D and marketing often involve data that is received from customers free of charge or exchanged for low marginal-cost services. The largely used intangible inputs are easy to locate in low-tax countries and it is difficult to evaluate whether the prices that are used in transactions between the parent company and the affiliates are market prices (following the arm's length principle). The corporate income created in a jurisdiction may also avoid CIT because the firms need not have a physical presence in order to sell digital products and collect user data.

In regard to CIT, the general trends worldwide reflect the ambition of broadening the taxing rights of a source state. The existing OECD-based tax treaties still mainly lean on the physical presence of the companies, which comes down to the definition of a permanent establishment (PE) and methods of profit allocation. Tax treaties do not take into consideration the special features of the digital economy (i.e. the non-physical economical and digital presence of the modern companies). Regardless of the shared aims of countries, views on how to amend the current tax system have differed strongly.

An increasing digitalisation of labour markets may increase tax gaps through several channels. As has been shown in the context of Denmark, rates of tax non-payment are considerably higher for people who self-report their income (Kleven et al., 2011). In most cases, digitally mediated work does not take place in an employment relationship. Rather, workers are typically taxed as solo entrepreneurs. Moreover, if clients and workers are located in different countries and are matched digitally via an intermediary platform, which is typically located in a third country, tax authorities have fewer contact points for enforcing taxation. The trans-boundary nature of these transactions increases the possibilities for both unintended tax non-payment and tax avoidance, and ultimately might increase the personal income tax (PIT) gap.

1.2 The scope of the study

The scope of the study in terms of tax systems covers CIT, PIT and VAT. The VAT system analysed in the study is based on the European VAT Directive 2006/112/EC, noting the possible exceptions made by the Finnish legislator in the framework of the directive.[2] These exceptions cover, e.g., tax rates applied by Finland. As the direct tax systems are not harmonised at the European Union (EU) level, the CIT and PIT structures analysed in the study are based on the Finnish legal system that governs CIT[3] and PIT.[4]

The research does not focus on estimating the possible impacts of the policy work that is in progress at the OECD or the EU, nor does it take a stand on the advantages or disadvantages of the possible tax models for a digital tax or any other tax currently under global discussion in terms of the digital economy.

1.3 Methodologies

1.3.1 Identification of the digital economy

The first step of the study aims to identify the economic activities and businesses functioning in the digital economy, both from the perspective of the global market and the Finnish market. We will conceptually analyse the core elements of the digital economy. The focus of our analysis will be on the Finnish context.

To our knowledge, only a few studies exist where the digital economy has been measured in monetary terms. The United States (US) Bureau of Economic Analysis (BEA) assessed the digital economy within the framework of national accounts. The analysis was based on the following three-step procedure that quantitatively assesses the size of the digital economy:

1. The identification of the goods and services included in the digital economy.
2. The identification of the industries producing these goods/services by using a supply table.
3. The calculation of the value added of digital goods/services by industry as follows: for each industry, divide the gross output of digital goods/services by the total gross output and then multiply this share by the value added of the industry.

An alternative approach to estimating the size of the digital economy was used by Oxford Economics, a macroeconomic consultancy (Oxford Economics, 2017). In their analysis, the first step was to estimate the value generated by businesses from their stock of digital assets (i.e. hardware, software and telecommunications equipment). In the second step, the definition of *digital assets* was expanded to also include short-lived digital goods registered as current expenditure. In the third step, indirect spill over effects from digital assets were estimated.

In this study, the size of the digital economy in relation to GDP is assessed in two phases:

1. We replicate the previously mentioned BEA study using Finnish data. The replication required data that we obtained from Statistics Finland. In addition, it was interesting to compare our results to the ones obtained from the US. The major shortcoming of the approach of the BEA is that it does

not take into account the digital portion of those goods and services categories that include both digital and non-digital components.

2. We further develop the BEA method by also considering activities that are partly digital. Our tentative approach used the share of ICT employees in each industry to approximate the digital-based value added. Furthermore, we also used online sales' share of total sales to approximate the value added created by online sales. This information was calculated by using an ICT survey of firms that was conducted by Statistics Finland. In sum, the goal of this approach is to assess the value added that is digitality produced by companies.

1.3.2 Tax gaps

The study covers desk research, the identification and collection of the necessary data, the calculation of indicators of tax gaps and the evaluation of the data availability, methods used and the results. The study uses the well-established Revenue Administration Gap Analysis Program (RA-GAP) methods of the International Monetary Fund (IMF) to study the CIT gap and the VAT gap.[5]

To address the possible contribution of digital freelance work to PIT gaps, we implemented a survey on the leading digital freelance platform, Upwork. The survey was targeted to Finnish freelancers who had earned at least USD 1 on the platform in 2019. In order to account for potential selective non-response, the respondent sample was weighed so that the full population of Finnish positive-earnings freelancers matched the respondent sample.

Additional insights into the problem were provided based on meetings with Finnish Tax Administration (FTA) representatives who were asked to highlight the main challenges for Finnish public finance.

1.4 The data and information used for the study

Our starting point was to assess the size of the digital economy by utilising all existing data. This data includes:

a. ICT usage and e-commerce data in 'Enterprises, 2018' – these database gave us access to hard data concerning the order of magnitude of e-commerce and sales through third-party platforms (e.g. Booking.com);
b. The Finnish longitudinal employer–employee data (FLEED) database (that links employees' and enterprises' data), which was used to identify the number of ICT employees in each industry;
c. ICT usage in households and by individuals;
d. The Labour Force Survey for 2017 – the survey included a question concerning individuals' earnings through digital platforms.

Two sets of interviews were performed:

a. Interviews were carried out at the FTA.
b. Interviews were carried out with representatives of five companies in the machine and equipment industry.

The tax gap analysis rested on the following data sources:

a. The CIT gap assessment utilised the national accounts data and the structural business and financial statement statistics of Statistics Finland. In addition, financial statements data that is only available for research purposes was used.
b. The VAT gap assessment used data on digital products and the related VAT revenues provided by Statistics Finland.
c. A bespoke survey based on a representative sample of Finnish freelancers was conducted on Upwork.

1.5 The structure of the study

The report is structured into eight chapters. Following the introductory chapter, Chapter 1, which sets out the purpose of the study, the data and information used for the study and the content of the study, Chapter 2 first discusses the definition of *the digital economy* and its measurement. It then presents the BEA methodology for assessing the size of the digital economy and further develops an improved alternative method (i.e. the Etla method) to more precisely measure the size of the digital economy.

Chapter 3 provides the results of our computations of the size of the digital economy in Finland during 2010–

2017 and compares the size of the Finnish digital economy to the corresponding findings of other country-level studies. Our reported interviews of various large Finnish manufacturers provide a complementary view of the degree of the digitalisation of Finnish businesses.

Chapters 4, 5, 6 and 7 focus on the tax gaps. Chapter 4 provides introduction to the assessment of the tax gaps in the economy. Chapter 5 defines the CIT gap and methodologies for estimating it, and it provides an assessment of the CIT gap in ICT industries in Finland. Chapter 6 assesses the VAT tax gap for digital products in Finland. Chapter 7 covers PIT gaps and further sheds light on the tax compliance of digital platform workers via the results of an online survey. Chapter 8 presents the final conclusions of the study with policy implications.

2 Quantitative assessment of the size of the digital economy

Various international rankings place Finland among the top countries in terms of digitalisation. However, no generally agreed definition of digital economy exists, and only a few prior studies have assessed the size of the digital economy quantitatively. This chapter introduces two methods by which to quantitatively assess the size of the digital economy in value added terms. The method proposed by the BEA calculates digital value added as the share of the gross output of digital products of all products, multiplied by the total value added. Partly digital products are excluded from the analysis. Our refined method explicitly also takes those partly digital goods and services into consideration in the assessment of the size of the digital economy. The Etla method bases its computation of the size of the digital economy in non-ICT industries on the relative importance of ICT workers (measured by the ICT workers' wages' share of total wages) and online sales in the industry (measured by e-commerce's share of total sales).

2.1 The composition and definition of the digital economy

2.1.1 International rankings

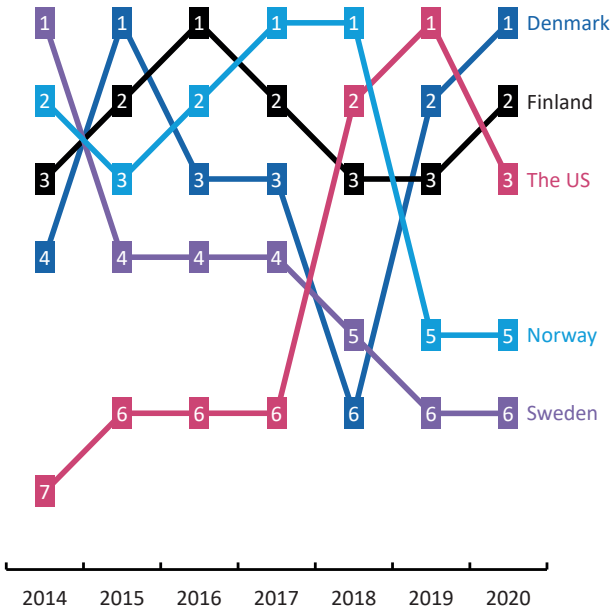
Currently, no generally agreed definition of digital economy exists, and there are only a few studies in which the size of the digital economy has been assessed quantitatively. Often, the degree of a country's digitalisation is assessed rather roughly by comparing different indicators of digitalisation across countries.

According to the Digibarometer executed by Etla in 2020, Finland has been ranked as the second most-advanced country in terms of digitalisation. The information is based on a recent study (Digibarometer, 2020) which compares 22 countries with a composite index consisting of 36 variables. Digibarometer is a study which evaluates how well individual countries utilise digitalisation and how they compare with one another in this respect. It measures the utilisation of digital capabilities based on numerous international databases provided by organisations such as the OECD, Eurostat, Google, the International Institute for Management Development (IMD) and the World Economic Forum (for details, see Digibarometer, 2020). The indications that the Digibarometer is based on are the a) capabilities, b) utilisation and c) implications of digitalisation over three sectors (company, civic and public sectors). Each sector is examined on each level, thus forming a scoring matrix of nine cells for each country.

Finland has been among the three best countries in the Digibarometer during the six years it has been carried out. Finland held the lead in 2016 and after that has been among the top 3 in the last three scoreboards (Digibarometer, 2020).

Finland's high placement is explained by its robust performance across various indicators. Finland's capabilities to utilise digitalisation and its actual utilisation are the second best in the world. However, regarding implications of digitalization, Finland scores lower (5th). Companies in Finland have been leading the records when discussing digitalisation. This is because of the implementation of digitalisation in their business activities. However, other countries, such as the US and other Nordic Countries, have overtaken Finland and Finland was only placed seventh in 2020.

Figure 2.1 The digitalisation rankings of selected countries in 2014–2020



Source: Digibarometer (2020).

The EU also measures the state of digitalisation in different countries by using composite indexes (European Commission, 2018). In 2019, Finland was ranked first among the EU Member States. Other Nordic countries also fended for themselves well. Sweden was ranked second and Denmark fourth. In 2018, Finland was ranked third while Sweden took the first position.

In recent years, an increasing amount of new digital services and platforms have been introduced. Examples of businesses targeted especially for the consumer market are, for example, Uber, Spotify and Airbnb, to name a few. There are also platforms such as UpWork and Amazon Mechanical Turk that enable people to offer their labour input globally without travelling. This creates a potential challenge to tax authorities from the viewpoint of personal income taxation, particularly in the cases when compensations are paid for by using virtual currencies (e.g. Bitcoin).

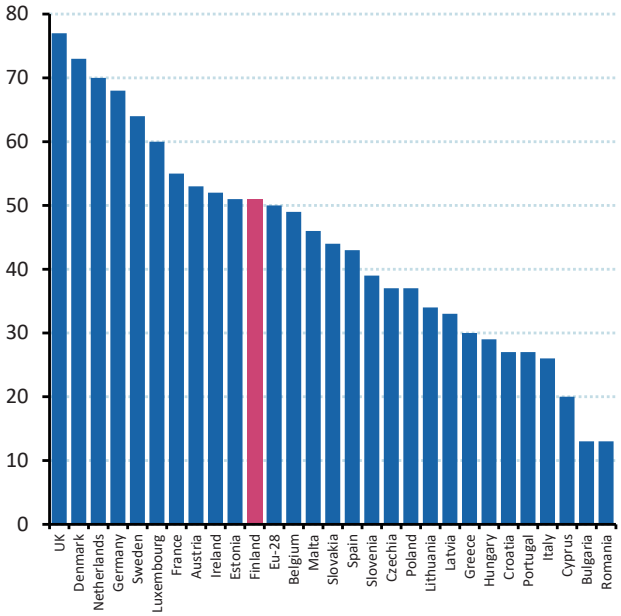
An increasing number of individuals order goods or services online. In the EU region, on average, 50% of consumers shopped online in 2018 (see Figure 2.2) while five years before, the corresponding share was 44%.

However, a country breakdown reveals great variation between countries. While in the UK, Sweden and Denmark, more than 70% of individuals have ordered goods or services via the internet during the past three months, in Bulgaria and Romania, less than 15% have done so. In Finland, the corresponding share was 51%.

The internet also offers channels through which to sell goods and services, but it is still more rare than offline purchasing. In the EU countries, on average, less than 20% of consumers used the internet for selling goods and services (see Figure 2.3).

Among the EU countries, the internet sales of individuals were most common in the Netherlands, Germany and Denmark where approximately 30% of individuals had sold goods or services online during the past three months. The share varies significantly among the EU countries as in certain countries, such as Greece, Ro-

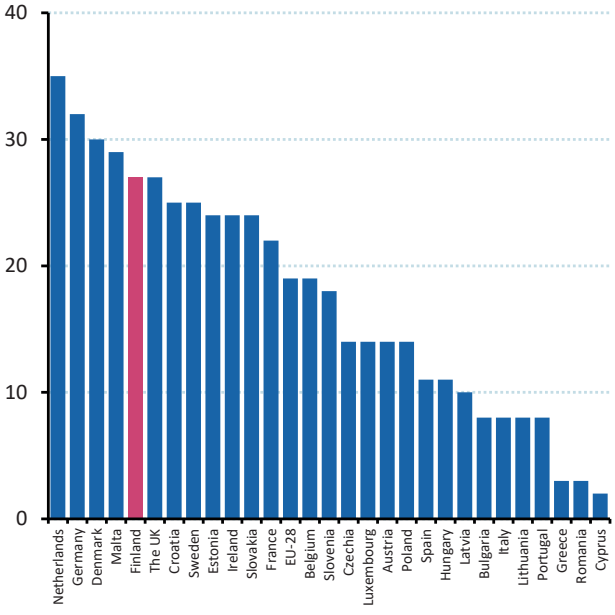
Figure 2.2 Individuals who ordered goods or services over the internet for private use, 2018



Note: The percentage of individuals (aged 16 to 74) who had ordered/bought goods or services for private use over the internet in the last three months.

Data source: Eurostat.

Figure 2.3 Individuals using the internet for selling goods or services, 2018



Note: The percentage of individuals (aged 16 to 74) who had used the internet for selling goods or services over the internet in the last three months.

Data source: Eurostat.

mania and Cyprus, only 2–3% of individuals had sold something online. In Finland, the corresponding share was 27%.

2.1.2 Definition of *digital economy*

Since the early 2000s, statistical bureaus in various countries, as well as the OECD and some other international organisations, have published quantitative information concerning the information and communication technology (ICT) sector. However, revisions of this classification have not kept up with the recent changes in digitalisation (IMF, 2018). Thus, today the ICT sector, as currently defined, is too narrow a definition to be used to measure the digital economy. On the other hand, all industries have at least some digital or data-based activities, but defining the digital economy as an entire economy leads us to too broad a definition. Currently, there does not exist a generally agreed definition of digital economy.

Recently, the OECD proposed a taxonomy of industries based on the extent to which they have gone digital (Calvino et al, 2018). Since different sectors utilise digital technologies in heterogeneous ways, digitalisation is hardly captured by a single indicator. Therefore, the classification by Calvino et al. (2018)is based on several indicators including: (1) the share of tangible ICT investment, (2) the share of intangible (software) ICT investment, (3) the share of intermediate purchases of ICT goods and services, (4) the stock of robots per hundred employees, (5) ICT specialists share of total employment and (6) the share of online sales of total sales. These indicators are used to create digitality indices for various industries, but indicators are not used to assess the size of the digital economy in monetary terms.

To our knowledge, there are only a few studies in which the digital economy has been assessed in monetary terms. The BEA assessed the digital economy within the framework of national accounts (Barefoot et al., 2018). Subsequently, the BEA method has also been applied in some other countries.

The analysis by BEA was based on the following three-step procedure, used to quantitatively assess the size of the digital economy:

1. The identification of the goods and services included in the digital economy;
2. The identification of the industries producing these goods/services by using the supply table;
3. Calculating the value added of digital goods/services by industries as follows: for each industry, divide the gross output of digital goods/services by the total gross output and then multiply this share by the value added of the industry.

Oxford Economics used a growth accounting framework augmented with measures for digital capital to estimate the size of the digital economy (Oxford Economics, 2017). In their analysis, the first step was to estimate the value added generated by businesses from their stock of digital assets (hardware, software and telecommunications equipment) captured in the Conference Board's TED data. In the second step, they expanded their definition of *digital assets* to also include short-lived digital goods that are registered as current expenditure captured within countries. In the third step, they estimated indirect spillover effects from digital assets using cross-country growth regression data from over 100 countries over 25 years. According to their results, the digital economy accounts for as much as 15.5% of global gross domestic product (GDP), of which only 28% is comprised of 'direct' effects and the remaining 72% is comprised of spillovers.

In this study, we build on and extend the framework introduced by the BEA (Barefoot et al., 2018). We argue that this framework that builds on supply tables has some benefits over the growth accounting approach applied by Oxford Economics. A specific concern for the viability of the growth accounting-regression approach is that cross-country data on digital inputs is likely to suffer from serious measurement issues.[6] On the other hand, the supply table approach taken by the BEA circumvents issues of international comparability as it builds on the data from an individual country.

We follow the BEA and define the digital economy primarily in terms of the internet and related ICT technology (Barefoot et al., 2018). Following this definition, the digital economy consists of three main categories:

1. Digital-enabling infrastructure;
2. E-commerce;
3. Digital media.

Digital-enabling infrastructure consists of the basic physical materials and organisational arrangements that support the existence and use of computer networks and the digital economy. These include computer hardware, software, telecommunications equipment and services and the Internet of Things. *E-commerce* describes purchases and sales of goods and services that occur over computer networks. *Digital media* is comprised of the content that people create, access, store or view on digital devices including: (a) the direct sales of digital media (e.g. Spotify and Netflix that sell digital products in exchange for a fee); (b) free digital media (e.g. YouTube and Facebook that earn revenue by selling advertising space); and (c) big data (e.g. companies that earn revenue by selling large data sets).

However, due to statistical reasons, the implementation of this definition is not straightforward. The statistics do not provide all the necessary information needed in the US nor in Finland. Therefore, we first replicate the study by the BEA as closely as possible. Then we propose an alternative approach that focuses on issues not fully covered by the original method of the BEA.

It should be noted that from the economic well-being perspective, GDP is not a perfect measure. During recent years, an increasing number of free or almost free digital services, such as Google Search, Facebook and Wikipedia, have been launched. However, in this study, we do not try to assess the value of these free-of-charge services. Instead, we take the follow-the-money approach and only take into consideration those digital goods and services that generate monetary revenue for organisations within the country being studied.

2.2 Method A: Replicating BEA analysis based on products' classification

In this study, we use two alternative methods to assess the size of the digital economy in value added terms. First, we replicate the analysis by the BEA as closely as possible using Finnish data. Second, we propose an alternative method in order to fill gaps in the BEA method.

Our starting point is to replicate the digital economy analysis done by the BEA and define the digital economy, primarily in terms of the internet and related ICT technology (Barefoot et al., 2018). In short, the basic idea of the BEA method is to classify goods and services groups into digital and non-digital goods and services, based on expert views, and then use statistics from a national statistical authority to assess the value added of the goods and services that have been defined as being digital.

In the first phase, we identify the goods and services included in the digital economy following the original study by the BEA. By using the supply table,[7] we identify the industries that produce those digital goods and services, and denote them using d.[8] To calculate the gross output of digital goods/services produced by each industry i ($GR\_Output_i^d$), we sum up the sales of the digital products produced by industry i ($Sales_i^p$):

$$(1) \quad GR\_Output_i^d = \sum_{p \in d}^{n} Sales_i^p .$$

In the second phase (Equation 2), we calculate the value added of digital products produced by each industry i and denote it using $Value\_added_i^d$. To approximate this for each industry, we first divide the gross output of digital products ($GR\_Output_i^d$) by the industry's total gross output (GR_Output_i), and then multiply that share by the industry's total value added ($Value\_added_i$):

$$(2) \quad Value\_added_i^d = \frac{GR\_Output_i^d}{GR\_Output_i} Value\_added_i \ .$$

A major shortcoming of the BEA's method is that it does not include the digital portion of such goods and services that include both digital and non-digital components. In a modern economy, virtually all industries use at least some digital data in their businesses, and this has not been taken into account, implying that the estimate is downward biased.

2.3 Method B: The alternative Etla method, based on industries

Because of the previously mentioned shortcoming of the BEA method related to partly digital business activities, we propose an alternative method for assessing the size of the digital economy in value added terms. The starting point of this alternative method is the ICT sector, as defined by the OECD and EU. Moreover, we approximate the role of digitalisation in non-ICT industries.

The basic elements of the Etla method for assessing the size of the digital economy are depicted in Figure 2.4.

In the Etla method, we classify all industries in the economy as either ICT or non-ICT industries based on the categorisation of the OECD. The entire amount of value added generated by ICT industries is incorporated into the digital economy. For non-ICT industries, the assessment of digital-based value added is based on two indicators. First, we approximate the role of digitality in goods and services by considering what share of employees are working in ICT occupations. The idea is that ICT employees create solutions and features embedded in goods and services that are sold to customers. However, a number of firms in various industries utilise digital technology in the output market without necessarily embedding digital elements into their offerings. Therefore, we also consider online sales.

Before formal presentation, let us consider the following examples to clarify Etla method. In the case of the software industry, the entire value added is counted as being within the digital economy. Another example concerns the machinery industry. A number of firms in the machinery industry produce goods that are often heavy and include tonnes of steel, but some of these goods also include software. To approximate the role of these digital features, we calculate what share of the total wage sum is paid to in-house ICT employees. The third example concerns industries – such as the leather industry – that produce pure physical goods with no digital features embedded. However, these goods are potentially sold via websites and e-commerce platforms. To take this type of digitalisation into account, we calculate online sales' share of total sales and multiply it by the value added of the industry.

Next, we formally present the Etla method. Our methodology is based on a three-step procedure for quantitatively assessing the size of the digital economy.

First, we calculate the value added of the ICT industry (Equation 3) following the industry definitions of the OECD (see Appendix 1). Because this approach completely excludes digital goods/services in non-ICT industries, we consider this as a lower bound estimate for the digital economy. Equation 3 is presented below:

$$(3) \quad Value\_added_{ICT} = \sum_{i \in ICT}^{n} Value\_added_i \ .$$

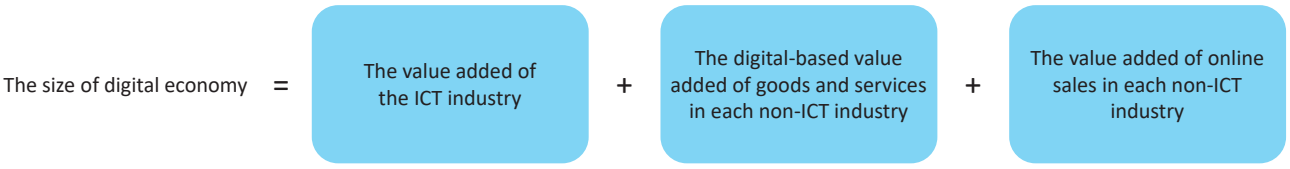
We then proceed by approximating the digital-based value added in goods and services (GS) produced by non-ICT industries ($Value\_added^{GS}_{N\_ICT}$). Since the development of digital elements requires human capital, we look at ICT employees' wages' share of total wages in non-ICT industries.

For each non-ICT industry (N_ICT), we derive the value added of digitality from the relationship between the wage income earned by ICT employees ($Wages^{ICT\_emp}_{N\_ICT}$) and the wage income of all employees ($Wages^{Total\_emp}_{N\_ICT}$), and then multiply this share by the value added of the industry (Equation 4):

$$(4) \quad Value\_added^{GS}_{N\_ICT} = \sum_{i \in N\_ICT}^{n} \left(\frac{Wages_i^{ICT\_emp}}{Wages_i^{Total\_emp}} Value\_added_i \right).$$

In addition to embedding digital technologies in goods or services, a number of firms in various industries utilise digital technology on the output market. This type of utilisation does not necessarily require in-house ICT specialists and thus is not captured by Equation 3. Therefore, we also consider online sales in order to complement our assessment. To approximate the value added

Figure 2.4 A conceptual depiction of the Etla method to assess the digital economy



of online sales ($Value\_added^{Online}_{N\_ICT}$) for each non-ICT industry, we calculate the share of online sales of the total revenue ($Total\_rev$) and multiply it by the value added of the industry (Equation 5):

$$(5) \quad Value\_added^{online}_{N\_ICT} = \sum^{n}_{i \in N\_ICT} \left(\frac{Turnover^{Online}_{i}}{Turnover^{Total\_rev}_{i}} Value\_added_{i} \right).$$

To proxy the digital based value added in non-ICT industries ($Value\_added^{d}_{N\_ICT}$), we total the digital-based value added of goods/services (Equation 4) and the value added of online sales (Equation 5) to get Equation 6:

$$(6) \quad Value\_added^{d}_{N\_ICT} = Value\_added^{GS}_{N\_ICT} + Value\_added^{Online}_{N\_ICT}.$$

Finally, to calculate the size of the digital economy on an aggregate level, we sum up the value added of the ICT industry and the value added of digitality in non-ICT industries (Equation 7):

$$(7) \quad Value\_added^{d} = Value\_added_{ICT} + Value\_added^{d}_{ICT}.$$

2.4 A summary of the BEA and Etla methods

The major advantage of the BEA method is the opportunity to compare results with a few other countries that have applied the same approach. As described earlier, in the BEA method product categories have been classified as digital and non-digital, based on the views of expert groups. The major shortcoming concerns this dichotomy because it excludes the role of digitality in goods and services that are partly digital.

To fill this gap, we developed a new method wherein ICT workers' wages and the share of e-commerce of sales have been used to assess the role that digitality plays in non-ICT industries. It is, however, possible that these indicators do not fully capture the significance of digitality in some industries and companies because they might rely on purchased digital solutions rather than solutions developed in-house with in-house employees. For that reason, the robustness considerations of the Etla method are based on ICT purchases rather than the wages of ICT workers.

3 Assessment of the digital economy in Finland

Our analysis shows that the share of value added that is generated by the digital economy in Finland has grown, but at a relatively slow pace, during the 2010s. According to the BEA method, in 2018, the size of the digital economy in Finland accounted for 6.4% of GDP – roughly the same as the size of the digital economy in the US (i.e. 6.5% of GDP). The refined method also takes into consideration partly digital products, which indicated that the digital economy comprised 10.9% of the GDP in Finland. The used methods do not yet fully capture the extent of digitisation. They neglect digital solutions that firms purchase rather than develop in-house and may not fully take into consideration the extent of digital technologies embedded in products and services. To assess the size of the digital economy in value added terms, we apply the two methodologies described in Chapter 2. This chapter describes the implementation of the methods and their results.

3.1 Assessment of the digital economy using the BEA approach

3.1.1 The digital economy in Finland

Following closely the method proposed by the BEA for estimating the size of the digital economy, the first step is to identify the digital goods and services included in the supply-use table by Statistics Finland. The most detailed supply-use table available in Finland includes 183 industries and 836 products and services.[9]

The Finnish supply-use table is not, however, as detailed as the US data which included approximately 5,000 categories of goods and services, of which 148 were identified as being digital. We followed this list of digital goods and services as closely as possible, but our data includes broader categories than in the US data. Thus, a total of 47 goods and services were selected for inclusion (the list of these digital goods and services is presented in Appendix 2).

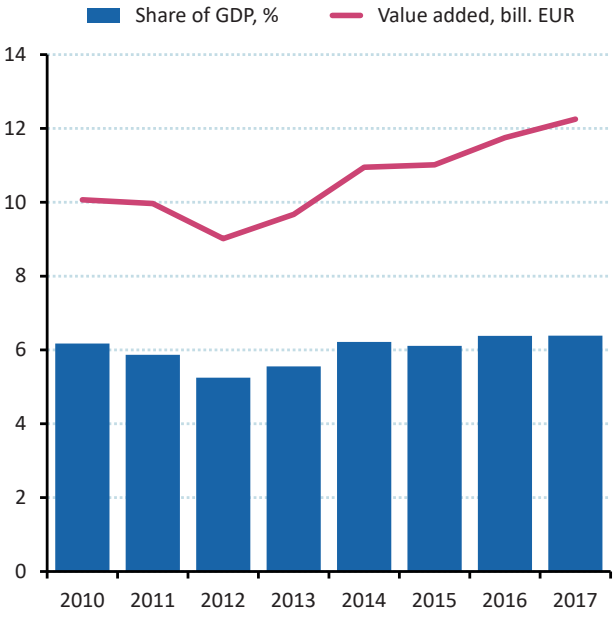
By using Equations 1 and 2, we were able to replicate the US analysis with Finnish data. First, we ordered the detailed supply-use table from Statistics Finland. This table included transactions of digital and non-digital goods and services by industries in gross terms. Second, to translate these gross values into value added terms (Equation 2), we merged this data with industry-specific value added, the figures for which were taken directly from Statistics Finland's National Accounts.[10]

At an aggregate level, our results based on the BEA method suggest that the value added of the digital economy has grown between 2010 and 2017 (see Figure 3.1).

While in 2010 the digital economy created EUR 10.1 billion of value added, in 2017 the corresponding value reached EUR 12.3 billion (see Figure 3.1). The growth is not, however, particularly rapid when the digital value added in relation to GDP is considered. During 2010–2017, the share of the digital economy increased from 6.2% to 6.4%. The figure also reveals a sharp decline between 2010 and 2012, raising the question of what the explanatory factors are. Therefore, we proceed by considering the change in digital-based value added by industry (see Table 3.1).

The largest negative contribution between 2010–2012 appears in the electronics industry (Column 'a' in

Figure 3.1 The value added of digital economy, based on the BEA method



Note: Value added is in current prices.

Source: The authors' calculations.

Table 3.1 The biggest decreases in the digital-based value added (2010–2012 and 2010–2017) by industry, based on the BEA method

Industry	(a) Change 2010–2012	Industry	(b) Change 2010–2017
Electronics	-1 724	Electronics	-900
Publishing activities	-73	Electricity, gas, steam supply	-46
Telecommunications	-56	Printing and recorded media	-36
Electricity, gas, steam supply	-45	The manufacture of machinery	-24
Printing and recorded media	-22	Architectonics and engineering	-21
Public admin. and compulsory social sec.	-10	Legal, accounting etc. activities	-21
Mfg. of food and beverages	-6	Telecommunications	-13
Paper	-4	Repair and inst. of machinery	-9
Construction	-3	Mfg. of food and beverages	-9
Security and other support activities	-2	Furniture and other mfg.	-4

Note: Changes in the value added of digital products, in EUR million at current prices. These are the top 10 industries with the largest decreases.

Source: The authors' calculations.

Table 3.2 The concentration of the digital-based value added (2010 and 2017) by industry, based on the BEA method

	2010			2017	
Industry	(a) Digital-based value added, mill. EUR	(b) The share of the country's total digital-based value added, %	Industry	(c) Digital-based value added, mill. EUR	(d) The share of the country's total digital-based value added, %
IT services	2,970	29.5	IT services	4,848	39.6
Electronics	2,746	27.3	Telecommunications	2,158	17.6
Telecommunications	2,171	21.6	Electronics industry	1,846	15.1
TV, music and broadcasting	632	6.3	Publishing activities	1,325	10.8
Legal, acct. and consultancy	547	5.4	TV, music and broadcasting	745	6.1
Electrical equip. mfg.	206	2.1	Legal, acct. and consultancy	526	4.3
Publishing activities	157	1.6	Electrical equip. mfg.	221	1.8
The manufacture of machinery	137	1.4	The manufacture of machinery	113	0.9
Electricity, gas and steam	70	0.7	Public admin., defence etc.	54	0.4
The repair and inst. of machinery	61	0.6	The repair and inst. of machinery	51	0.4
Other industries	371	3.7	Other industries	363	3.0
Total	**10,068**	**100**	**Total**	**12,251**	**100**

Note: The value added of digital products, in EUR million at current prices. These were the top 10 industries in 2010 and 2017.

Source: The authors' calculations.

Table 3.1). The value added of the electronics industry's digital goods diminished by EUR 1.7 billion in those two years, pulling down the aggregate figures. This drop originates from the difficulties of Nokia that took place in those years. Notwithstanding Nokia's recovery from those years, the digital-based value added of the electronics industry has not reached the level that prevailed in 2010 (Column 'b' in Table 3.1). This is not surprising because Nokia sold its mobile devices business to Microsoft which, in turn, later closed all these operations, both in Finland and in other countries. The major underlying reason for the observed decline in the digital value added is thus generated by the structural change of the Finnish economy during the 2010s.

As described in Chapter 2, the method by the BEA is based on the classification of products as digital and non-digital, and in principle, each industry potentially produces digital goods or services. The results, however, show that the production of digital goods and services is highly concentrated to a few industries (see Table 3.2. and the Appendix).

In 2010, based on the BEA method, the top 3 industries accounted for more than 78% of the total digital-based value added in Finland (Column 'b' of Table 3.2). In 2017, the corresponding share was still 72% (Column 'd' of Table 3.2). The most important industries have remained the same between 2010 and 2017. The information technology (IT) services industry, the electronics industry and the telecommunications industry are the main industries producing digital goods and services.

Our final industry-level analysis concerns the digital-based value added's share of the total value added. Table 3.3 reports the top 20 industries with the highest share of digital-based value added.

Based on the BEA method, digital goods and services only account for a significant share of the total value added

Table 3.3 The share of digital-based value added (2017) by industry, based on the BEA method

Ind. code	Industry	The share of digital-based value added, % of total value added	Digital-based value added, mill. EUR
61	Telecommunication	97.0	2,158.4
62–63	IT services	88.9	4,848.0
59-60	TV, music and broadcasting	78.9	744.5
58	Publishing activities	51.0	1,325.2
26	Electronics	40.7	1,845.9
69–70	Legal, acct. and consultancy	15.1	525.8
27	The manufacture of electrical eq.	12.0	221.2
36	Water collection and supply	5.8	24.9
18	Printing	5.6	23.8
33	The repair and inst. of machinery	3.4	51.5
65	Insurance and pension funding	2.3	36.1
28	The manufacture of machinery	2.3	112.7
95	The repair of computers etc.	1.5	2.4
72	Scientific R&D	1.3	19.1
64	Financial service act.	0.7	24.8
73	Advertising and market research	0.7	4.5
23	The mfg. of other mineral products	0.7	7.7
78	Employment activities	0.7	15.2
25	The mfg. of fabricated metal products	0.6	16.9
30	The mfg. of other transport equip.	0.6	2.7

Source: The authors' calculations.

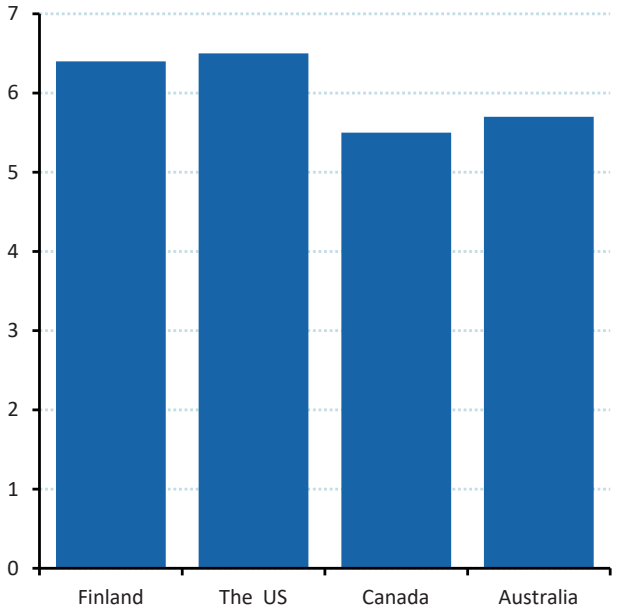
in a few industries (see Table 3.2). In the telecommunications and IT services industries, digital goods and services account for 90% or even more of the total value added. Digital goods and services also play an important role in the TV, music and broadcasting industry and the publishing activities and electronics industries. In other industries, the share of digital-based value added is low or even close to zero. This raises the question of whether the BEA method can capture all digital-based value added that is created in various industries.

3.1.2 Cross-country comparisons

In addition to the US, the BEA method has been applied in Australia, New Zealand and Canada, enabling us to compare our results to other countries (see Figure 3.2).

The relative size of the digital economy in Finland is approximately at the same level as in the US (see Figure 3.2). In Canada and Australia, the relative sizes of the digital economy are slightly less, accounting for 5.5% and 5.7% of GDP (in base prices) respectively (ABS, 2019; Statistics Canada, 2019). However, the calculation method in Canada slightly deviated from other studies. While other studies used the same categorisation of digital and non-digital goods/services proposed by the BEA, the figures concerning Canada also include some partially digital goods and services. These concern education programmes, e-commerce transactions in wholesale trade and banking service fees. Because other countries have not taken these into account, the comparable figure concerning Canada would be lower than the reported 5.5%.

Figure 3.2 The digital economy's share of GDP, based on the BEA method



Note: The results concerning Canada are not fully comparable to other countries.

Sources: Finland: The authors' calculations; the US: Barefoot et al. (2018); Canada: Statistics Canada (2019); Australia: ABS (2019).

3.2 Assessment of the digital economy using the Etla approach

3.2.1 Baseline assessment

As mentioned before, the figures based on the BEA method do not include goods and services that have a mix of digital and non-digital elements. To take this issue into account, we have developed the alternative method described in Section 2. To implement the method, we use the detailed data of Statistics Finland.[11] The analysis is based on linked data that combine four data sources: (1) the industry level value added by industry (national accounts), (2) the classification of occupational status, (3) linked employer–employee data and (4) ICT usage by firms.

First, we calculate the value added created by the ICT sector (Equation 3) following the industry definitions of the OECD (see Appendix A.1). The data of Statistics Finland includes the value added created by each unit located in Finland, and we sum up the value added of each unit in the ICT sector.[12]

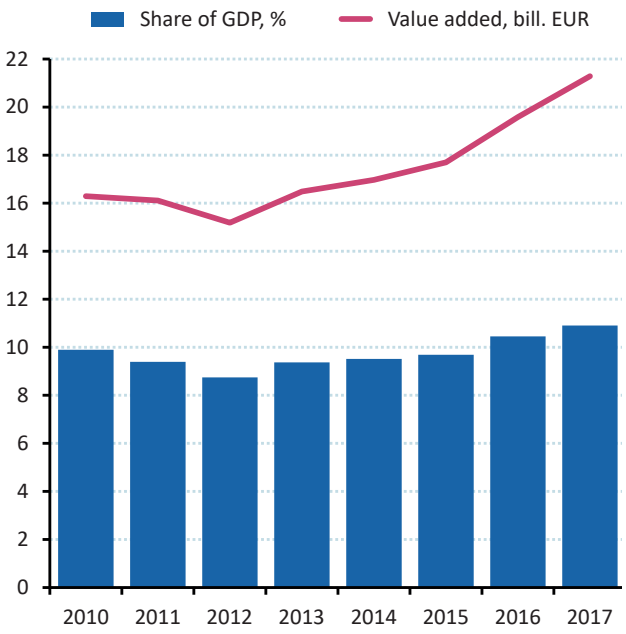
Second, we approximate the digital-based value added of goods and services produced in non-ICT industries by considering the role of ICT employees (Equation 4). To capture ICT employees' share of total employment, we use occupational classifications (International Standard Classification of Occupations, 2010). Persons who are employed in the following occupations are defined as ICT employees: 251 software and application developers and analysts, 252 database and network professionals, 133 ICT service managers, 351 ICT operations and user support professionals, 2153 telecommunications engineers and 7422 ICT installers and servicers.[13] Then we use the linked employer–employee data of Statistics Finland to calculate ICT employees' wages share of total

wages in each non-ICT industry and multiply this share by the industry-level value added (from Statistics Finland data falling under 'National accounts: Income and production by sector and industry').

Third, we assess the value added of online sales by using the data collected by Statistics Finland. Among other EU countries, Statistics Finland has conducted a survey called 'ICT usage in enterprises, covering basically all industries. This questionnaire includes the following request 'Please indicate an estimate of the percentage of the total turnover resulting from orders received that were placed via a website or apps'. We calculate the average of this share for each non-ICT industry. To approximate the value added of online sales (Equation 5), we multiply these shares by the industry-level value added reported in national accounting (in the Statistics Finland series 'Income and production by sector and industry').

Finally, we sum up the value added of the ICT sector, the digital-based value added of goods and services in non-ICT industries and the value added of online sales in non-ICT industries (see Equation 6). One potential drawback of this method involves the risk of double counting some digital-based value added in the non-ICT industries. As a result, firms with a large share of online sales in their total revenue may also be the ones with a large number of ICT employees (and so the ICT employees' share of wages is high). To evaluate this risk, we calculated the correlation between the ICT employees' share of wages and online sales' share of total sales at the firm level. The correlation coefficient obtained the value of 0.028, indicating that there is no linear correlation between the variables, and thus this does not imply double counting.

Figure 3.3 The value added of the digital economy, based on the Etla method



Notes: Value added is in current prices. The share of GDP is in base prices.

Source: The authors' calculations.

Based on the Etla approach described in Section 2.1.2, the following figure (Figure 3.3) shows the size of the digital economy at an aggregate level.

Based on the Etla approach, in 2010 the digital economy generated EUR 16.3 billion of value added (see Figure 3.3), accounting for 9.9% of Finnish GDP.[14] Both the absolute and relative figures rose during 2010–2017. In 2017, the digital economy accounted for 10.9% of Finnish GDP. Not surprisingly, both exceed the figures provided by the BEA method because the latter does not take into account semi-digital goods and services.

The breakdown of the digital economy reveals that digital-based value added has grown, particularly in non-ICT industries (see Table 3.3). While in 2010 non-ICT industries accounted for 25% of the digital economy, in 2017 the corresponding share rose to 43%.

In 2010, the value added of the Finnish ICT sector was approximately at the same level as in 2017 (see Column 'b' in Table 3.3). However, within the period 2010 and 2017, the value added varied remarkably. The decline between 2010 and 2012 was driven by the difficulties of Nokia, which was the flagship of the Finnish electronics industry.

As mentioned before, non-ICT industries have generated an increasing amount of digital-based value added (see Columns 'c' and 'd' in Table 3.3). Since 2010, we assess that the digital-based value added in non-ICT industries has grown by EUR 5 billion, and more than half of this growth has been generated by online sales (see Column 'd').

Table 3.3 The value added of the digital economy by component, based on the Etla method (EUR bill.)

	(a) Total	(b) The ICT sector	(c) Other industries, based on ICT workers' wages	(d) Online sales in other industries
2010	16.3	12.2	1.0	3.0
2011	16.1	10.2	2.9	3.1
2012	15.2	9.0	2.8	3.4
2013	16.5	9.8	2.9	3.8
2014	17.0	10.3	3.0	3.7
2015	17.7	9.4	3.0	5.3
2016	19.6	10.8	3.2	5.6
2017	21.3	12.2	3.3	5.8
Growth 2010–12, €bn	-1.1	-3.3	1.7	0.4
Growth 2010–17, €bn	5.0	-0.1	2.3	2.8

Note: Value added is in current prices.

Source: The authors' calculations.

Table 3.4 The concentration of the digital-based value added (in 2010 and 2017) by industry, using the Etla approach

	2010			2017	
Industry	(a) Digital-based value added, mill. EUR	(b) Share of country's total, %	Industry	(c) Digital-based value added, mill. EUR	(d) Share of country's total, %
ICT industries	12,245	75.2	ICT industries	12,189	57.3
Wholesale trade excl. ICT	402	2.5	Land transport	752	3.5
The manufacture of machinery	251	1.5	Wholesale trade, excl. ICT	592	2.8
Electricity, gas, steam	238	1.5	Air transport	525	2.5
Land transport	219	1.3	Paper industry	517	2.4
Construction	158	1.0	Public administration	428	2.0
Water transport	156	1.0	Electricity, gas, steam	349	1.6
Retail trade, excl. vehicles	148	0.9	Construction	348	1.6
Air transport	146	0.9	Employment activities	277	1.3
Trade of motor vehicles	144	0.9	Publishing act., excl. ICT	270	1.3
Other industries	2,185	13.4	Other industries	5,035	23.7
Total	**16,483**	**100.0**	**Total**	**21,282**	**100.0**

Note: Digital-based value added is in EUR million at current prices. These are the top 10 industries in 2010 and 2017.

Source: The authors' calculations.

Next, we consider the largest contributor industries in the digital economy (see Table 3.4).

The growth of digital-based value added is widespread (see Table 3.4). Based on the most recent figures, firms providing land transport generated EUR 752 million digital-based value added, more than triple the amount compared with 2010. Other major non-ICT industries are the wholesale trade and air transport industries.

These and some other non-ICT industries are somewhat surprising. For that reason, we proceed by exploring the digitality of non-ICT industries in more detail (see Table 3.5.).

The role of online sales is important in number of industries (see Column 'b' in Table 3.5), such as in the land transport, air transport, paper and employment activities industries. In all these industries, online sales account for at least 80% of the digital-based value added.

In industries (such as the architectural and engineering activities industry; the construction industry; and the electricity, gas and steam supply industry) online sales represent a smaller role compared to the digital value added which comes through in-house ICT workers.

The role of digitalisation varies remarkably within non-ICT industries. As mentioned before, online sales play

Table 3.5 Digital-based value added by components in non-ICT industries, 2017 (mill. EUR)

Industry	(a) Digital value added through ICT workers' wages	(b) Digital value added through online sales	(c) Digital-based value added, total	(d) The digital-based value added's share of the industry's total value added, %
Land transport	19	733	752	16.1
Wholesale trade, excl. ICT	181	411	592	8.2
Air transport	16	509	525	68.5
Paper	31	486	517	15.9
Public administration	428	0	428	3.9
Electricity, gas, steam	200	149	349	8.6
Construction	285	64	348	2.5
Employment activities	55	222	277	12.2
Publishing activities, excl. ICT	74	195	270	14.8
The manufacture of machinery	130	139	269	5.4
Accommodation	4	247	251	33.6
Real estate activities	39	201	240	4.7
Water transport	11	209	220	32.9
Retail trade, excl. vehicles	61	147	208	3.1
Trade of motor vehicles	19	181	200	6.3
Warehousing	32	166	199	8.7
Security activities	10	164	174	34.2
Architectural and engineering act.	130	43	174	4.9
Electronics, excl. ICT	89	82	170	10.6
Education	166	0	166	1.7
Other industries	1,295	1,469	2,765	2.9
Total	**3,278**	**5,816**	**9,093**	**5.0**

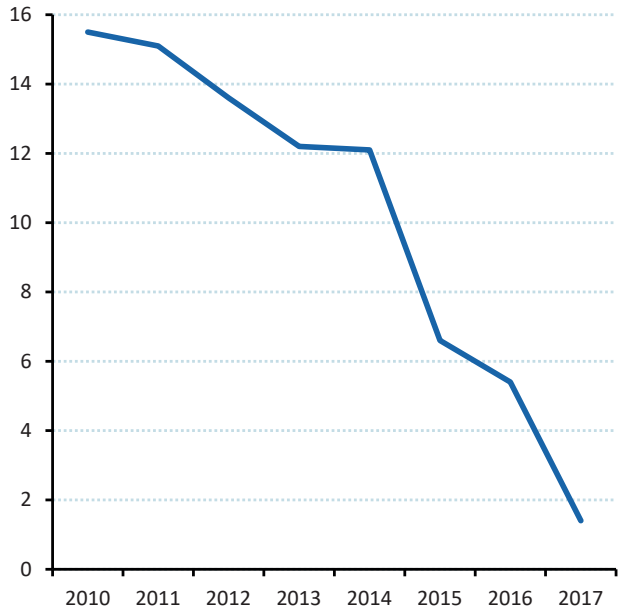
Source: The authors' calculations.

a pivotal role in air transport, raising the share of digital value added to 68.5% (see Column 'd' in Table 3.5). The significant role of online sales also explains the high shares of industries such as the accommodation (hotels etc.), real estate activities and water transport industries. We further acknowledge that the digitisation of certain service industries, such as financial services in which digital technologies are embedded in the production of services, may be underestimated by both the BEA and Etla approach.

3.2.2 The digitisation of the financial services sector in Finland (Focus Area 1)

The financial services sector is among the sectors that has shifted from the brick-and-mortar business into a heavily digitised service provision during recent decades. The digitisation of financial services that already began in the 1990s has been accelerated by the expansion of broadband networks, cloud computing services, the diffusion of smartphones and the growing number of internet users. The use of artificial intelligence and the analysis of big data have further changed the landscape of financial service provision. The market entry of fintech (financial technology) companies has introduced new competitors to the incumbent service providers in the financial services sector and contributed to the digitisation of various financial products, as well as enabled the launch of completely new services and products.

Figure 3.4 Commercial bank branches per 100,000 adults in Finland



Source: Statista.

The digitalisation of the operation of traditional banks is most visibly manifested by the fast decline in the number of bank branches. In Finland, the number of commercial bank branches fell drastically between 2010 and 2017, from over 15.5 branches per 100,000 adults to 1.4 branches per 100,000 adults. Currently, there are less than 800 bank branches in Finland that offer customer services. This automation improved efficiency and allowed banks to move their customer services to digital channels, facilitating the bank branch closures.

Monetary transactions increasingly take place in a digital format. In 2002, the share of cash in total payment transactions in Finland was about 50%, while in 2018, it had dropped to less than 20%. According to the survey undertaken by Finance Finland, in 2019, almost 90% of the respondents typically paid their bills either using the internet, mobile banking or e-invoices.[15] In 2003, the corresponding share of people typically paying their invoices digitally was 34%. The automation of invoicing is further reflected by the statistics that show that in 2019, 78% of internet bank users received e-invoices directly to their internet bank account, while in 2008, automated e-invoicing was merely used by 15% of internet bank users.[16] In 2018, 79% of the Finnish enterprises sent e-invoices that were suitable for automated processing.[17]

Fintech companies and the digitisation of incumbent banks' services have further introduced new types of digitised personal financial services. For instance, robo-advisors offer algorithm-based financial planning services for private investors (e.g. automated online portfolios and investment strategies that allow private investors to choose the volume and risk levels of the investments they are willing to make). Robo-advisors are in the early stages of replacing their human counterparts though. Among the incumbent Finnish banks, Nordea was the first to launch its robo-advisor service in 2018.[18] It is estimated that in 2019, there were about 30,000 robo-advisor users in Finland, but the trend is increasing.[19] The volume of digital remittances grows, and there are also new lending and financing alternatives provided by fintech, as well as by global technology giants on their digital

platforms. The clerks still pay a central role in processing and negotiating the terms of the firms' and individuals' loan applications in traditional banks.

In the heavily digitised service sectors, such as the financial services sector, digital technologies are largely embedded in the production of services and are a fundamental means for companies to deal with their customers. There is no data that comprehensively and precisely covers the degree of digital service provision and usage in the financial services sector though. However, he above-presented numbers hint that, currently, most of everyday financial service usage, such as payment transactions, takes place in a digital format.

3.2.3 Alternative assessments: Digitalisation in non-ICT industries (Focus Area 2)

Our baseline assessment of the digital-based value added created by non-ICT industries relied on the wages of ICT employees and online sales (Equation 4). The assessment based on the wages of ICT employees does not capture the cases where the majority of ICT knowledge has been sourced from other companies. In this subchapter, we use alternative digitalisation indicators instead of ICT wages. To develop alternative indicators, we rely on data collected by Statistics Finland (the producer of the vast majority of Finnish official statistics).[20] Alternative indicators include:

The share of software developers who develop software for a firm's in-house use of total employment, expressed as a percentage. This information is based on the following request from the ICT Usage and E-commerce in Enterprises questionnaire: 'Please estimate the number of person years that your employees have used to develop software for your company's in-house use.'[21] This number is divided by the total number of employees.

- *The share of IT purchases of total purchases, expressed as a percentage*. This describes what share of a company's total amount of purchases have been used to purchase IT goods and services.

- *The share of IT purchases of net sales, expressed as a percentage*. This describes what share of a company's revenue has been used to purchase IT goods and services.

- *The share of IT purchases of operating expenses, expressed as a percentage*. This describes what share of a company's total amount of purchases have been used to purchase IT goods and services.

Based on these indicators, we calculate three alternative approximations (Equations 4.1–4.3) for the digital-based value added in goods and services produced by non-ICT industries ($Value\_added^{GS}_{N\_ICT}$). All these alternative indicators are composed of two elements: the share of in-house software developers of total employment and the share of IT purchases. The first element remains the same in all alternatives, but the latter element differs depending on the denominator.

In the first alternative indicator (Alternative Indicator 1), the IT purchases of industry i are divided by all purchases i (Equation 4.1):

$$(4.1)\quad Value\_added^{GS}_{N\_ICT} = \sum_{i \in N\_ICT}^{n} \left(\frac{Programmers\_for\_inhouse\_use_i}{Total\_employment_i} Value\_added_i \right) + \sum_{i \in N\_ICT}^{n} \left(\frac{Purchases_i^{IT}}{Purchases_i^{Total}} Value\_added_i \right).$$

In the second alternative indicator (Alternative Indicator 2), IT purchases are divided by net sales (Equation 4.2):

$$(4.2)\quad Value\_added^{GS}_{N\_ICT} = \sum_{i \in N\_ICT}^{n} \left(\frac{Programmers\_for\_inhouse\_use_i}{Total\_employment_i} Value\_added_i \right) + \sum_{i \in N\_ICT}^{n} \left(\frac{Purchases_i^{IT}}{Net\_Sales_i} Value\_added_i \right).$$

The second element of Alternative Indicator 3 is based on IT purchases' share of operating costs (Equation 4.3):

$$(4.3)\quad Value\_added^{GS}_{N\_ICT} = \sum_{i \in N\_ICT}^{n} \left(\frac{Programmers\_for\_inhouse\_use_i}{Total\_employment_i} Value\_added_i \right) + \sum_{i \in N\_ICT}^{n} \left(\frac{Purchases_i^{IT}}{Operating\_costs_i} Value\_added_i \right).$$

The common strength of these alternative indicators is that they take into account the digital knowledge that has been acquired outside of the company. However, these alternative indicators suffer from weakness in regard to double counting. If digital knowledge has been purchased from domestic companies operating in the ICT sector, the value added of these companies was to some extent calculated twice: the first time was when the value added of the ICT sector was calculated and the second time was when ICT purchases were used to approximate the digitality of non-ICT industries. Thus, these alternative

indicators that use ICT purchases potentially overestimate the digital value added in the economy.

In addition to this potential upward bias that is common to all three alternative indicators, there are differences between them. Alternative Indicator 2 (Equation 4.2) is potentially downward biased because IT purchases relative to net sales does not take into account profits generated by inputs. On the other hand, our Alternative Indicator 3 (Equation 4.3) is potentially upward biased because IT purchases' share of operating costs excludes the direct costs. Due to these biases, our preferred alternative is Alternative Indicator 1 (Equation 4.1).

To recalculate the assessment of the digital economy, we replace our baseline definition of the digital-based value added in goods and services produced by non-ICT industries (Equation 4) using alternative definitions (Equations 4.1–4.3) in turn and then calculating the aggregate size of the economy similarly to before (Equations 5–7).

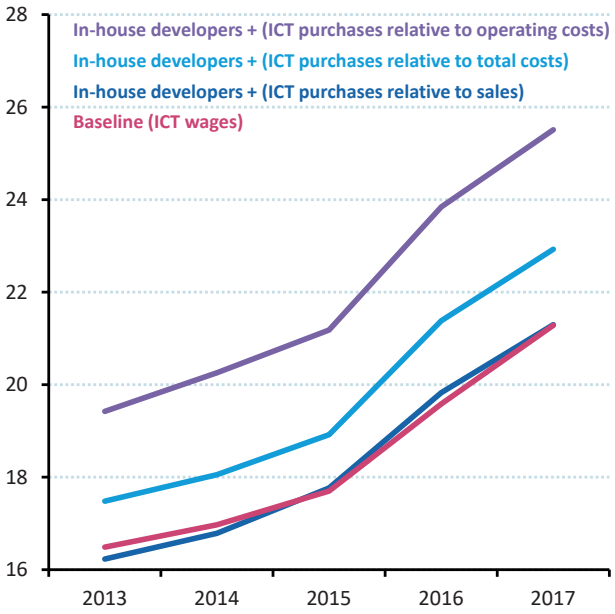
At the aggregate level, these alternative assessments generate the outcomes depicted in Figure 3.5.

Differences between alternative assessments in regard to the size of the digital economy are fairly modest (see Figure 3.5). Based on our baseline estimate, in 2017 the digital economy would have generated EUR 21.3 billion euros of value added while the alternative approximations vary between EUR 21.3 billion and EUR 25.5 billion, depending on the indicator. More importantly, alternative indicators generate consistent development or growth rates for the digital economy (see Figure 3.5). In relative terms, the most recent figures suggest that the digital economy accounts for 10.9–13.1% of the Finnish GDP (see Figure 3.6).

Finally, we analyse to what extent our baseline and alternative indicators are correlated at the industry level (see Table 3.6). Overall, there was a strong, positive correlation between the baseline assessment and alternative assessments. Three alternative assessments are also highly correlated with each other ($r > .94$).

We conclude that our robustness tests concerning alternative indicators generate figures that are in line with our baseline estimates. Thus, the size of the digital econo-

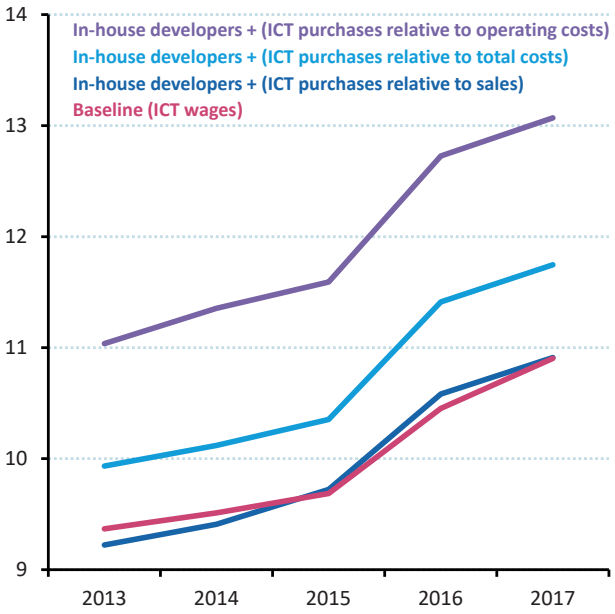
Figure 3.5 The value added of the digital economy based on the Etla approach (bill. EUR at current prices)



Notes: Value added is at current prices. The share of GDP is based on base prices.

Source: The authors' calculations.

Figure 3.6 Shares of the digital economy (as a percentage of GDP)



Notes: The share of GDP based on base prices.

Source: The authors' calculations.

Table 3.6 A correlation matrix

	Baseline assessment	Alternative assessment 1	Alternative assessment 2	Alternative assessment 3
Baseline assessment	1			
Alternative assessment 1	.831	1		
Alternative assessment 2	.915	.965	1	
Alternative assessment 3	.841	.966	.942	1

Note: Period = 2013–2017. Pearson correlations, *n* = 338.

Source: The author's calculations, based on data from Statistics Finland.

my remains approximately at the same level regardless of the indicator we used.

3.3 The interviews of Finnish industrial companies (Focus Area 3)

PwC carried out interviews with the largest Finnish companies operating in the machinery and equipment industry in order to analyse their use of digitalisation in the business.

These companies cover over 26% of the personnel in the sector and have an extensive number of subcontractors. The interviews focus on scoping and estimating the direct or indirect use of the digital economy in the business. The companies interviewed were Kone Oyj, Metso Oyj, Outotec Oyj, Ponsse Oyj and Valmet Oyj. The interviews were expected to give a picture of digitalisation in the industry and of the impact of the digitalisation on the operations and business of these companies.

In the interviews, the companies were asked about the role of software in the final products of their companies, the role of digitalisation in the core business of their companies and the role of digitalisation as a driver of business operations. It should be noted that the interviewed companies did not have exact data or numbers regarding the impact of digitalisation as it may not be considered significant information from the point of view of a company.

The interviews showed clearly how the role of digitalisation and software has an expanding impact on the core business of these companies. Digitalisation is seen as a method of pulling ahead from the competitors when discussing final products, that is, machinery. Even if the machinery itself were not to change significantly, the clients would expect to receive digitalisation both as installed in the machinery itself and as a software through which the services connected to the machinery may be provided to the clients more easily and efficiently. Providing IT to the clients in order to collect data on the use of the machinery as an ancillary by-product was a commodity that was seen to have a rising role in the future business. Different data collected both for the client and the manufacturer may be used to increase the effectiveness of the business for the benefit of both parties. In addition, this information helps the manufacturer to provide the services without visiting the premises of the client.

The companies interviewed took the standpoint on the fact that digitalisation has not had an impact on their territorial establishment. Subcontractors are used but the knowhow of using technology and digitalisation in the final products was considered an asset that cannot be bought from outside. All the companies employ experts who develop and build the digitalisation into the machinery. The software framework was considered an asset which is impossible to even outsource as the company itself has the best information on the digitalisation needed for the final products. Only some minor maintenance services could be outsourced in this respect.

The ratio of digital solutions developed by the personnel of the company to those developed by subcontractors or other services providers was between 50 to 70%.

One Finnish company employed 50–99% of the software developers whilst another company reported that only a small number of the software developers were employed by the Finnish company.

The companies interviewed reported that the percentual amount of the turnover ranges from 36 to 90% based on goods and from 10 to 64% based on services. The amount of turnover connected to the products in which software has a significant role was between 3 and 65%. The amount of turnover connected to the services in which the software has a significant role was reported to be between 0 and 40%. Altogether, products and services in which software has a significant role comprised 64–66% of the combined turnovers at the group level.

The ratio of digital solutions developed for internal use to those developed for selling to customers was reported as being 50/50 in two companies while one company reported the internal use as being only 5%. Moreover, two companies reported that although digital solutions are developed for both internal use and for clients, the focus is on the latter (i.e. on the development of digital solutions for clients). In the case where digital solutions are supplied to customers, the sales revenue mostly drifts to Finland except in the case of one company where the revenue globally drifts based on the intellectual property of the final product or service.

Depending on the company, 15 to 50% of R&D costs are allocated to the development of digital solutions and 20 to 85% of the costs are allocated to developing new products and services. Process innovations are allocated 10 to 90% of the costs, that is, costs related to innovating new processes or to developing a distribution network or back office operations. No costs were reported to be allocated to other innovations.

The companies' financial statements from the year 2019 were used when analysing the data from the interviews. When calculating the amount of R&D costs allocated to digital solutions, and new products and services, as well as to innovations, we used the percentages that were reported as these indicators' share of R&D costs at the group level. As we do not have the percentages of these units for the Finnish companies, we used the same percentages when calculating the said R&D costs of the Finnish companies. Therefore, in this report we report on the numbers in percentages and euros at the group level and in euros regarding the Finnish companies. In addition, it should be noted that only four of the interviewed companies reported on the above-mentioned indicators.

The median of R&D costs allocated to the development of digital solutions at the group level is 0.65%, the standard deviation is 0.54% and the average is 0.75%. In terms of euros, these numbers are EUR 10.3 million, EUR 2.2 million and EUR 11.0 million respectively. Regarding the Finnish companies, the numbers are EUR 290,600, EUR 3.7 million and EUR 2.1 million respectively.

The median of the R&D costs allocated to the development of new products and services at the group level is 1.43%, the standard deviation is 0.51% and the average is 1.58%. In terms of euros, these numbers are EUR 32.6 million, EUR 21.2 million and EUR 32.9 million respectively. Regarding the Finnish companies, the numbers are EUR 913,000, EUR 5.8 million and EUR 3.6 million respectively.

The median of R&D costs allocated to the development of process innovations at the group level is 0.44%, the standard deviation is 0.96% and the average is 0.85%. In terms of euros, these numbers are EUR 15.3 million, EUR 11.5 million and EUR 15.0 million respectively. Regarding the Finnish companies, the numbers are EUR 534,000, EUR 663,000 and EUR 670,000 respectively.

Altogether, R&D costs at the group level comprise EUR 378.3 million which is 1.99% of the combined turnovers from 2019. Costs allocated to digital solutions comprise 0.23% of the combined turnovers whereas 0.69% is allocated to new products and services and 0.32% to process innovations.

All the companies replied that digitalisation has had very little or no impact on the business of the company in the sense that the revenue streams would have shifted from one country to another. However, one company reported that the revenue streams stemming from services have slightly shifted to Finland.

When the companies were asked how they estimate that their input to the development of software and digital solutions will change within three years, the input was estimated to grow by a significant amount. However, the

companies stressed that the main driver of the business is the core product and not digitalisation. However, the companies expressed that the digital solutions will have a stronger role both as an integral part of the main business product and as a part of the growing number of services connected to the main product.

4 Tax gaps

This chapter provides an introduction to the assessment of the tax gaps in the economy. The major motivation and objective of a tax gap estimation is to provide numerical information about the compliance of taxpayers. The broadest definition of ***tax gap*** *considers the gap as the difference between the tax theoretically due from taxpayers and the amount collected. A narrower and more common definition is to consider the tax gap as a sum of a compliance gap and a policy gap. The causes of tax gaps can be classified as information problems, mistakes, insolvency, tax planning, tax avoidance, tax evasion and fraud.*

4.1 Interviews made on tax experts at the FTA

PwC ran interviews to get clarification of the background and the state of play of the taxation of the digital economy. The interviews concentrated on tax experts at the FTA prior to the assessment of the digital economy and its impact on taxation and revenues. We interviewed the following people at the FTA:

27/6/19 Director General, Markku Heikura;
16/7/19 Head of Grey Economy Information Unit, Janne Markkanen;
13/8/19 Head of Risk Management, Sami Kinnunen;
15/8/19 Leading Tax Expert at PIT Unit, Sami Varonen;
22/8/19 Leading Tax Specialist, Tero Määttä;
26/8/19 Leading Tax Expert, Lauri Savander;
26/8/19 Company Income Tax Expert, Teemu Autio;
26/8/19 Chief Development Officer and Chief Information Officer, Jarkko Levasma
6/9/19 Leading VAT Expert, Mika Jokinen

Based on the interviews with various tax experts from the FTA, identifying a Finnish tax gap in terms of CIT is difficult. Provided that the Finnish tax gap is defined as the difference between taxes payable in Finland under current tax rules and taxes actually collected, many of the experts had doubts about whether there really is a tax gap at all. In many cases this doubt was based on the assumption that non-Finnish resident entities receiving income from Finland from digital business do not in many cases actually have a PE in Finland (under current rules) which would enable Finland to tax the Finnish source business income attributable to the PE. Thus, with respect to non-Finnish resident entities, a tax gap could result from non-Finnish entities not declaring their PEs in Finland. However, under the current rules, not declaring a PE was not assumed to be a significant problem. It was also noted that non-Finnish entities having Finnish activities are already required to file a tax return, even in cases where they consider no PE to exist.

Many of the experts raised the EU- and OECD-level work as an example of future developments. The mentioned work is not seen to fix incorrect taxation under current rules, but more to address how taxable profit should be allocated in the future, especially in connection with the digital economy, but not limited to it. This means that the taxes in, for example, Finland would be payable on the basis of different facts and circumstances than those used today. It would not mean that taxes in, for example, Finland would be payable based on the same facts and circumstances as today but more efficiently (i.e. it would not close the gaps). The EU and OECD work is more of a question of if the legislation should be changed (e.g. so that nexus and transfer pricing rules regarding internationally operating groups would lead to a different allocation of income taxes between countries than today).

The main topic raised in connection with the digital economy and the tax gap was the need for information on the revenues of Finnish taxpayers. This topic was mainly raised in connection to Finnish resident individuals not declaring their revenues. The topic was not seen as problematic in connection to CIT as Finnish resident entities are already required to record their revenue on the basis of accounting law today, and as mentioned earlier, in many cases non-Finnish resident entities were assumed to not to have the relevant nexus in Finland to make the revenue subject to Finnish taxation under current rules. There were doubts about whether Finnish resident entities not recording their revenues in their accounting would typically be digital economy driven. Thus, the non-recording was not specifically seen as a digital economy businesses issue but as an issue of the economy as a whole.

Based on the interviews with the FTA, the current Finnish tax legislation is sufficient concerning the personal income taxation of income received through digital platforms. Thus, there is no compelling need to adjust

the current Finnish tax legislation. The current tax legislation is based on a comprehensive concept of income, meaning that, in general, all income received is taxable unless otherwise stipulated. Therefore, income received through digital platforms has not been excluded from taxation in Finland.

Based on the interviews, the dilemma relating to the taxation of personal income received through digital platforms lies in the fact that the FTA does not currently receive information on the income received by individual taxpayers through using the platforms provided by third parties, resulting in it being the sole responsibility of the taxpayer to report the income to the tax authorities. This means that income received by a taxpayer has not been automatically declared on the pre-completed tax return and, consequently, the taxpayer is liable to amend the tax return with the income received through digital platforms. It seems that there are a vast number of taxpayers who intentionally or mistakenly do not report such income. This emphasises the need to facilitate the regulation concerning the outsider's duty to provide information including sales events that take place through digital platforms in such a way that the platform provider is obliged to report such sales events directly to the FTA.

VAT as an EU-based tax system is also harmonised in terms of electronic services, and further regulation will be introduced in 2020 and 2021 regarding the distance sales of goods as well as VAT treatment for digital platforms. Based on the interview, the EU has faced challenges because of the increasing number of distance sales of goods, as well as the supply of digital and electronic services across the Member State borders. This fact also increases the VAT gap in the EU. The problem especially seems to be with consumer sales as consumers are ordering increasingly commodities from other countries. One problem is the VAT exemption of low-value goods, which has been also seen as the reason for the growing VAT gap in Finland (7.4% in 2017).[22] The need to amend the VAT treatment of these sales is essential and noted by the Member States as well as by the European Commission. The sharing economy is another challenge as the VAT treatment of the new supplies provided by private persons is not clear and the suppliers of these services do not recognise the possible VAT impacts of their activity.

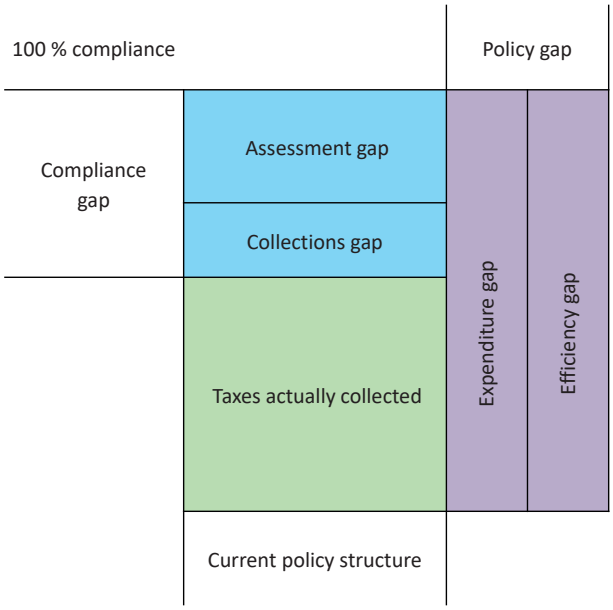
4.2 Definitions

The broadest definition of *tax gap* considers the gap as the difference between the tax theoretically due from taxpayers and the amount actually collected. This definition is not very practical because it is difficult to say what kind of a tax system would provide the theoretically correct outcome. For example, from the point of view of optimal taxation, the CIT system should generate a maximal amount of tax revenue with minimal distortion of investment and employment decisions, and should support the chosen redistribution goals. This broad view also considers behavioural reactions and the influence of the CIT system on other TBs than corporate incomes.

A narrower and a more common definition is to consider the tax gap as a sum of a compliance gap and a policy gap. *Policy gap* refers to deviations from the main rule that defines the TB and tax rate. Examples of deviations are tax allowances and differentiated tax rates. The main rules of taxation are country specific, which means that international comparisons of policy gaps are not very informative.

The basic structure and components of the tax gap are illustrated in Figure 4.1. The coloured area depict the po-

Figure 4.1 The components of the tax gap



Source: Modified from Hutton (2017).

tential tax revenues which can be collected if compliance is 100% (the vertical axis measures compliance) and the standard rate is applied to the full potential TB (the horizontal axis measures the policy structure). The corresponding tax policy is called *the reference policy structure*.

The policy gap can be divided into the efficiency gap and the expenditure gap. The *efficiency gap* is the difference between potential tax revenue, if a standard rate is applied to the full TB (the reference policy structure), and the potential revenue if a specific set of items are excluded from the TB (normative policy structure). The *expenditure gap* describes the influence of additional exemptions, that is, the difference between potential TB assuming normative policy structure and the potential TB, given the current policy structure (Thackray et al., 2015). The measures of the policy gap assume full compliance.

Correspondingly, the compliance gap that defines the amount not collected because of non-compliance can be divided into the assessment gap and collection gap. The *assessment gap* describes the difference between potential collections, given the current policy structure, and the taxes actually assessed or declared. The *collection gap* describes the amount assessed but not collected.

The compliance gap mainly consists of failures to report the taxable revenues correctly and on time, and to pay the taxes due on time. The failures may be intentional – as in cases of tax avoidance, fraud and evasion – or unintentional, as in cases of inadequate information, mistakes and insolvency. The main issue is that the benchmark for non-compliance is based on the current tax legislation of the country studied. Here again, international comparisons of tax gaps are not very informative because of the differences in tax codes. We focus on the compliance gap.

4.3 Motivations for estimating tax gaps

The key objective of a tax gap estimation is to provide numerical information about the compliance of taxpayers. Warren (2019) lists other reasons why tax gap analysis is important, as follows. The analysis gives information about potential revenues lost because of the incentives created by the tax rules, complexity and compliance costs, and inefficiencies in the implementation of tax policies and administration. Trends in tax gaps reveal changes in non-compliance and thereby the sustainability of the tax system. Higher compliance generates more tax revenues but also levels the playing field of the firms and improves the fairness of the tax system.

The size of a tax gap as a single number is not, however, very informative since it does not tell about the reasons behind the gap and the possibilities for diminishing it. Its practical use is also limited because the reliability of the estimate cannot be easily checked. Therefore, it is recommendable to use several complementary methods, if feasible. A third aspect which reduces the information content of single-year estimates is the variation caused by business cycles. Therefore, it is useful to look at the trends in the variables, especially in the analysis of single industries.

The gap estimate is most useful when it is combined with information on different types and practices of non-compliance. For example, informational problems are most

Table 4.1 Tax gap elements and the activities of the taxpayer

	Intention	Legality	Gap
Information problems, mistakes	Yes/no	Yes/no	Compliance
Insolvency	No	Yes	Compliance
Tax planning	Yes	Yes	Policy
Tax avoidance	Yes	Yes, but against the spirit	Policy + compliance
Tax evasion, fraud	Yes	No	Compliance

Source: The authors.

easily solved by delivering information, not by increasing control or tax policies. The single steps taken in the process of evaluating the size of the tax gap can also generate knowledge that is valuable for the tax administration.

Table 4.1 classifies the elements of the tax gap, their intentionality and legality. The borderlines in the classification are not strict. For example, it is difficult to detect whether mistakes in tax declarations are done on purpose. Moreover, differences in legislation and accounting procedures in different jurisdictions may blur the lines between tax planning, tax avoidance and tax evasion. Becoming multinational has been demonstrated to lower the shown profits of firms since the profit shifting possibilities increase (Bakke et al., 2019).

A tax gap does not measure the amount of taxes that can be collected even with 100% compliance. The main reason is that taxation influences the behaviour of economic agents. An example from the CIT gap illustrates the issue. If the initial compliance gap is due to multinationals shifting the profits of domestic investments to low-tax jurisdictions, higher compliance would increase the required rate of return on those investments. Lower domestic investment rates would weaken the competitiveness of the multinationals, the productivity of labour and the overall growth of the economy. Furthermore, as the incidence of the CIT is partly on labour (i.e. on wages and employment), higher CIT compliance would increase the CIT revenues of the home country but lower revenues from personal income taxation and VAT. On the other hand, the higher CIT compliance of the multinationals improves the relative competitiveness of the firms operating solely in domestic markets.

Another reason for conservative estimates of the scope of collecting more CIT revenues is the costs of monitoring, implementation and legal disputes. It can be expected that these costs increase exponentially when coming close to full compliance.

5 Assessing the CIT gap in the Finnish ICT sector

We employed the RA-GAP method of the IMF to calculate the CIT gap in the Finnish ICT sector. A full tax gap analysis failed due to the unavailability of detailed industry-level national accounts data. We introduced alternative indicators based on operating profits that were used to approximate the trends in tax compliance. The results of a detailed industry-level analysis among the ICT industries showed wide annual fluctuations in financial flows and extraordinary items. Such fluctuations would challenge the accuracy of the RA-GAP results even if the required data for the analysis were available. The less sophisticated indicators of CIT compliance, such as CIT efficiency, did not show any marked changes in the compliance trends in recent years.

5.1 Definitions

5.1.1 CIT

There are no special definitions for the digital economy in Finnish corporate tax legislation. Furthermore, as the international tax rules were first written in the 1920s, they were not formulated to meet the features of modern business models. Therefore, and also deriving from the nature of the international tax legislation that mainly leans on the national tax rules and the tax treaty network between the countries,[23] the term *digital economy* has not been defined internationally at the level of model tax conventions.

The OECD/G20 Inclusive Framework on BEPS has concluded that it is not possible and not even appropriate to ring-fence the digital economy as, in the future, all business models will be more or less digitalised (OECD, 2019b, p. 5). Therefore, it is important to find a long-term solution that recognises the features of the digital economy but is not only limited and targeted to highly digitalised business models. The common aim of the countries has been to review the nexus and profit allocation rules according to which the right of taxation is allocated between jurisdictions, and at the same time, profits from different activities and operations are allocated between the group companies (OECD, 2019, p. 8).

Simultaneously, and overlapping with the work carried out by the OECD/G20 inclusive framework on BEPS, many countries have unilaterally moved forward with enacting new tax rules in order to introduce new taxes in the context of the digital economy. Also, the EU proposed a directive to introduce a so-called digital services tax (DST) to be implemented within all EU Member States. The EU Member States never reached consensus on the directive. However, some countries (Austria, France, Hungary, Italy, Turkey, the UK) have introduced domestic DST schemes.[24]

The proposal for the directive on a DST did not define *digital economy* as such, but taxation was planned to be targeted to certain specifically defined types of (digital) services. The DST would not have been applicable to the digital economy as a whole but only to specifically defined activities that are typically regarded as a significant part of the digital economy. The services covered by the DST would have been certain advertising, platform-related and user contribution–related activities. The idea would have been to tax revenues arising from these activities in the source state of the revenue.

For example, the UK and France have introduced a similar type of new *digital taxes*, as those proposed by the EU with the DST. In the UK, certain specifically defined services are covered by the new digital tax. The new tax in the UK hits, for example. search engines, social media platforms and online marketplace–related activities, whereas for example, sales of used goods online or the provision of online content, and radio and television broadcasting services are not covered. France has announced a similar type of approach for its new digital tax. The tax would not hit the digital economy as a whole but certain specifically defined activities, such as certain platforms, advertising and user data usage–related activities.

5.1.2 Digitalisation and tax shifting from a CIT perspective in Finland

Globalisation, together with digitalisation, creates a modern business environment that enables plenty of forms of tax planning for multinational enterprises. The headquarters and other facilities can be located in countries with low or no taxation. Entering into new jurisdictions is easier using internet-based tools and ICT. In addition, Finnish companies buy more and more R&D services

from foreign operators, which impacts on the tax revenue in Finland as supplies of these services do not cultivate revenue for the Finnish Exchequer.[25]

In theory, the lack of digital-nexus rules, together with the challenges concerning profit allocation as regards digital companies, may create the risk of a tax gap. However, if a tax gap is understood in the light of existing rules as a tax gap based on compliance, we should not mistake a theoretical discussion of profit allocation for a tax gap discussion. Therefore, the definition of *tax gap* based on the current rules should be clearly differentiated from the discussion of tax planning. Also, as the European Court of Justice (ECJ) has in several cases concluded, it is acceptable for a company to plan its economic activity for the sole purpose of obtaining a tax advantage.[26] If the nexus and profit allocation rules were updated, some of the foreign companies that currently do not pay taxes in Finland could end up in a taxable position in Finland. Accordingly, some of the digitally operating Finnish companies could have a taxable presence in another country in which the company would pay taxes from the profits allocated there in accordance with the tax legislation of that country.

It is essential to understand that when discussing the taxation of the digital economy, the actual issue is about a fair method of distributing the right to impose a tax. If the company does not have a responsibility to pay taxes in Finland based on the current legislation, the lack of revenue may not be regarded as a tax gap. Therefore, the ultimate objective in the international projects (BEPS, the EU digital tax) should be the creation of a system of fair taxation and tax distribution among countries whilst simultaneously ensuring that the tax burden of the companies is kept level and that the growth of the business and Member States' economies are not harmed.

Some tax experts at the FTA were interviewed for this study. It was revealed that these experts also find it difficult to identify the tax gap. Provided that the Finnish tax gap is defined as the difference between taxes payable in Finland under current tax rules and taxes paid to the exchequer, many doubts were presented about whether any tax gap exists. This is because in many cases non-Finnish resident entities receiving income from Finland do not have a PE in Finland which would enable Finland to tax the Finnish source business income attributable to the PE. Thus, with respect to non-Finnish resident entities, the reason for the tax gap could result from non-Finnish entities not declaring their PEs in Finland. However, under the current rules, PEs not declaring tax in Finland were not assumed to be a significant problem. It should be noted that non-Finnish entities having Finnish activities are already required to file a tax return, even in cases where no PE is considered to exist.

Many of the tax experts at the FTA raised the EU- and OECD-level work as an example of future development. The mentioned work is not seen as a fix to incorrect taxation under current rules but more of a way to address how taxable profit should be allocated in the future (especially in connection with the digital economy, but not limited to it). This would not mean that taxes in Finland would be payable based on the same facts and circumstances as today. Nonetheless, the rules would reflect the new business environment and hence the basis for taxable presence and operations would differ from the existing determinations. The EU and OECD work is more a question of if the legislation should be changed in such a way that nexus and transfer-pricing rules regarding internationally operating groups of companies would lead to a different allocation of income taxes between countries than today.

The main topic raised by the tax experts of the FTA in connection with the digital economy and tax gap was the need for information on the revenues of Finnish taxpayers. This topic was mainly raised in connection to Finnish resident individuals who do not declare their revenues. The topic was not seen as problematic in connection with CIT as Finnish resident entities are required to record their revenue according to accounting laws. Also, as mentioned earlier, in many cases non-Finnish resident entities were assumed not to have the relevant nexus in Finland required (under current rules) to make the revenue subject to Finnish taxation. Doubts were raised about whether Finnish resident entities not recording their revenues in accounting would typically be those operating in the digital sector. Thus, such non-recording was not seen specifically as an issue of businesses in the digital economy but as an issue of the entire (grey) economy.

5.2 Methods for estimating corporate income taxation gaps

5.2.1 Overview

The report of the FISCALIS Tax Gap Project Group presented the CIT compliance gap estimation methodologies in use and assessed their advantages and disadvantages (FISCALIS, 2018). Here the alternatives are listed briefly. The aim is to give an overview of the issues before describing in detail the RA-GAP method of the IMF.

The estimation methodologies can be divided into two groups depending on the data and aggregation level used in the analysis. Top-down analysis uses national accounts and statistics on financial statements to generate an alternative view of the taxable income of the corporate sector. The main challenge in this approach is related to the available data. The data should not come mainly from the same source (tax declarations) and should be detailed enough so that the concepts and items from national accounts, financial statements and tax liability calculation can be reconciled.

Top-down estimation using national accounts data does not fully capture the tax gap due to tax avoidance and evasion because activities such as transfer pricing, the international allocation of patents and the financial operations of the multinationals are likely to also influence the income and expenditure described in the national accounts. The main benefits of the approach are the relatively low costs of repeating the calculation after the initial effort and the possibility to follow trends.

Bottom-up methods use micro-level information collected, for example, from registers, audits, data matching and surveys. The idea is to produce a tax gap estimate for a group of firms or forms of non-compliance and extend the results to the aggregate corporate sector. The main challenge in this approach is to generate representative samples without too high costs. The main benefit is the possibility to isolate sources of non-compliance, which helps planning actions to increase compliance. Table 5.1 provides a non-exhaustive list of methods that can be used to assess the CIT gap.

5.2.2 Top-down methods

National accounts methods

The main idea in the national accounts method is to create an alternative aggregate CIT base estimate for the corporate sector by using independent data from financial statements and national accounts. Both observed and unobserved economic activities are included.

A prime example is the RA-GAP method, created and promoted by the IMF (see Ueda, 2018). The method starts from the gross operating surplus of the enterprise sector and modifies it using mainly national accounts data to generate an alternative estimate for the financial accounting profit (FAP). In the next step, the estimated accounting profit is converted to an alternative TB using other data, mainly accounting statistics and tax declaration data. The method is described in detail later in this chapter.

Macro model methods

Macro data can be used indirectly to detect the size of non-observed economies. The idea is to use indicators of economic activity – such as the use of electricity, money in circulation or the size of the labour force – to generate alternative estimates for the aggregate value added of the country (the GDP). All these indicators measure value added with large margins of error and are there-

Table 5.1 Methods for estimating CIT gaps

Top-down	Bottom-up
The national accounts method	Random audits
Macro models	Risk-based audits
The elasticity of profits to CIT	Propensity score matching
CIT efficiency estimates	Other econometric methods

Source: FISCALIS Tax Gap Project Group (2018).

fore not very accurate. Moreover, even if the hidden value added could be measured reliably, part of the additional economic activity would not be subject to CIT. The difference between the alternative and official GDP is also a very rough indicator of a CIT gap because it does not consider the many differences in the concept of profit in national accounts, financial statements and corporate income taxation.

The elasticity of the reported profit to CIT rates or rate differences

Elasticity studies aim to analyse profit shifting by econometrically estimating how much the home country CIT rate and the weighted average CIT rates of other countries (or the difference between them) influence the domestic CIT base. It is based on the idea that an aggregate single company decides how to allocate productive capital and profits across countries. The tax gap is evaluated by comparing the TB shown in tax declarations to a TB that is produced, simulating the model on the condition that profit shifting is extremely costly. The outcome only describes the gap in revenues due to profit shifting.

CIT efficiency estimates

A CIT efficiency estimate uses some easily available reference TB, such as the gross operating surplus (GOS) of the companies, to construct a reference level of CIT revenue and to divide the actual revenue by that number. The ratio is likely to be below one since GOS does not consider many expenses and tax allowances, such as depreciation and interest paid on debt. As GOS represents value added created in the home country by the key activities of the firm, it gives an idea of the outcomes of the source-based allocation of profits and tax revenues. Differences in CIT efficiency between countries indicate that profit shifting may take place.

5.2.3 Bottom-up methods

Random audits

Well-designed random audits can yield representative results for the whole target population of firms. The number of audits must, however, be large in order to gain representativeness. Therefore, the audit costs both to tax administration and to the businesses are substantial. If a large majority of the companies are compliant taxpayers, there will be many unnecessary audits. Furthermore, the audits cannot reach non-registered firms and frauds that involve many parties. It is also possible that, by chance, the random audits do not reach some of the most important companies in the industry, and in the case of specific companies, it may be impossible to generalise the unique results.

The audit approach can generate more detailed information on the causes and patterns of non-compliance compared with top-down methods, which then helps politicians to decide upon preventive tax policies and tax administrations in order to apply more precise methods to detect the unwanted behaviour. The change in compliance is supported by the risk of being audited. Therefore, it is possible that the additional costs of tax administration will be covered but the compliance costs of businesses remain.

Risk-based audits

Focusing audits on companies considered to have a high compliance risk is less costly but more prone to selection problems than random audits. Risk-based audits are often part of the normal routines of tax administration and therefore tax gap data can be collected with a small amount of effort. Statistical methods can be used to reduce the selection bias, but if the number of audited firms is small, representativeness remains uncertain. Moreover, when the population is small, as is often the case in the analysis of single industries, leaving out some of the major companies may distort the results, as in the case of random audits.

The benefits of risk-based audits are similar to those of random audits in terms of receiving comprehensive information on the different elements of non-compliance. On the other hand, the additional information generated by calculating tax gaps may not be large.

The comparison of companies using matching

Propensity scoring matching aims to find similar firms with different possibilities to avoid taxes. An example is the comparison of otherwise identical domestic and multinational firms. If the taxable profit shown differs, there is a reason to suspect profit shifting. The reliability of the outcome depends on the ability to find good matches. Differences in market conditions and other operating environments may generate systematic differences in productivity and profitability, which suggests that differences in profits should not be interpreted as stemming from profit shifting only.

Other econometric estimations used to quantify profit shifting

The elasticity of tax revenues to tax rates can also be estimated from firm-level data. Increased availability of affiliate-level microdata has improved the possibility to analyse the different dimensions of international profit shifting, but some of the often-used databases are compiled of non-random samples, which restricts the interpretation of the results (Bradbury et al., 2018).

5.3 The RA-GAP methodology[27]

The report of the IMF (Ueda 2018) provides stepwise guidance for using the RA-GAP methodology for estimating the CIT gap. The overall idea is first to generate alternative FAP from the GOS of the companies by adjusting income and expenditure, and considering the valuation of existing assets. The next stage is to generate the net aggregate TB for the current year from FAP by adding revenues that are taxable but not in financial statements and subtracting the expenses that are not taxable but are used in financial statements. It is a net TB since it also includes the losses from the current year (current-year net tax base [C-NTB]). To find the TB for profit making companies (current-year tax base [C-TB]), the losses from the current year are added to C-NTB. Finally, the TB for the calculation of the tax gap is generated by subtracting the carried-over losses from previous years.

5.3.1 Basic choices

Before starting the adjustments for income and expenditures, some basic choices must be made. The first is to define which sectors are to be included in the analysis. One obvious criterion is that the entities must generate income subject to CIT. For example, in Finland the main CIT payers are limited companies, which in national accounts are classified as being included in the corporate sector.

The second choice relates to the treatment of the financial industry. Calculation of the value added of the financial corporations in national accounts is largely technical and corresponds poorly to data from financial statements. Therefore, a practical solution is to focus on the CIT gap analysis of the companies that are classified in national accounts as non-financial corporations, excluding housing corporations (S111). If three-digit data is not available, the relevant aggregate is non-financial corporations (S11).

The third choice relates to whether to focus the analysis on the aggregate corporate sector or on single industries. Industry-specific analysis provides more detailed information on the potential sources of non-compliance, but it easily runs into data problems. The main difficulty in the industry analysis is the difference in the criteria for companies to be classified into an industry. National accounts first divide the company into business establishments and decide on the relevant industry for each of them. Financial statements statistics, as well as tax authorities, classify each company into a single industry by its primary activity (legal units). The difference between the outcomes may be large if the companies typically have many kinds of products produced in different establishments. On the other hand, the more specialised the companies are, the less the classification differs.

Another related data problem is that national statistical offices do not publish the secondary income accounts that show how the income transfers between sectors by industry. A similar disaggregation problem applies to property income and expenditure. Both are used in the RA-GAP method to create a counterpart to profits shown in the financial statements from the GOS of national accounts. Since the disaggregated data is not available, the corresponding information must be picked out from financial statements or tax data if available, which weakens the independence of the gap evaluation.

A third potential data problem is that the value added of the shadow economy is estimated to be at the level of the national economy and only allocated to single industries as a part of output or value added. Even if the allocations are correct, there is not enough information to identify the amount of income that should be subject to the CIT.

The slow process of creating national accounts data and the frequent revisions weaken the possibility to follow the most recent trends of tax gaps. For example, the GOS, which is the starting point in the CIT gap analysis, was in the latest revision on average 4.7% higher than the first estimate in the non-financial corporate sector during 2012–2018.

5.3.2 The comparison of national accounts and financial statements

The first set of adjustments in the RA-GAP method starts from the GOS of the national accounts, which is amended by adjustments in income and expenditures to generate an alternative estimate for the profits shown in financial statements. Table 5.2 compares the concepts used in national accounts and financial statements.

The primary income account of national accounts divides the primary incomes into the part that is based on participation in production (operating surplus and the compensation of employees) and property income. The secondary income account shows current transfers between the sectors. The fourth relevant element of national accounts for the purpose of calculating CIT gap is the capital account.

Output at basic prices includes change in the inventories of finished goods and work in progress, production of goods that are retained for the producer's own use, and other regular income that is directly related to production, such as rents on fixed capital. It does not include capital gains related to the sale of fixed assets. The concepts used in the two statistical sources are not fully compatible, even after adding the above-mentioned items into the net turnover. For example, investment subsidies are included in the capital accounts in the national accounts, but in the financial statements they are part of other operating income. Another example is non-life insurance claims that fall under current transfers in national accounts, but in financial statements they fall under operating income.

Table 5.2 The approximate correspondence of concepts in national accounts and financial statements

National accounts	Financial statements
	Net sales
	– VAT and other indirect taxes
Output at basic prices	= net turnover
	+ change in inventory of finished products and work in progress
	+ production for personal use
	+ other operating income, excluding transfers gains from fixed assets
– intermediate consumption at purchase price	– materials, services, and other operating expenses
= gross value added at basic prices	= value added at factor cost
– wages and salaries	– wages and salaries
– employers' social contributions	– social security expenses
= GOS	= operating profit before depreciation (EBITDA*)
– consumption of fixed capital	– depreciation, amortisation and reduction in value
= operating surplus, net	= operating profit/loss (EBIT)
+ property income	+ financial income
– property expenditure	– financial expenses and paid dividends
+ current transfers, receipts	
– current transfers, payments	– current taxes
= disposable income	= profit/loss before appropriations and extraordinary items, but after paid dividends and current taxes

* EBITDA = Earnings before interest, taxes, depreciation and amortisation.

Source: Statistics Finland.

The goods and services that are purchased to be used as intermediate inputs in production are called *intermediate consumption* in national accounts. The elements of this concept differ somewhat from the operating expenses of financial statements. For example, purchases of goods and services for R&D and software are *investments* in national accounts but *expenses* in financial statements (R&D for internal use is included in the item *production of goods that are retained for the producer's own use*).

5.3.3 The calculation of financial accounting profit from GOS

GOS describes the surplus of the company from its basic domestic activities. Several of the adjustments listed in Table 5.3 must be made in order to get the potential FAP.

The first adjustment involves adding property income and subtracting expenditure. The tax gap calculation uses the concepts and numbers provided by national accounts with some exceptions. Capital gains and losses in national accounts statistics include unrealised changes in value and must be replaced by other data. Three income items that are included in national accounts but not in the calculation of potential FAP are the distributed income of corporations, reinvested earnings on foreign direct investments and investment income attributed to insurance policy holders.

National accounts divide interest income and expenditure into two parts. The interest rate used in the calculation of property income and expenditure in national accounts is the reference interest rate, not the actual rate. The differences to actual interest incomes and expenditures are called *financial intermediation services indirectly measured* (FISIM) and comprise part of intermediate consumption of the non-financial companies. The calculation of potential FAP uses FISIM-adjusted interest income and expenditure.

The second major adjustment to GOS is to add the received current transfers and to subtract the paid current transfers. Similarly, received capital transfers (for example, investment grants) must be added and paid capital transfers must be subtracted from the GOS. Inventory valuation gains/losses from national accounts is the next item to be added to GOS.

Depreciation is in national accounts is called *the consumption of fixed capital*. It is calculated in a way that does not correspond to the decisions of the firm or accounting practices. Therefore, it is necessary to replace it with the numbers provided by financial statements statistics when the potential FAP is estimated.

Finally, the profits of foreign branches should be added to the TB. GOS only comprises resident companies, but

Table 5.3 The adjustments to GOS required in order to calculate the potential FAP

Items to be added to GOS	Items to be subtracted from GOS
Received interest, excluding FISIM*	Paid interest, excluding FISIM
Received dividends and withdrawals of income from quasi-corporations	
Other received investment income	Other paid investment income
Received rents from natural resources	Rents paid for natural resources
Received current transfers	Paid current transfers
Received capital transfers	Paid capital transfers
Inventory valuation adjustment	
	Depreciation
Capital gains	Capital losses
The profits of foreign branches	
Other adjustments	Other adjustments

* Financial intermediation services indirectly measured.

Source: Ueda (2018).

in accounting, foreign branches are considered as the same entities as their parent companies.

5.3.4 From accounting profit to taxable income

The calculation of the CIT gap with the RA-GAP method continues with adjustments that transform the FAP into potential taxable profit. Before going into detail, it is useful to note the difference in the principles of calculating the two types of profit. Taxable income is calculated using cash-basis accounting and profits shown in the financial statements are calculated using the accrual method. This means that, in accounting, companies report revenues when they are earned and expenses when they are incurred. The cash-basis method only considers revenues that are received and expenses that are paid during the accounting period.

Table 5.4 illustrates the differences in the calculation and thereby the needed adjustments to get current-year net tax base (C-NTB). As explained earlier, the aggregate industry C-NTB is a net CIT base since it is the sum of the profits and losses of the companies.

The next step is to add current-year losses to the tax base provided by the aggregate industry data. The outcome is called the *potential current-year tax base* (C-TB). Correspondingly, losses carried over from previous periods are deducted in order to get the potential tax base (TB). The last challenge is to fit the reporting periods of the calculated potential TB and the actual tax declarations. National accounts are based on yearly data collected from calendar years, but this is not necessarily the case for the financial accounting and tax declarations of the companies.

The potential CIT liability can be calculated by multiplying the generated potential TB by the CIT rate. The RA-GAP method uses two measures for compliance: the CIT base gap, which is the difference between potential and declared C-TB, and the CIT gap, which is calculated as the difference between the potential and declared CIT liability. The CIT gap is often expressed as a ratio with respect to C-TB or as a percentage of GDP. In the case of industry analysis, GDP ratios are not very informative.

5.4 The calculation of the CIT gap in digital industries in Finland

This section describes an attempt to characterise the CIT gap in the digital industries in Finland. It starts from the definition of the sector that is analysed. Unfortunately, national accounts data only allows us to study the tax gap of the ICT sector, and even then, the industry-specific data on the property income, secondary income accounts and capital accounts are missing. As an additional data source, we use company- and industry-level data from financial statements statistics. Part of the missing data is only available in tax declarations, and we had no access to this data.

Table 5.4 Adjustments needed in the potential FAP to get the C-NTB

Items to be added to GOS	Items to be subtracted from GOS
+ income that is taxable but not included in the accounting profit	For example: share of the income of controlled foreign corporations
– income that is not taxable but included in the accounting profit	For example: dividends, profits from foreign branches that have PE abroad
– costs that are deductible in taxation but are not expenses in the calculation of accounting profit; in addition, tax allowances	For example: bad debt expenses and negative differences between accounting depreciation and tax depreciation
+ costs that are not deductible in taxation (or are deductible with limits) but are deducted when calculating accounting profit	For example: paid taxes, merger losses, share of entertainment expenses and interest expenses

Source: Ueda (2018).

Digital activities have specific features that affect the size and variation of profits, the taxable share of income and possibilities for CIT avoidance and evasion. Global markets and extremely low marginal costs of production imply that successful products can create huge profits. The businesses can also be very risky and large losses may be made several years before new products start to yield net income (the 'ubiquity first, revenue later' business model). This implies that the paid CIT has large variance. Even though some companies never become profitable, the investments made in human capital can create PIT and indirect tax revenues.

High R&D intensity aims to reach and sustain monopoly power. The inputs are often human capital and other intangible capital, including intellectual property. Investment costs in R&D are mainly labour costs but also the equipment used can often be deducted immediately and fully in taxation. Inputs in R&D and marketing often involve data that is received from customers free of charge or exchanged for low-marginal-cost services.

The largely used intangible inputs are easy to locate in low-tax countries and it is difficult to evaluate whether the prices that are used in transactions between the parent company and the affiliates are market prices (following the arm's length principle). Corporate income created in a jurisdiction may also avoid CIT because the firms need not have a physical presence to sell digital products and collect user data.

5.4.1 The targeted industries and the OECD definition of the ICT sector

The Etla method of measuring the size of the digital economy comprises three parts: value added by the ICT sector (as defined by the OECD), the digital-based value added of goods and services produced in non-ICT sectors and the value added of online sales. In this chapter we focus on the ICT sector simply because there is no data available on the size of the CIT base generated by digital activities outside the ICT sector and the corresponding taxes actually paid.

The OECD defines that the ICT sector includes the ISIC codes 261–264, 268, 465, 582, 61, 62, 631 and 951. Public national accounts and financial statements data are, however, only available at two-digit level. Therefore, it is necessary to assess how informative it would be to use the two-digit industry data to describe the ICT industry. In Table 5.6, the turnovers of three-digit level ICT industries in 2017 are compared to the turnovers of the corresponding higher-level two-digit industries.

Table 5.5 should be read as follows. ICT-industry 631 (data processing, hosting and related activities; web portals) had a total turnover of EUR 2056 million in 2017. The corresponding two-digit industry 63 (information service activities) had a turnover of EUR 2189 million in 2017. Using the two-digit industry data in the analysis means that 6% of the turnover is generated by non-digital companies in this industry.

Table 5.5 The ICT industry at three-digit level compared to the corresponding two-digit industries, 2017

	Turnover of the 3-digit ICT industries, mill. EUR	Turnover of the 2-digit industry, mill. EUR	Share of the ICT industry
Industries 261–264 and 268 compared to 26	11,665	13,720	0.85
Industry 465 compared to 46	5,631	64,525	0.09
Industry 582 compared to 58	541	2,587	0.21
Industry 61	4,212	4,212	1
Industry 62	9,908	9,908	1
Industry 631 compared to 63	2,056	2,189	0.94
Industry 951 compared to 95	183	365	0.50
Total	**34,196**	**97,506**	**0.35**

Source: Statistics Finland and the authors' calculations.

If the total numbers of the two-digit industries (with a corresponding turnover of EUR 97,506 million) were used in the tax gap analysis, the share of the non-ICT companies' turnover included would be 65%, which is obviously too large. Therefore, the most reasonable way to proceed is to focus on those two-digit industries where the ICT companies dominate. For example, if only industries 26, 61, 62 and 63 were analysed, the analysis would still capture 81% of the ICT turnover and decrease the turnover of non-ICT companies included in the analysis to 7%, as shown in Table 5.6.

5.4.2 CIT efficiency in the ICT sector

As a first step of assessing CIT compliance, CIT efficiency is analysed in the ICT sector (the two-digit industries listed in Table 5.6). CIT efficiency is measured by dividing the actual revenue by the reference CIT revenue, which is calculated by multiplying the reference TB with the CIT rate. We follow the practice of the IMF by using GOS as the reference TB (Keen et al., 2014). GOS is a broad measure for the actual TB since it does not consider deductions, such as depreciation and interest expenditure. Therefore, the ratio is likely to be below one. For analyses of single industries, it is also useful to remember that the definitions of industries are different in national accounts (the source for GOS) compared to tax declarations (the source for paid CIT).

Table 5.7 shows that, on average, the CIT efficiency is rather low. This may reflect a low capacity to tax the revenues, the importance of the omitted deductions, such as depreciation, or both. On the other hand, GOS does not include some of the income items that would expand the TB, such as taxable domestic and foreign property income.

Another observation is that CIT efficiency varies strongly between the years. This illustrates both the variation in the yearly profitability, and the problematic nature of the ratio measure when dealing with numbers that are negative or close to zero. The yearly variation in CIT efficiency is even larger when single industries are studied.

Table 5.6 ICT-intensive two-digit industries, 2017

	Turnover of the 3-digit ICT industries, mill. EUR	Turnover of the 2-digit industry, mill. EUR	Share of the ICT industry
Industries 261–264 and 268 compared to 26	11,665	13,720	0.85
Industry 61	4,212	4,212	1
Industry 62	9,908	9,908	1
Industry 631 compared to 63	2,056	2,189	0.94
Total	**27,841**	**30,029**	**0.93**

Source: Statistics Finland and the authors' calculations.

Table 5.7 CIT efficiency in the ICT sector

	2012	2013	2014	2015	2016	2017	2018
Income taxes, mill. EUR	900	550	-523	525	366	666	736
GOS, mill. EUR	3,206	4,775	5,424	4,970	5,304	6,287	5,376
CIT rate, %	24	24	20	20	20	20	20
Reference tax revenue, mill. EUR	785	1,170	1,085	994	1,061	1,257	1,075
CIT efficiency	1.15	0.47	-0.48	0.53	0.34	0.53	0.68

Source: The authors' calculations, based on data by Statistics Finland.

5.4.3 The calculation of the CIT gap

The following calculation describes in detail how far it is possible to proceed in the CIT gap evaluation of the ICT industry with the RA-GAP method. We follow the list of actions described in Section 5.2.

In Finland, financial accounting and corporate income taxation are closely connected. Financial accounting includes the information that is needed for defining taxable income. Some of the deductions are only accepted in taxation if they are noted as expenses in financial accounting. The same applies to some of the income items. If an income item is not taxable, the corresponding expenditure is not deductible. Examples of such items are write-ups and write-downs, merger profits and losses, and capital gains and losses from the disposal of shares of fixed assets. CIT declarations must include information on the differences between financial accounting profit and taxable profit.

CIT liability

The studied corporate sector includes many types of corporations, quasi-corporations and notional resident units. As a base rule, limited companies and cooperative societies are liable to CIT. The profits are fully taxable as the income of the owner-shareholder in the case of self-employed professional individuals, self-employed business entrepreneurs, or general or limited partnerships.

Financial accounting statistics include a table that describes the enterprises by industry and legal form. The share of limited companies and cooperative societies which are liable to CIT has been at least 98.8% when measured with turnover, at least 97.2% when measured with the number of personnel and at least 98.1% when measured with total wages during the period 2013–2018. Therefore, the possible bias in the tax gap results due to having companies not liable to CIT in the data is small.

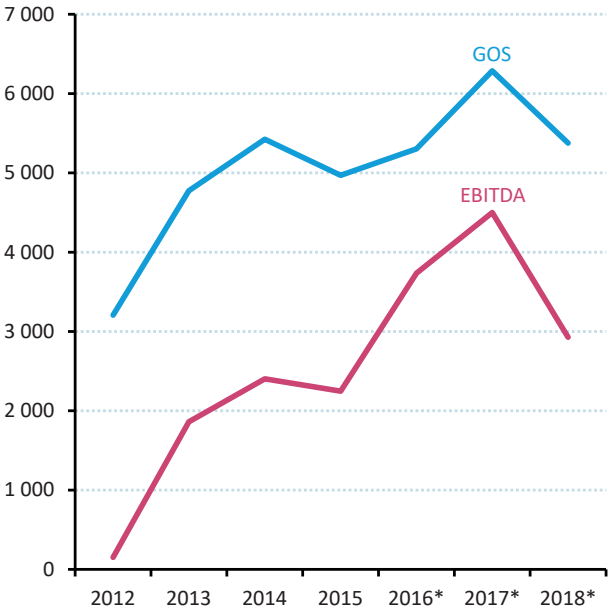
The definition of industries

As noted earlier, national accounts first divide the company into business establishments and decide the relevant industry for each of them. Financial statements statistics, as well as tax authorities, classify each company into a single industry by its primary activity. As the RA-GAP method uses information from all the three sources, it is important to know how much the differences in definitions influence the actual numbers when single industries are studied. The information needed to correct the difference is possessed by Statistics Finland but was not available for this study.

The size of the possible problem is illustrated in Table 5.8 by comparing key figures from the two sources. The ratio of the numbers from the different statistics illustrates the discrepancy. The compensation paid to employees picked from national accounts fits well with the wages and salaries found in the financial accounting statistics. The range in the ratio is not large (0.97–1.04) for the years 2012–2018 and it varies unsystematically. This suggests that the difference in the classification of the ICT industries is not very important from the point of view of this study.

The gap between GOS and earnings before interest, taxes, depreciation and amortisation (EBITDA) has been declining in the ICT sector (see Figure 5.1), but it is still substantial, which suggests that there are major differences in the ways in which outputs and intermediate inputs are calculated in the two statistics. In addition to

Figure 5.1 GOS and EBITDA in the ICT industry (mill. EUR)



Sources: The authors' calculations, based on data by Statistics Finland.

Table 5.8 A comparison of the data from two statistical sources for ICT industries (mill. EUR) for 2016–2018

	2016	2017	2018
1. Output at basic prices	22,513	24,571	25,131
2. Net turnover + other operating income	29,765	31,936	31,756
The ratio of 1 to 2	**0.76**	**0.77**	**0.79**
3. Intermediate consumption at purchase price	11,139	12,202	13,333
4. Operating expenses (excluding compensation of employees)	20,069	21,232	22,509
The ratio of 3 to 4	**0.55**	**0.57**	**0.59**
5. Compensation of employees	6,184	6,189	6,538
6. Wages and salaries	5,961	6,205	6,319
The ratio of 5 to 6	**1.04**	**1.00**	**1.03**
7. GOS	5,304	6,287	5,376
8. Operating margin (EBITDA*)	3,735	4,500	2,927
The ratio of 7 to 8	**1.42**	**1.40**	**1.84**

* EBITDA = Earnings before interest, taxes, depreciation and amortisation.

Source: Statistics Finland and the authors' calculations.

differences in the industry definition, the items that influence the gap are expenses that are not considered in the calculation of GOS, such as acquired R&D, paid and received income transfers and foreign income. An additional specific item is imputed salary adjustment, which describes the annual unpaid work input performed by the entrepreneur, but the adjustment was EUR 76 million in 2017 and therefore contributes little to the difference between GOS and EBITDA in the ICT sector.

National accounts only cover the value added that is produced in the home country of the company. Transition from GOS to FAP requires that the profits of foreign branches are added to GOS.

Companies claim for the removal of double taxation in tax declarations. This information separates different types of income and shows the taxes paid abroad. It is in practice the only source of information that can be used to evaluate the foreign source business profits. The problem is that tax data is not independent, which restricts the scope of CIT gap analysis.

Income transfers

Current transfers are reported in the secondary income accounts of national accounts and are therefore not included in GOS. As the secondary income accounts are not published at the level of single industries, either additional data from Statistics Finland and/or approximations must be used. Financial accounting statistics are not detailed enough to separate the needed items.

To illustrate the importance of paid and received income transfers, Table 5.10 shows the main items in the total non-financial sector. The most important items are non-life insurance premiums and compensations. The amounts are understandably not far from each other in the long term. Non-life insurance premiums are *expenses* in the financial statements, but in national accounts the part of gross premiums corresponding to the insurance service (the value added of the insurance sector) is included under *intermediate consumption*. Net premiums paid are included in the current transfers (ESA, 2010).

Table 5.9 Received and paid income transfers for the non-corporate sector (mill. EUR) for 2017–2018

Received	2017	2018	Paid	2017	2018
Non-life insurance compensations	883	892	Non-life insurance premiums	704	824
Other miscellaneous current transfers from social security funds	244	249			
Other miscellaneous current transfers from the EU	12	12			
			Other current transfers to Finland	162	90
Total	**1,139**	**1,153**		**866**	**914**

Source: The authors' calculations, based on data by Statistics Finland.

Compared to the total GOS of the non-financial sector, which was more than EUR 55 billion in 2018, the net income transfers are not very large and are not likely to include elements of a tax gap. Therefore, it is unlikely that the problem of having no industry-level information on the income transfers would generate a substantial bias in the calculation of the CIT gap in ICT industries.

Property income

The RA-GAP method advises using national accounts data for property income except in the case of capital gains. Capital gains and losses must be estimated using financial statements data or tax declarations since the data in national accounts include unrealised gains and losses. The property income items that are not included are paid dividends, reinvested earnings on foreign direct investments and investment income that is attributed to insurance policy holders.

In the tax gap analysis of industries, national accounts data is not, however, available. Therefore, financial accounting data (or tax data) must be used. Structural business and financial statement statistics provide the aggregate of financial income and expenses, as well as interest income and expenses. In these statistics, financial income includes foreign-sourced income, but it is not known how largely it is liable to taxation. Tax declaration data would resolve this problem.

National accounts divide interest income and expenditure into two parts. The first part is the adjusted interest income and expenditure that are calculated using a reference interest rate. The outcome is called *FISIM-adjusted interest income and expenditure*. The second part consists of the difference between the actual and FISIM-adjusted interest flows. This gain that the financial institutions receive from interest-bearing assets and debts is considered as intermediate consumption for the enterprise sector.

Table 5.10 Property income and expenditure adjusted to estimated FISIM in the ICT sector (mill. EUR) for 2016–2018

	2016	2017	2018		2016	2017	2018		2016	2017	2018
Financial income	970	4,939	2,364	Financial expenses	1,471	1,564	2,611	Net	-501	3,376	-247
Interest income	216	2,397	417	Interest expenses	337	559	421	Net	-121	1,838	-4

Source: The authors' calculations, based on data by Statistics Finland.

The problem of using property income data from financial statements is the amount of FISIM that is not available at the industry level. One possible method is to use national accounts data to estimate the ratio of FISIM-adjusted interest flow with respect to the actual flow in the aggregate non-financial corporate sector and use that ratio to adjust the financial statements data in the ICT sector. For example, in 2017, the FISIM-corrected interest income was 102.4% of the actual income in the non-financial corporate sector. The corresponding FISIM-corrected interest expenditure was 81.2% of the actual expenditure. These percentages have been used to adjust all the numbers in Table 5.10 for the year 2017.

The difference between the received and paid interest income, as well as between received and paid total financial income, is in general rather small, but there is large variation in some years, as in 2017. The second observation is that financial incomes are large compared to the GOS, which measures the return on actual businesses.

Inventory valuation adjustment

The inventory valuation adjustment is obtained as the difference between the changes in inventories calculated using book values and those calculated at current prices. No industry-specific data is available from public sources, but holding gains or losses are likely to be small because of low overall inflation, the transition to just-on-time logistics and job order manufacturing.

Capital transfers

Capital transfers paid by companies are rare. Received capital transfers consist mainly of investments grants, which are rather small for the total enterprise sector in Finland (accounting for 0.3% of GOS in 2018). Another marked item is other capital transfers, for example, transfers of the ownership of fixed assets, which have large yearly variation. As the capital accounts by industry are not available, an approximation of the received amount must be used, if considered necessary.

The depreciation of capital

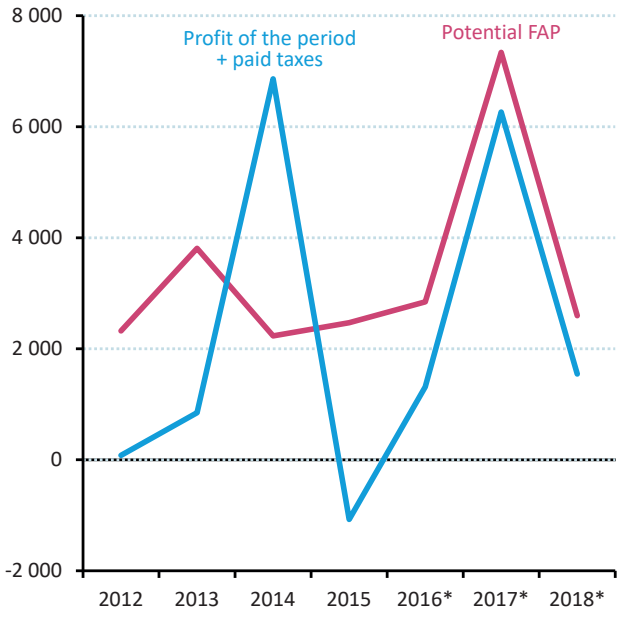
The RA-GAP method suggests that the consumption of fixed capital in national accounts, which describes the depreciation of capital valued at its historical acquisition cost, should be replaced by depreciation data from financial statements, which values the decline at repurchase value. Structural business and financial statement statistics use the concepts of depreciation, amortisation and the impairment of tangible and intangible assets, wherein depreciation is linked to tangible assets and amortisation to intangible assets. Both describe the value changes that follow the depreciation plan. Impairment write-downs illustrate an expectedly permanent decline in the asset's market value. The aggregate found in financial statements was EUR 2323 million in the ICT sector in 2017.

The comparison of potential and actual financial accounting profits

Table 5.11 shows the elements available to be used in the estimation of the potential FAP and the outcome. The data illustrate the importance of the net property income for the result.

The estimated potential FAP is not very informative without any comparison point. In Figure 5.2, the estimated FAP is compared to the actual accounting profit of the period (adjusted with paid income taxes). There are two exceptional years in the accounting profit during this period. Otherwise, the estimated potential accounting profit is somewhat lower than the actual figure, and the dif-

Figure 5.2 Potential and actual tax adjusted FAP (mill. EUR)



Sources: The authors' calculations, based on data by Statistics Finland.

Table 5.11 From GOS to potential FAP in ICT industries (mill. EUR), 2016–2018

	2016	2017	2018
GOS	5,304	6,287	5,376
Add foreign source business income	..	..	..
Subtract paid and add received income transfers	..	..	..
Subtract paid and add received property income	-501	3,376	-247
Add received capital transfers	..	..	..
Add holding gains on inventories	..	..	..
Subtract depreciations	-1,960	-2,323	-2,534
The estimate of potential FAP	**2,843**	**7,340**	**2,595**

Source: The authors' calculations, based on data by Statistics Finland. Missing data is marked by '..' The net property income includes paid dividends that could not be separated from paid property income in the financial statement statistics.

ference has declined in recent years. This is in line with the data shown in Figure 5.1, where GOS is larger than EBITDA.

After receiving an estimate for potential accounting profits, several adjustments are needed to get an alternative estimate for taxable profits in ICT industries. First, non-taxable income must be removed, and taxable income that is not considered as income in financial statements must be added. Second, disallowed expenses must be added to taxable income and tax allowances must be considered as reducing the taxable income. Next, the current-year losses must be added and deductions for carried-over losses from previous years must be subtracted. Finally, the reporting period should be matched to the calendar years.

The evaluation of the amount of taxable foreign source income

When the potential current-year net profits that are subject to taxation (the C-NTB) are determined, it must be evaluated whether the foreign business income added for calculation of FAP is liable to domestic corporate income taxation. The main rule (the OECD model treaty) suggests that business income should be taxed in the country where it is generated if a PE exists there.

Another source of foreign income is property. The OECD model treaty defines income from immovable property as being taxed in the country where it is generated, but for dividends, interest and royalties, a resident taxation principle is recommended. However, bilateral tax treaties often allow the use of source tax. Normally the tax paid abroad is credited in domestic taxation.

The tax declarations of the companies can be used to estimate both the foreign business income and the property income that are liable to domestic taxation. As mentioned before, the tax declarations may involve non-compliance and therefore weaken their reliability when used for the tax gap estimate.

Omit received dividends

The dividends received from other companies (with some restrictions) are not liable to CIT in order to avoid double taxation. Analysis of the dividends received by different industries is complicated by the fact that both national accounts and the publicly available financial statements statistics do not provide the information. In the estimate of Table 5.13, the financial statements available for research purposes have been used.

Omit special tax allowances and add disallowed expenses to the TB

Special allowances reducing taxable income, such as accelerated depreciations, must be subtracted from taxable income. In Finland it is also possible not to follow the depreciation plan and carry over the difference of planned and actually deducted depreciations. The deductible portion of entertainment expenses is limited to 50% in Finland. Also, several other items, such as donations, have restrictions. These items are reported in tax declarations.

Add current year losses and subtract the deductions for carried-over losses

The potential profit liable to taxation should only be calculated from data on profit-making corporations. The C-NTB of an industry or total corporate sector is, however, a sum of the profits and losses of all the companies concerned. Therefore, the losses should be added to the C-NTB in order to get the C-TB. The next step to generate the potential TB for the calculation of the tax gap is to subtract the losses carried over from previous years from the C-TB.

The importance of this element is studied in the following by showing the profits and losses separately in the ICT industry. The source is financial statements statistics (non-public versions), which give a different view of the profits than tax declarations. This data is only available up to 2017. The concept used is *the profits of the period*. Figure 5.3 shows that using the sum of losses and profits as a proxy for the CIT base gives a distorted view. According to the financial statement statistics, there were high profits and large losses at the same time in the ICT firms, especially in 2015.

Check that the reporting periods match

The last challenge is to fit the reporting periods of the calculated potential TB and the actual tax declarations. National accounts are based on yearly data collected from calendar years, but this is not necessarily the case for financial statements and tax declarations. Therefore, the tax declaration data on taxable profits should be allocated to calendar years. Another option is to repeat the calculation annually and to compare the moving averages of the potential and declared TBs.

Potential taxable profits and the tax gap

Table 5.12 shows the items that the available data allows us to use to illustrate the tax gap. The missing information can be mainly be collected from tax declaration data. The data is shown both as thousands of euros and as the ratio of this to the value added of the industry. The value added comprises the sum of the labour costs and operating profit, and illustrates the revenue generated by the primary activities of the firm.

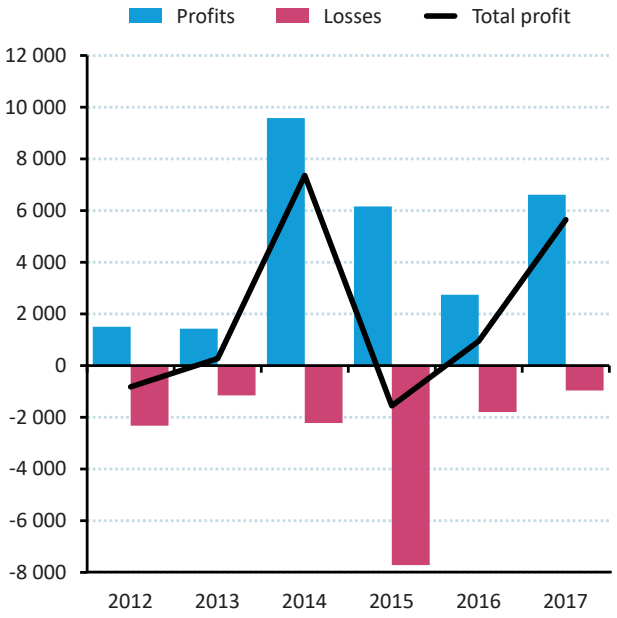
Figure 5.4 shows the trends in the estimated potential taxable profit and implicit taxable profit calculated using information on actual CIT collections presented in financial statements and the CIT rate. The estimated potential taxable profit is systematically much higher than the implicit TB. Because of the missing data, interpreting this as a sign of a large tax gap is speculative. The two indicators of TB are with different sign in 2014, when there was at the same time exceptionally large financial expenditure and high extraordinary income. In 2015, the accounting losses were large because of the continued exceptionally high financial expenditure.

Table 5.12 From potential FAP to potential taxable profits in ICT industries (mill. EUR), and the ratio of this to value added for the years 2016–2017

	2016		2017	
	Mill. EUR	The ratio to the value added	Mill. EUR	The ratio to the value added
Potential FAP	2,843	0.29	7,340	0.68
Remove non-taxable foreign source income	..	..	..	..
Subtract received dividends	120	0.01	254	0.02
Subtract special tax allowances and add disallowed expenses	..	..	..	..
Add current year losses (from accounting data)	1,220	0.12	446	0.04
Subtract the deductions for carried-over losses	..	..	..	..
Potential taxable profit (the TB)	3,943	0.4	7,532	0.7
Adjusted for the reporting periods	..	..	..	..

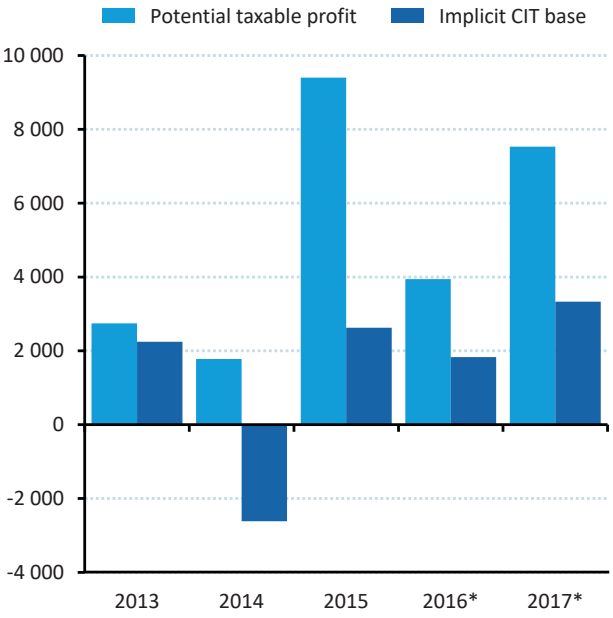
Source: The authors' calculations, based on data by Statistics Finland. Missing data is marked by '..'.

Figure 5.3 Accounting profits and losses in the ICT industry (mill. EUR)



Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.4 Potential taxable profit and the implicit TB in the ICT sector (mill. EUR)



Sources: The authors' calculations, based on data by Statistics Finland.

The RA-GAP method generates two measures for CIT compliance. The CIT base gap describes the difference between the potential C-TB and the declared TB. The CIT gap is the difference between potential CIT liability and the declared CIT liability. As the data for calculating the CIT gap in the ICT sector is poor, the numbers would be misleading and are not presented here.

5.5 The analysis of various ICT industries (Focus Area 4)

The CIT gap analysis presented in Section 5 studied the aggregate ICT sector. The aim of this focus area investigation is to support the CIT gap analysis by studying the key indicators of the ICT industries. The analysis illustrates first structural indicators that focus on the primary activities of the companies. Thereafter, the financial operations and connection between profitability and paid taxes is studied. The objective is to isolate the factors that generate the large variation in profits shown in financial statements and the potential FAP of the aggregate ICT sector.

The industries studied are as follows:

- The electronics industry, that is, the manufacture of computer, electronic and optical products (industry code 26)
- The telecommunications industry (industry code 61)
- The computer and information service activities industry (industry codes 62 and 63)

The analysis of single industries is performed using an identical set of indicators and figures. As the national accounts and financial statement statistics give a different picture, both are used to illustrate the trends in the primary activities. The terms used in the figures are explained in Table 5.13. National accounts aggregate industries 62 and 63. The aggregation is followed throughout the analysis. Comparable structural business and financial statement statistics are available for 2012–2018, except that data on extraordinary items is missing for 2017–2018.

Due to missing data, it was not possible to calculate tax gaps for the industries with the RA-GAP method. The

Table 5.13 The concepts and terms in national accounts and financial statement statistics

	National accounts	Structural business and financial statement statistics
Output	Output at basic prices	Operating revenue
Intermediate input	Intermediate consumption	Operating expenses + the costs of goods sold, excl. personnel costs
Value added	Value added, gross at basic prices	Value added
Labour costs	Compensation of employees	Personnel costs
Operating profit	GOS	Operating profit (EBITDA)

Table 5.14 CIT efficiency in ICT industries

	2012	2013	2014	2015	2016	2017	2018
The electronics industry (26)	5.56	0.29	-1.76	0.15	-0.18	0.36	0.97
The telecommunications industry (61)	0.31	0.6	0.42	0.48	0.43	0.44	0.48
The computer and information service activities industries (62 and 63)	0.42	0.63	0.76	1.11	1.09	0.91	0.54

Source: The authors' calculations, based on data by Statistics Finland.

only compliance indicator which the data allows is CIT efficiency. It is measured by dividing the actual revenue by a reference CIT revenue, which is calculated by multiplying GOS with the CIT rate. A summary of the tax efficiency indicators is provided in Table 5.14. It shows that the outcomes are far from the value 1, which indicates full compliance. The next pages describe the activities of the three industries, their profitability and the taxes paid one by one.

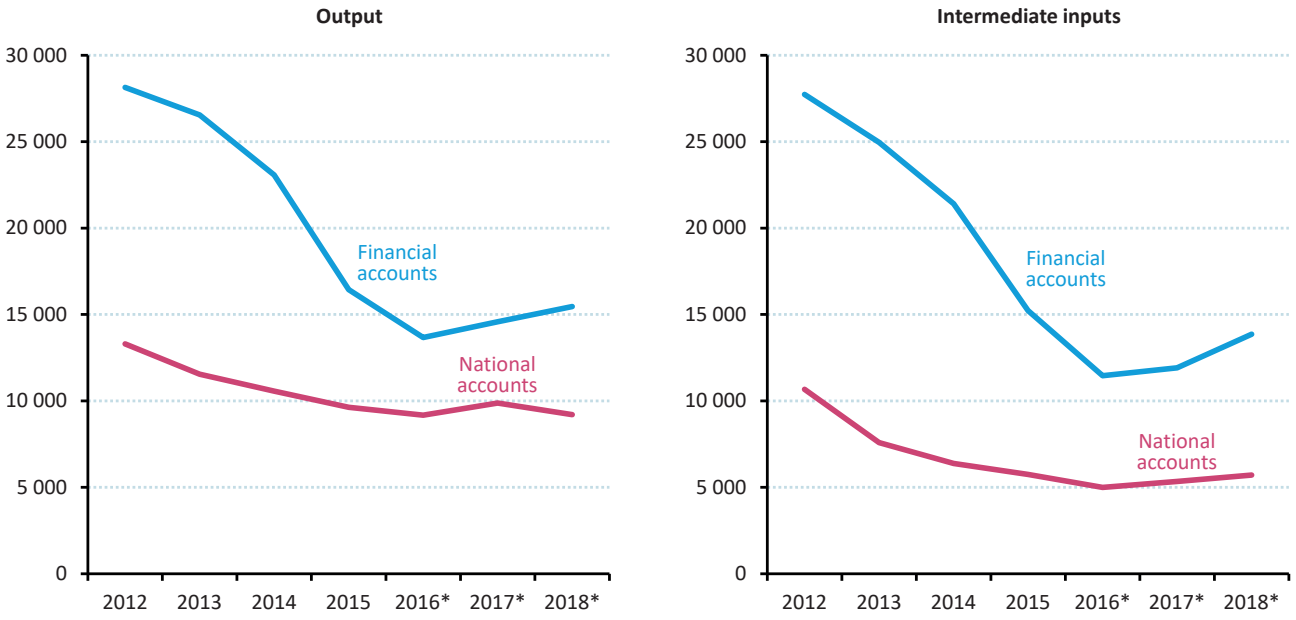
5.5.1 Indicators for the electronics industry (industry code 26)

The highly R&D intensive electronics industry encompasses the production of digital products and devices. After 2012, the output declined remarkably because Nokia – the flagship of the Finnish electronics industry – was struggling. In 2014, Nokia sold its mobile devices unit to Microsoft. Consequently, the demand for intermediate inputs fell until 2016. However, since then the value added and operating profit have increased.

National accounts and financial statements give somewhat different views of the primary activities. As national accounts measure production inside the national borders and as financial statements also measure some foreign activities, the scales of output and intermediate inputs are much larger in the latter's statistics. Labour costs are, however, of a similar size.

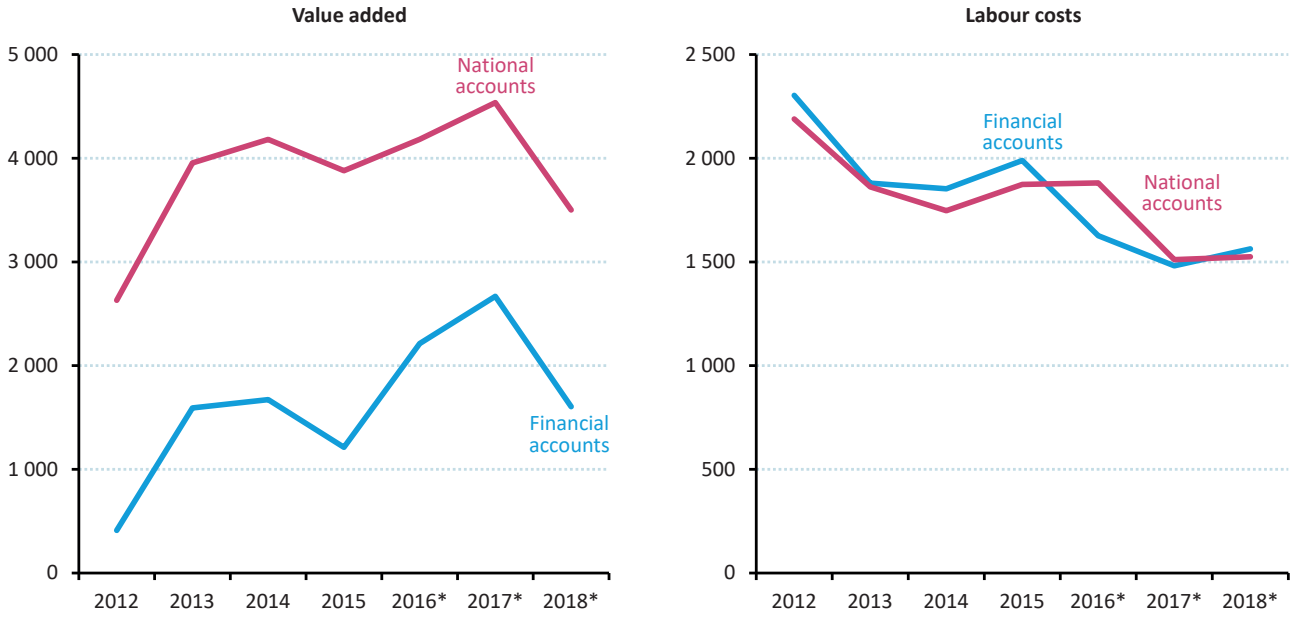
The third observation is that the created value added and the result of primary production (operating profit) are remarkably smaller in the financial accounting statistics. There are several potential explanations for this outcome. Foreign business income and expenditure are the main suspects, and the possible explanations are either the unprofitability of foreign activities or profit shifting. Also, the classification of industries differs, but this discrepancy is likely to be small, judging from the personnel costs that are of a similar size in the two statistics. Finally, there are discrepancies in the definitions of the income and expenditure classes in the two

Figure 5.5 Output and intermediate inputs in the electronics industry according to national accounts and financial accounts (mill. EUR)



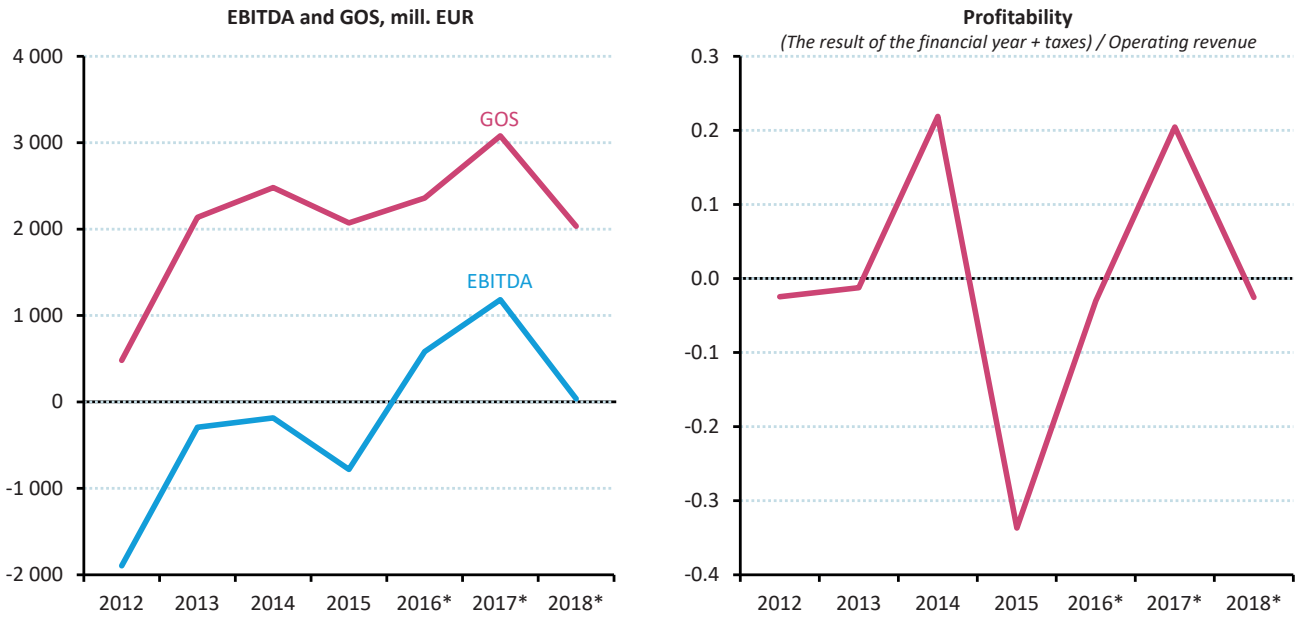
Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.6 Value added and labour costs in the electronics industry according to national accounts and financial accounts (mill. EUR)



Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.7 Indicators of the operating profits and profitability in the electronics industry



Sources: The authors' calculations, based on data by Statistics Finland.

statistical sources, which at least somewhat influence the outcome.

Figure 5.8 captures the contributions of financial income and expenditure and extraordinary items on the profits of the industry. The large variation in these variables explains the bumpy path of the accounting profits. The sale of the mobile devices unit by Nokia provided extraordinary income for 2014. At the same time, there were large financial operations that reduced the net financial income in both the years 2014 and 2015. The indebtedness of the industry has grown markedly.

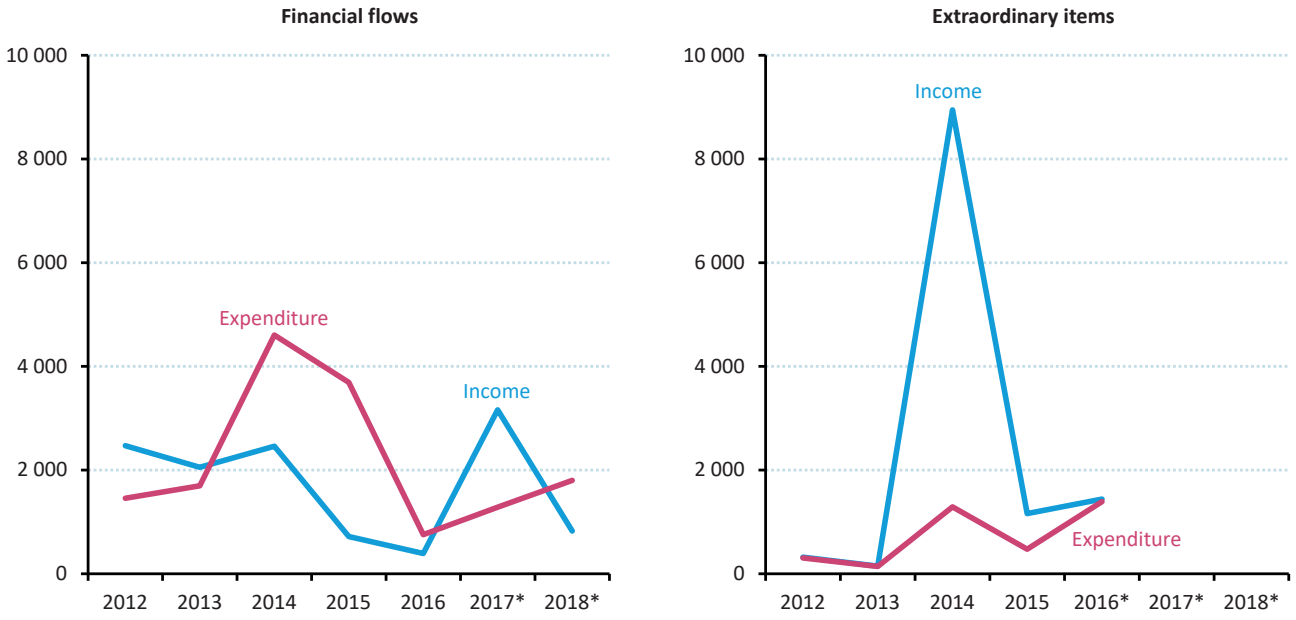
Figure 5.9 describes the relation of paid taxes to the results of the companies in the electronics industry. The paid taxes are divided both by operating profit (EBITDA) and the sum of the result of the financial year and taxes. The idea is to find out implicit tax rates, which should be close to the actual CIT rate divided by 100. Unfortunately, the period included several years of negative operating profits and results for financial years. Moreover, in some years either the incomes or tax revenues were close to zero, which makes the ratios uninformative. The CIT efficiency indicator partially suffers from the same problems. Here the value of the indicator should approach one 1 with full compliance.

The electronics industry has undergone a radical structural change during the studied period. The figures from primary activities show a steady trend of improving results, but the profitability is still low. The accrued losses from previous periods reduce the taxes paid in the future. The low values of the CIT efficiency indicator suggest that tax compliance is not very high. More detailed analysis of the CIT gap with the RA-GAP method is not possible due to missing data, but it is unlikely that the framework would be flexible enough to capture the extraordinary variation in income and expenditure, even with complete data. A more informative approach to studying tax compliance would be to analyse single dominating companies in this industry.

5.5.2 Indicators for the telecommunications industry (industry code 61)

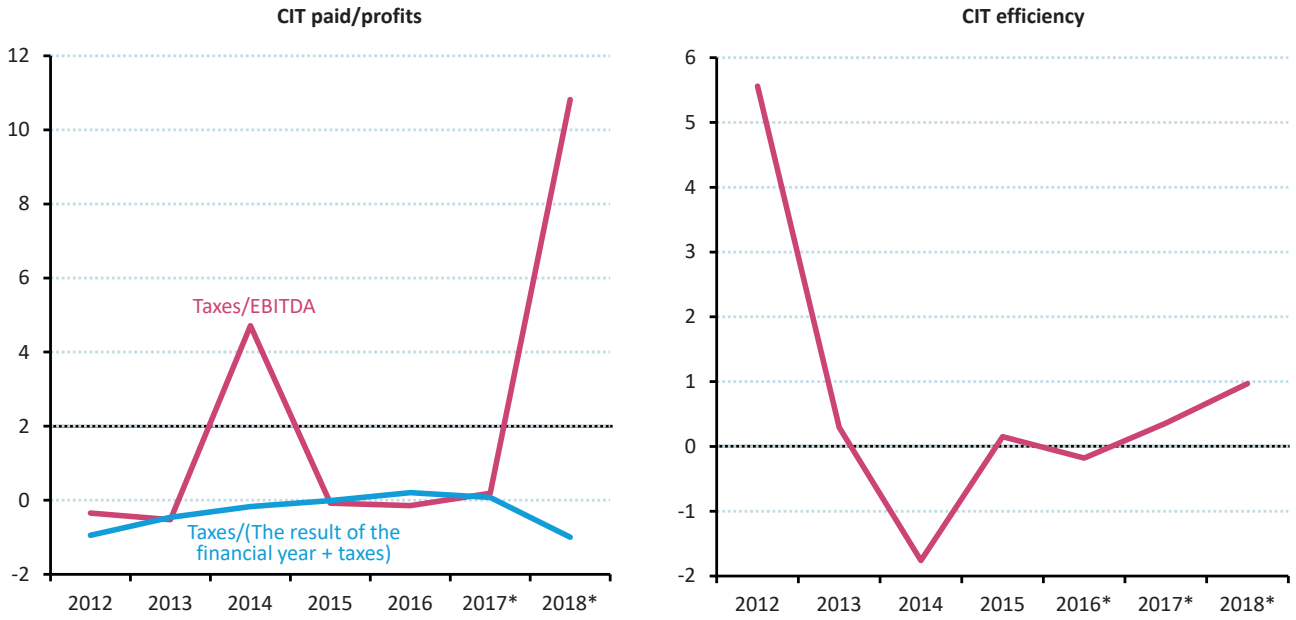
The telecommunications industry comprises wired, wireless and other telecommunications activities. In Finland, the industry is highly concentrated and includes three major companies (Telia Finland, Elisa and DNA).

Figure 5.8 Financial income and expenditure, and extraordinary items in the electronics industry (mill. EUR)



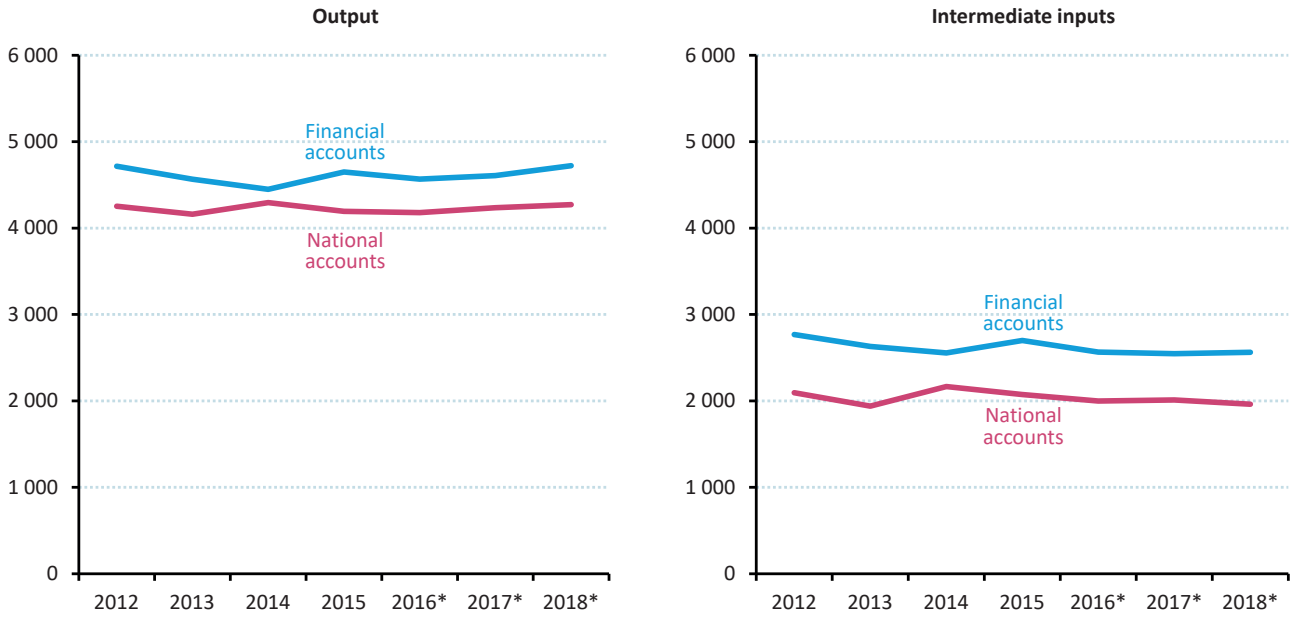
Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.9 CIT paid/profits and CIT efficiency in the electronics industry



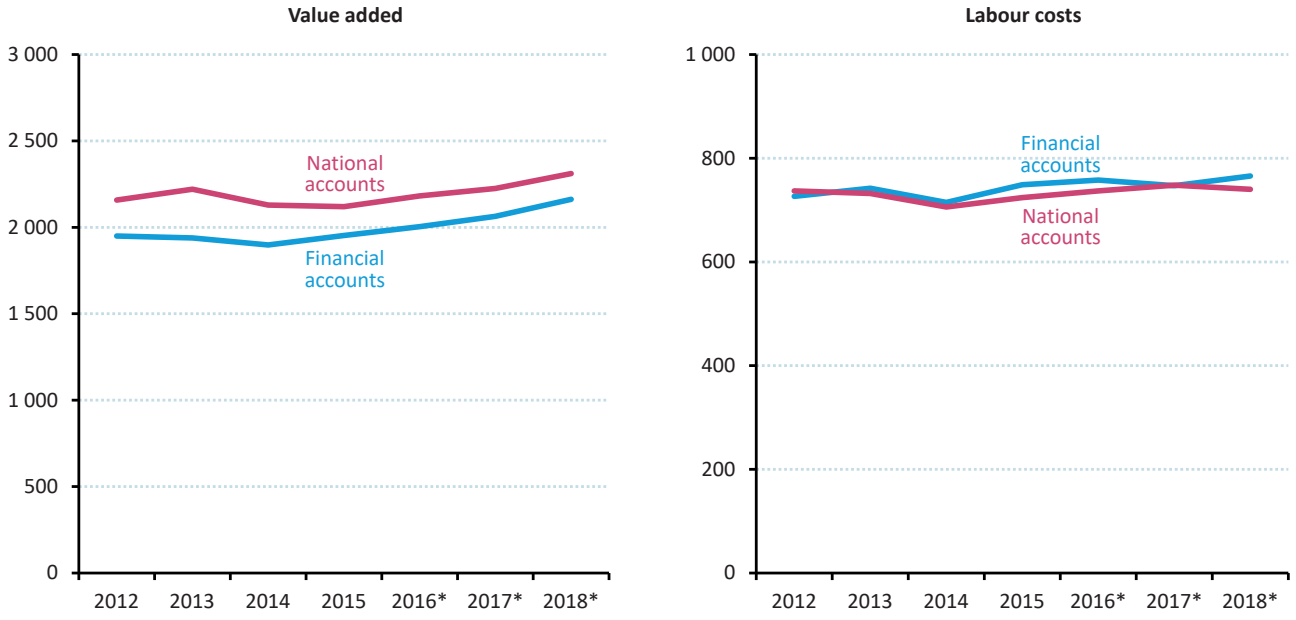
Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.10 Output and intermediate inputs in the telecommunications industry according to national accounts and financial accounts (mill. EUR)



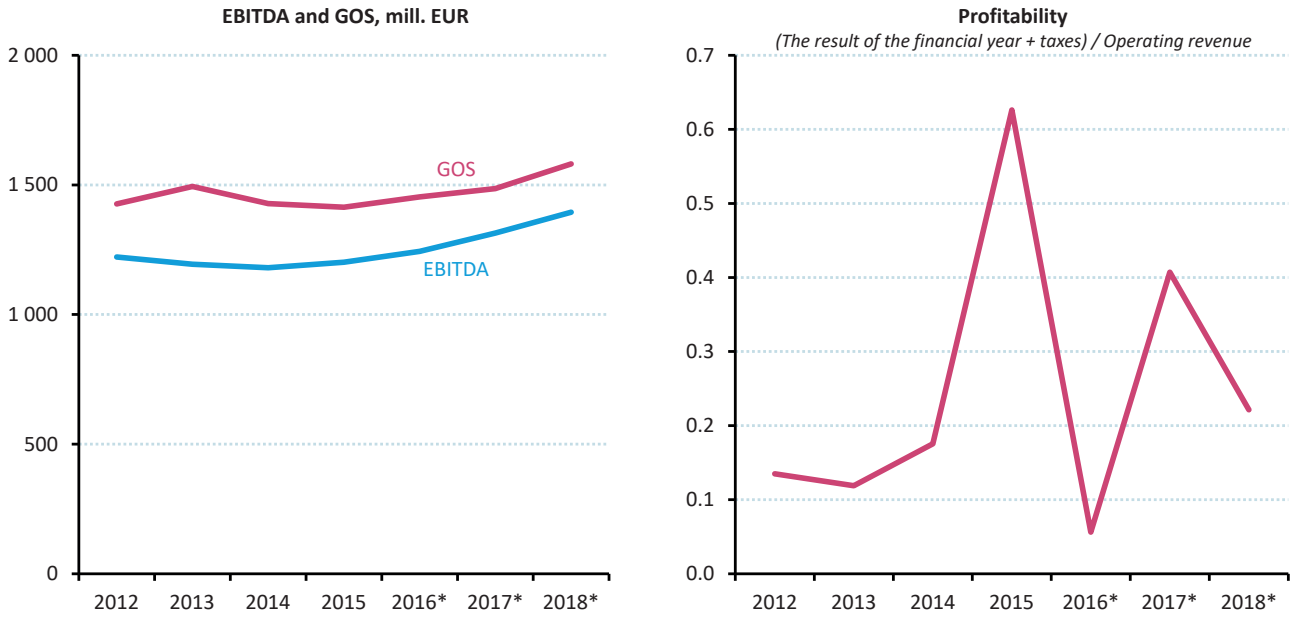
Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.11 Value added and labour costs in the telecommunications industry according to national accounts and financial accounts (mill. EUR)



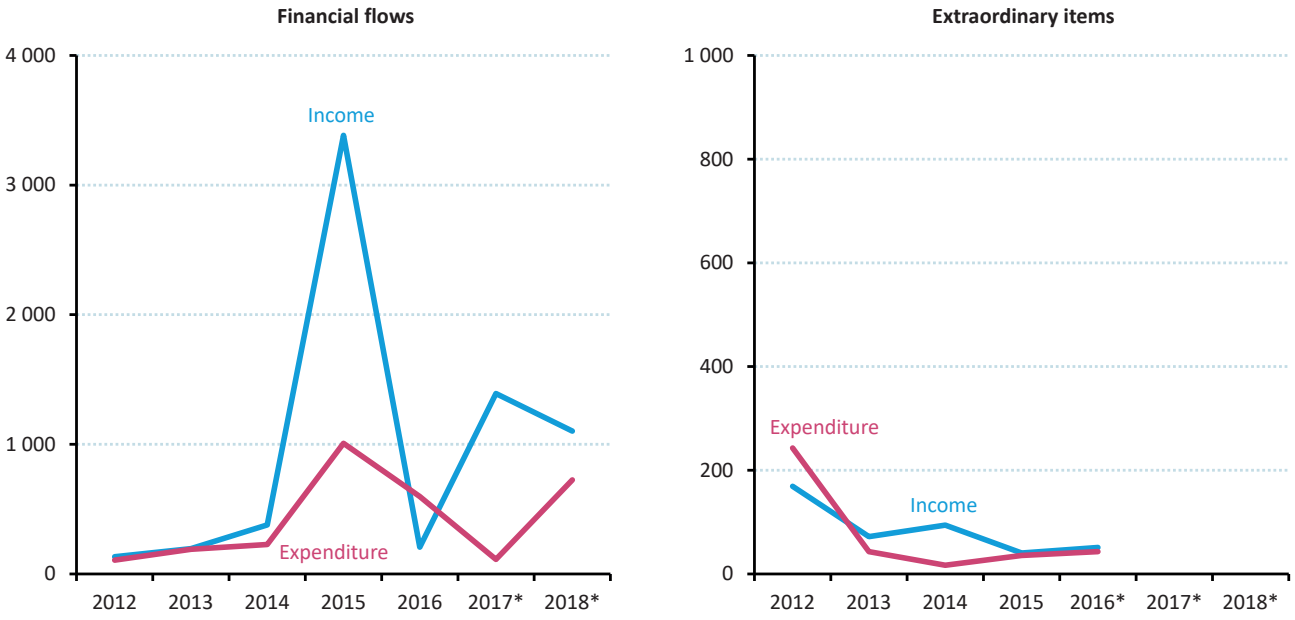
Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.12 Indicators of the operating profits and profitability in the telecommunications industry



Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.13 Financial income and expenditure and extraordinary items in the telecommunications industry (mill. EUR)



Sources: The authors' calculations, based on data by Statistics Finland.

During 2012–2018, the indicators of primary activities show a flat trend. The data from the two statistical sources provide a unanimous overview. The financial statements data again shows a higher activity level, but a lower value added and operating profits. The difference is, however, markedly smaller than in the electronics industry. The operating profits are high compared to sales, which is typical for the industry.

There was a large increase in received dividend for the year 2015. Accounting profits increased strongly but not the paid CIT. This is because dividends received by companies are not taxable income. The variation caused by the difference in the accounting and taxation rules is shown in Figure 5.14, which describes the implicit tax rate calculated using total profits. Taxes/EBITDA and CIT efficiency, which measure the tax revenues related to the return on primary activities, show rather steady development; however, the level is lower than would be expected if CIT compliance were full.

5.5.3 Indicators for computer and information service activities (industry codes 62+63)

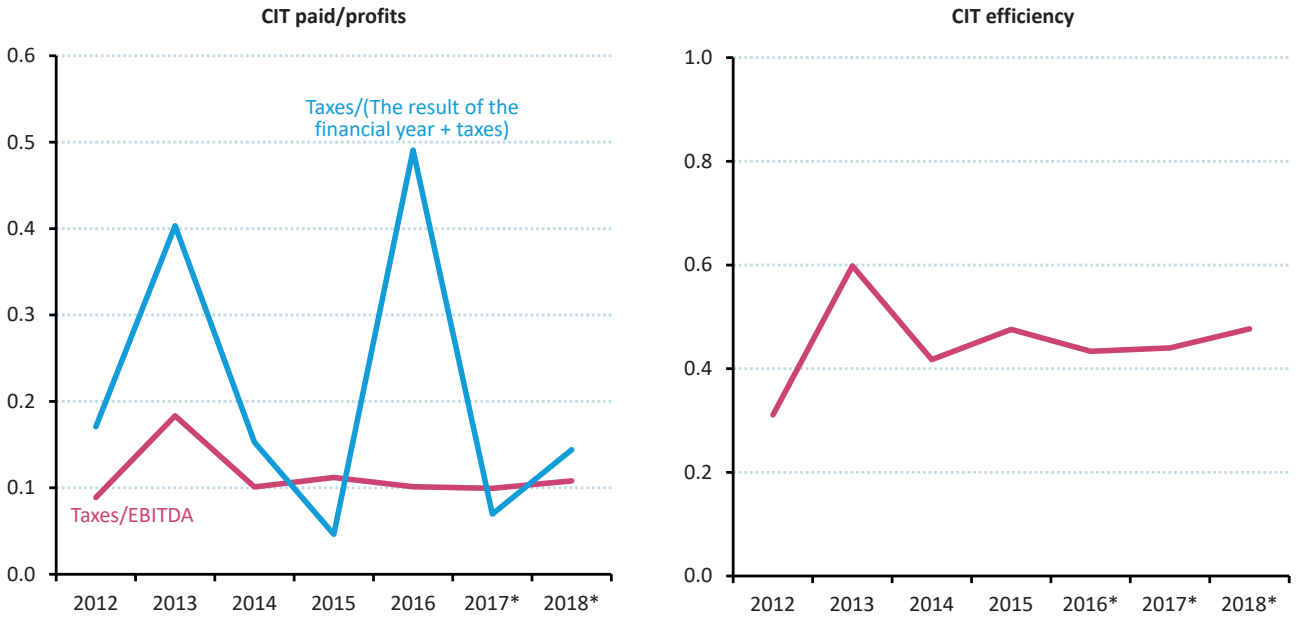
The industry discussed in this subsection is an aggregation of the computer programming, consultancy and related activities industry (industry code 62) and the information service activities industry (industry code 63). It is a growing industry with an average level of profitability. Financial statements show higher primary activities than national accounts, but value added and operating profits are of a similar size.

The large financial one-off expenditure in industry 63 brought down the profitability (measured by the result of the financial year plus taxes, divided by operating revenue) in information services in 2012. In information services, the profitability is also lower, on average, than in programming services. Otherwise, the trends are rather stable. Net financial income supports profitability.

The ratio of paid taxes to accounting profits is close to the CIT rate, which was 24.5% during 2012–2013 and declined thereafter to 20%. Also, CIT efficiency shows high tax compliance when measured with the ratio of actually paid taxes to potential tax revenues, calculated by multiplying GOS by the actual CIT rate.

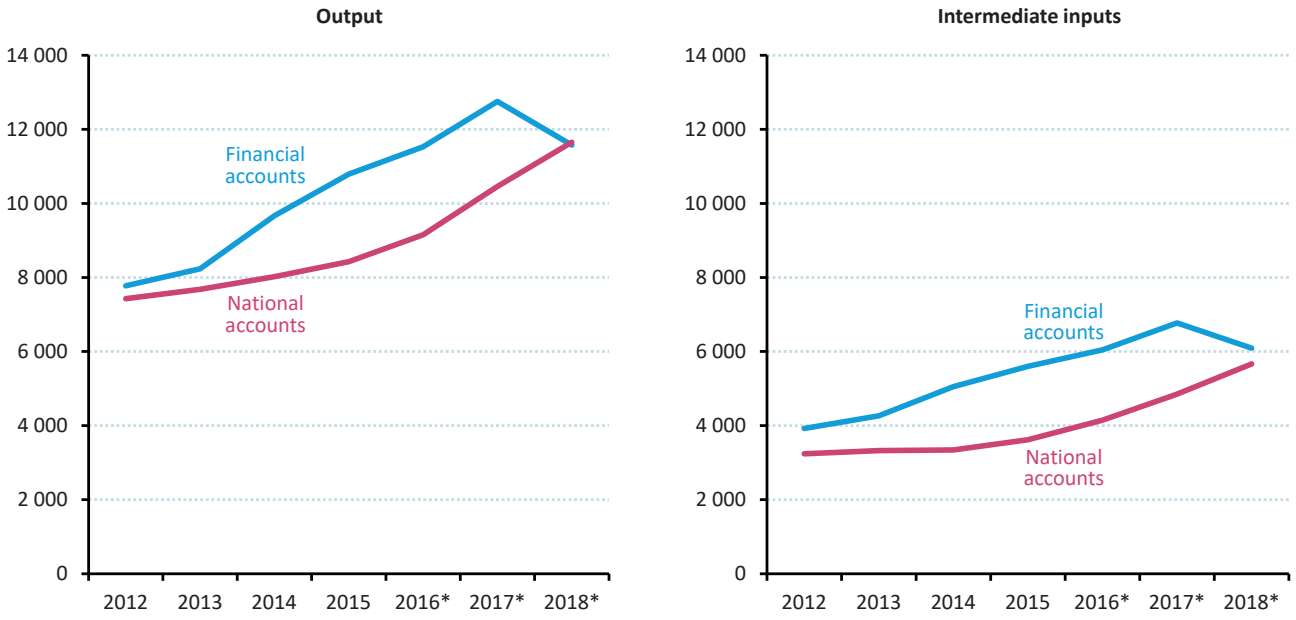
In conclusion, the one-off items in financial income and expenditure, and extraordinary income explain well the variation in the accounting profits. The rough compliance

Figure 5.14 CIT paid/profits and CIT efficiency in the telecommunications industry



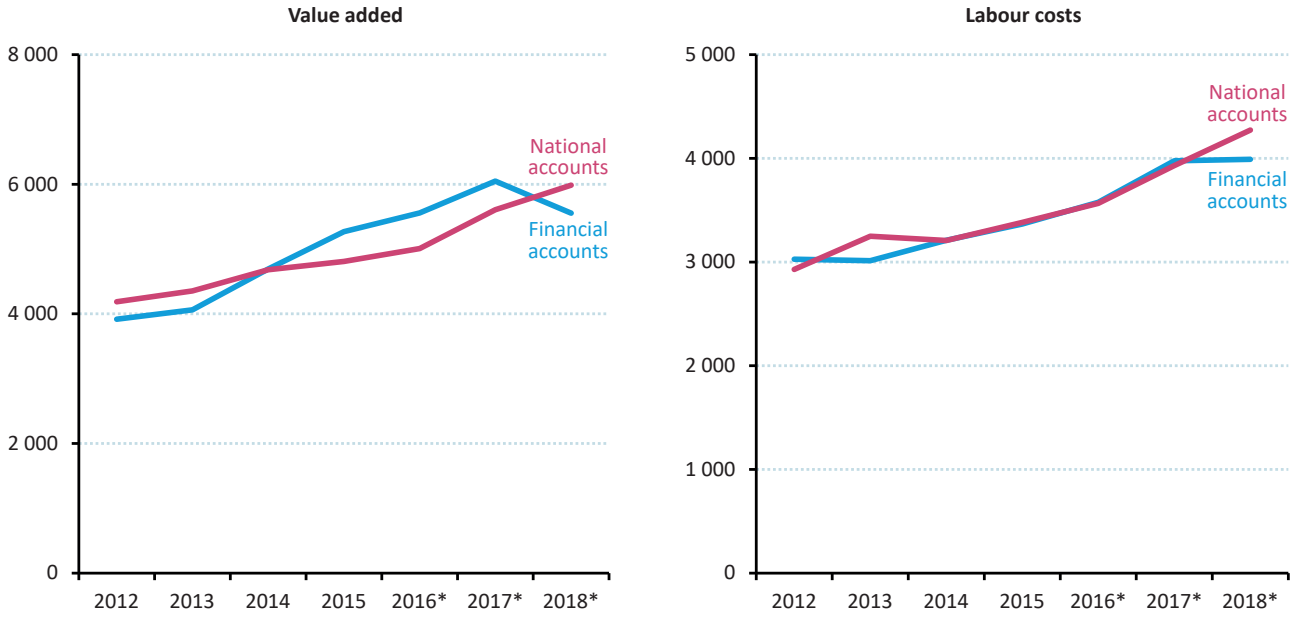
Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.15 **Output and intermediate inputs in the computer and information services industry according to national accounts and financial accounts (mill. EUR)**



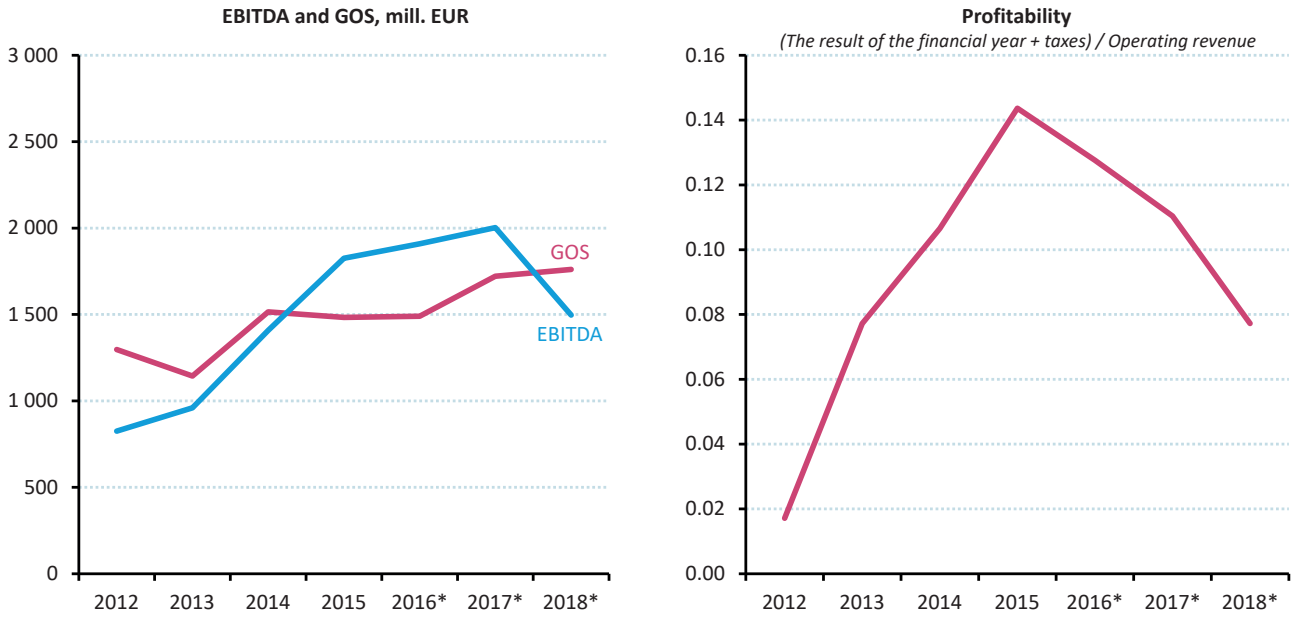
Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.16 **Value added and labour costs in the computer and information services industry according to national accounts and financial accounts (mill. EUR)**



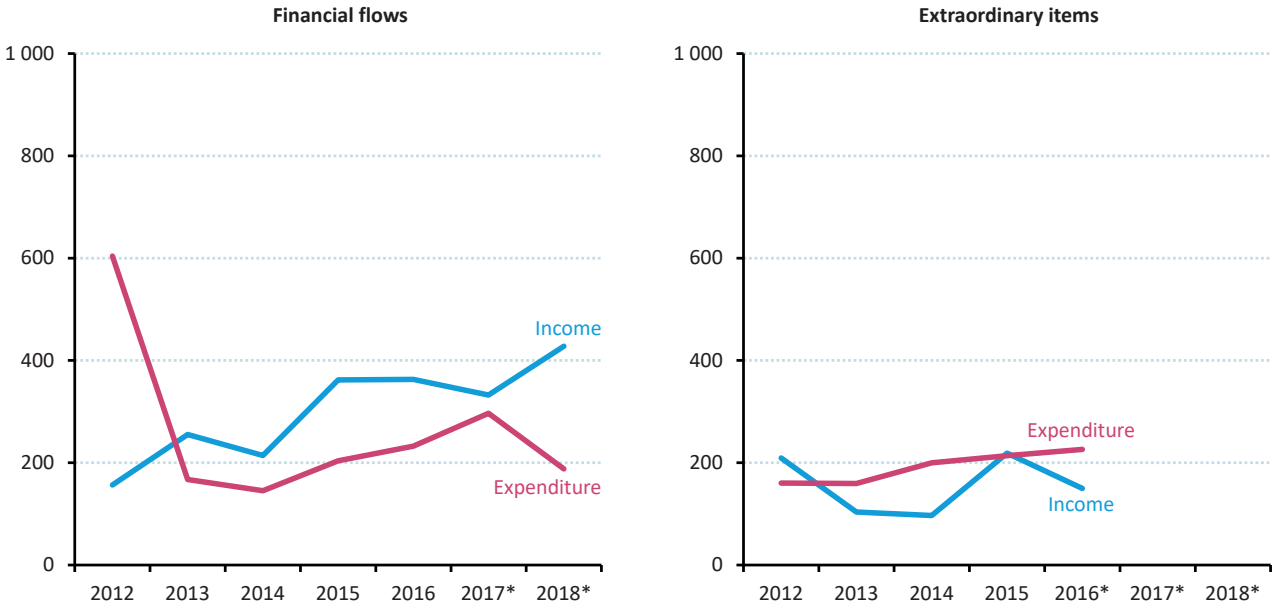
Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.17 Indicators of the operating profits and profitability in the computer and information services industry



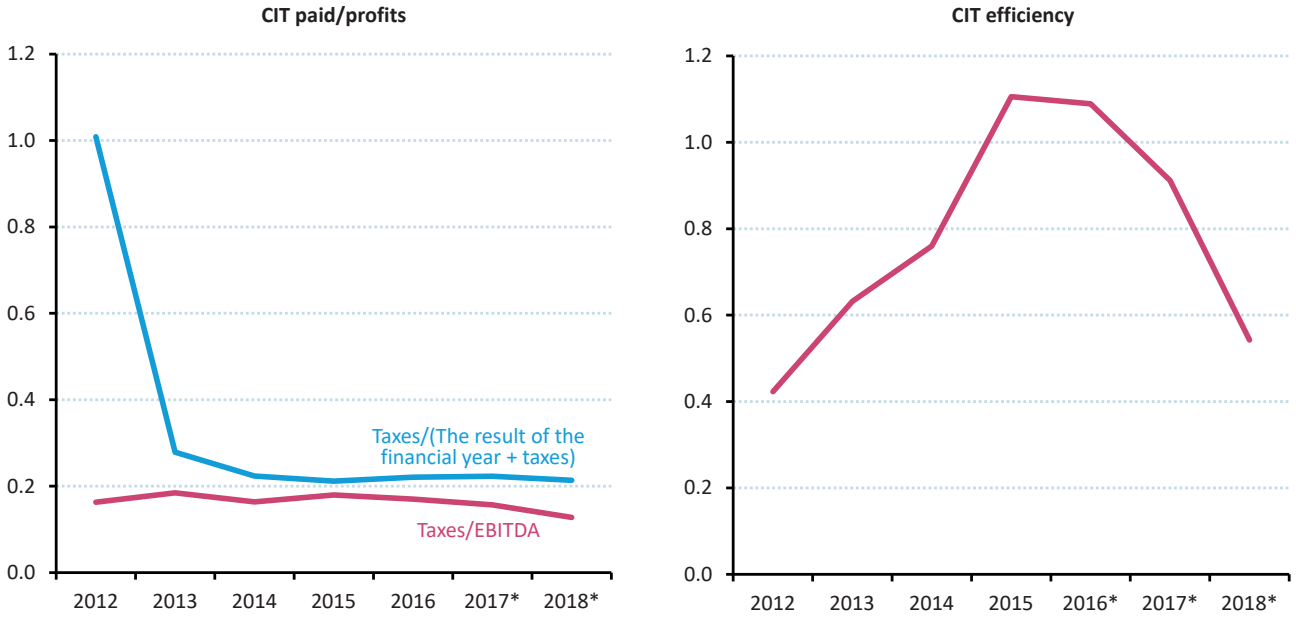
Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.18 Financial income and expenditure, and extraordinary items in the computer and information services industry (mill. EUR)



Sources: The authors' calculations, based on data by Statistics Finland.

Figure 5.19 CIT paid/profits and CIT efficiency in the computer and information services industry



Sources: The authors' calculations, based on data by Statistics Finland.

indicators show that the ratio of the taxes paid to the results of primary activities is low in industries 26 and 61 and high in the aggregate industry of industries 62 and 63. Low profits are likely to be related to foreign activities, especially in the electronics industry, since the result of domestic primary activities, measured by GOS, is markedly higher than EBITDA, which also encompasses foreign income. The losses from previous years lower the taxable profits in the future.

5.6 Discussion

The idea of estimating the CIT gap using alternative statistical data for the TB and interpreting the difference to measure the compliance gap has several weaknesses which affect the usefulness of the results. The main problem is access to sufficiently detailed data, which determines the reliability of the tax gap estimate. Publicly available data is not detailed enough. A related problem is the required independence of the alternative data. Tax declaration data is largely used to generate both national accounts and financial accounting statistics, and the supplementing data comes mainly from surveys targeted to companies. Third party information is missing.

The next major issue is that the difference between the declared TB and the potential TB is interpreted to stem fully from tax compliance, even though there are differences in concepts and measurement errors. The corporate sector serves as a residual sector in the national accounts. It is also difficult to assess how reliable the estimate is without any comparable information. For example, comparison to tax audit data may be prone to selection problems and comparison to results from other countries may be prone to different accounting rules and different risks of audits that influence tax compliance.

The causes of tax gaps can be classified into information problems, mistakes, insolvency, tax planning, tax avoidance, tax evasion and fraud. The tax gap calculated using the RA-GAP method does not include CIT revenue lost because of tax planning and tax avoidance since it calculates the potential TB using the current CIT rate and rules of taxation. Therefore, the method basically captures non-compliance due to non-deliberate actions and tax evasion. However, insofar as evasion influences the national accounts data, it may remain undetected. There is a reason to suspect that this is a problem since the alternative data is mainly based on information provided by the enterprises.

The analysis of the CIT gap of digital companies – or in the case of this study, ICT companies – with the RAGAP method turned out to run to additional severe data problems. National accounts do not provide sector-specific data on property income, secondary income accounts or capital accounts. Moreover, the way companies are classified into various industries differs between national accounts and taxation. The same problems will be met by any effort to make an industry-specific analysis of the CIT gap with the RA-GAP method.

It turned out that in some industries of the ICT sector there is large variation in profitability, property income and expenditure dominate the results in some years and there is a permanent difference between the implicit taxable profits and the potential profits calculated using data from national accounts and financial statements. Many items that are normally included in the RA-GAP calculation were not, however, available, which means that quantitative assessment of the size of the tax gap and its trends are not feasible.

6 The assessment of the value added tax gap of digital products

The VAT compliance related to digital products was studied by simulating the potential VAT revenues with the RA-GAP model of the FTA and comparing the outcome to the actual revenues. Data on the accrued VAT revenues from the most recent years was not available, but the observations from the earlier years did not reveal tax gaps. The common trends in the potential VAT generated by the model and the value added of the digital products indicate that the method suits well the VAT gap assessments of the digital products regardless of the data problems that limit the preciseness of the yearly tax gap estimates.

6.1 Motivation

6.1.1 The VAT of digital products

In the EU, there are specific VAT rules for electronic services and platforms. Finland, as a member of the EU, is obliged to apply these rules based on VAT Directive 2006/112/EC, and Finland has therefore implemented the articles of the VAT Directive in its National VAT Act (1501/1993). The definitions of electronic services are further specified in the implementing regulation.[28] As the implementing regulation is directly applicable in all Member States of the EU, it is applicable in Finland.

The implementing regulation defines 'electronically supplied services' in Article 7. These services include services which are delivered over the internet or electronic network, the nature of which renders their supply to essentially be automated, to involve minimal human intervention, and which are impossible to ensure in the absence of IT. The implementing regulation gives a list of services that are regarded to be electronically supplied services. These services include, inter alia:

a. the supply of digitised products generally, including software and changes to or upgrades of software;
b. services providing or supporting a business or personal presence on an electronic network, such as a website or a webpage;
c. services automatically generated from a computer via the internet or electronic network, in response to specific data input by the recipient;
d. the transfer for consideration of the right to put goods or services up for sale on an Internet site operating as an online market on which potential buyers make their bids by an automated procedure and on which the parties are notified of a sale by electronic mail automatically generated from a computer;
e. Internet Service Packages (ISP) of information in which the telecommunications component forms an ancillary and subordinate part (i.e. packages going beyond mere Internet access and including other elements, such as content pages giving access to news, weather or travel reports; playgrounds; website hosting; access to online debates etc.); and
f. the services listed in Annex I of the implementing regulation.[29]

The implementing regulation also defines some supplies, which are not regarded as electronically supplied services. These supplies are:

a. radio and television broadcasting services;
b. telecommunications services;
c. goods, where the order and processing are done electronically;
d. CD-ROMs, floppy disks and similar tangible media;
e. printed matter, such as books, newsletters, newspapers or journals;
f. CDs and audio cassettes;
g. video cassettes and DVDs;
h. games on a CD-ROM;
i. services of professionals such as lawyers and financial consultants, who advise clients by email;
j. teaching services, where the course content is delivered by a teacher over the internet or electronic network (namely, via a remote link);
k. the offline physical repair services of computer equipment;
l. offline data warehousing services;
m. advertising services, as in newspapers, on posters and on television;
n. telephone helpdesk services;
o. teaching services purely involving correspondence courses, such as postal courses;

p. conventional auctioneers' services reliant on direct human intervention, irrespective of how bids are made;
q. tickets to cultural, artistic, sporting, scientific, educational, entertainment or similar events booked online; and
r. accommodation, car-hire, restaurant services, passenger transport or similar services booked online.

Finally, it should be noted that electronic services are not regarded as either telecommunication or broadcasting services (as defined in Articles 6a and 6b of the implementing regulation).

Member States are obliged to implement the VAT e-commerce package (2017/2454; 2017/2455; and 2459/2017) in their domestic VAT legislation by the 1st of July 2021.[30] Article 14a of the VAT directive regulates the facilitation of a taxable person with an electronic interface, such as a marketplace, platform, portal or similar marketplace. The article regulates the place of the supply of goods within the community by a taxable person not established within the community to a non-taxable person. The taxable person who facilitates the supply shall be deemed to have received and supplied those goods herself of himself. This new regulation sets new obligations for digital market operators. However, it does not directly define the digital economy in terms of VAT.

6.1.2 Digitalisation and its impact on the VAT gap

In terms of digital services, VAT as a tax on consumption is paid in the country of the purchaser (i.e. in the country to which the service is supplied and in which it is 'consumed'). In cross-border B2B supplies, as the purchaser – while reporting the VAT of the supply based on reverse charge – has the right to deduct the same amount of VAT when making the purchase for the VAT taxable use, the purchaser has no interest in not reporting the VAT. The interest in not reporting the VAT might only occur in limited situations where the purchaser is making the purchase for an exempt economic activity for which no right of deduction exists. Exemption being the exception in the European VAT system, these situations are limited to some sectors, such as the financial, insurance and healthcare sectors. At the same time, these sectors are not those that have been regarded as being most sensitive to fraudulent behaviour.

In business-to-consumer supplies, the risk of not reporting the VAT is bigger as these situations require the supplier to report the supplies made to the consumers in other EU Member States. This might happen even if the reporting has been made easy for the suppliers via a one-stop-shop scheme, where the reporting may be made to all Member States via the electronic platform of the domestic tax authority.

When the supply takes place domestically, the supplier is obliged to report the VAT of the supply in all cases to the exchequer in the country of her or his fixed establishment. In this case, not reporting the VAT is under the surveillance of the tax authorities in the country where the supplier has the fixed establishment from which the supply is made.

The digital economy and digital services have been of specific interest to the EU legislator since the twenty-first century. The VAT gap varies between nearly 0 to 36% from one Member State to another. The VAT gap has been decreasing in all but three countries – namely Greece, Latvia and Germany – from 2016 to 2017.[31] Even if the VAT gap has not been regarded as being especially connected to digital services, these services have been seen as a group of services that deserve special attention in terms of legislation and the exchange of information between the Member States. The EU legislator has put effort into making the obligations of reporting to the operators as easy as possible in terms of administrative burden so that the reporting system does not push operators to not obey the rules. The so-called VAT e-commerce package was finally completed in February 2020 when the Commission Implementing Regulation 2020/194 was adopted by the Member States.

The idea of an e-commerce package was to simplify VAT obligations for companies carrying out cross-border sales of goods or services (mainly online) to final consumers and to ensure that VAT on such supplies is correctly paid to the Member State of the customer, in line with the principle of taxation in the Member State of destination. The EU legislative process has taken place in several stages. The first measures already entered into force in 2003 by the implementation of the directive 2002/38/EC as in that directive third country operators were obliged to register and pay VAT on their supplies of electronic services to private customers in the EU area. This mea-

sure was broadened in 2015 to cover telecommunications, broadcasting and electronic services. In December 2017 new rules for distance sales of goods, as well as for any type of service supplied to final customers in the EU, were adopted by the European Council. The latter measures (i.e. the VAT e-commerce package) was planned to set to apply from the 1st January 2021. However, the European Commission gave a proposal on the 8th of May 2020 to postpone the adoption by six months (i.e. till the 1st July 2021) because of the practical difficulties created by COVID-19.[32]

6.2 Methods for estimating the VAT compliance gap

The motivations for estimating VAT gaps are similar to those in the case of the CIT gap: the public sector needs information on the loss of tax revenues, the gap causes an additional burden for compliant taxpayers and competition is distorted due to non-compliance. There is also interaction between the objectives and methods for estimating the tax gaps. The more information is needed on the reasons why tax gaps exist, how taxes are avoided and which types of companies are involved, the more likely it is that a tax audit is the proper method. On the other hand, the less resources exist to be used for assessing the gap and the more important it is to have a comprehensive view of the size of the gap, the more likely it is that the correct choice is to use a top-down method that utilises national accounts. These methods support each other: top-down methods can reveal the industries where the tax gaps are largest and where audits would be most fruitful.

As the name suggests, the basic idea of *value added tax* is to tax the value added generated in the production process. It is levied on all the transactions of the participants in the production chain and distribution to consumers. The cumulation of the tax in the value chain is avoided by allowing the producer to deduct the tax paid on intermediate inputs from the tax paid on the sales. Therefore, the final incidence is generally considered to be on the producers of tax-exempt products and consumers.[33]

The main methods of estimating the VAT tax gap are listed by Hutton (2017) as follows:

1. **The top-down approach.** This method is based on the comparison of actual tax revenues and potential revenues estimated using statistical data. The method provides a comprehensive view.
2. **The bottom-up approach.** The approach benefits from tax audits that can be either random or targeted to risky groups.
3. **Econometric techniques.** Estimates of revenue losses can be produced by frontier analysis and time series analysis. Since the approach is sensitive to the choices of models, parameterisation and data, this method is not recommended by international organisations.

There are two main approaches for assessing the tax gap using national accounts data. The first is based on evaluating the potential tax revenues using data on end users (i.e. private consumption and producers of exempt products).[34] This demand-based approach is used, for example, in the assessments of the tax gap in EU Member States commissioned by the European Commission[35]. The second approach, promoted by the IMF, is based on the calculation of value added that is subject to tax. A rough idea of the TBs can be achieved by using the aggregate supply–demand identity of national accounts.

Value added (Y) can be defined as a difference between output (O) and intermediate inputs (N). The aggregate supply consists of value added and imports (M). The aggregate demand consists of final consumption (C), investment (I) and exports (X). The supply–demand identity can be written as follows:

$$O - N = Y = C + I + X - M$$

Rearranging the identity generates an expression that describes two ways of illustrating the number of products consumed. The final consumption is equal to value added minus investments and the excess of exports to imports. Further rearranging generates a sum of imports and production to domestic markets minus intermediate use and investments:

$$C = O - N - I + M - X = M + (Y - X) - (N + I)$$

The demand-based approach uses national accounts data to estimate the amount of VAT paid by consumers and businesses that produce tax-exempt products. The alter-

native value-added–based approach uses input–output tables. The benefit of using this method is that the items on the right side of the equation above can be estimated separately for all industries.

6.3 The RA-GAP method[36]

6.3.1 Calculating the potential VAT revenues

The RA-GAP method estimates the potential net VAT revenues, measures the actual collections and relates the difference to GDP.

The basic model for the RA-GAP assessment follows the structure defined above. Potential net revenues are accrued from imports (M) and output to domestic markets (Y-X) minus use for investments (I) and intermediate inputs (N). Other elements that define the amount of revenues collected are the VAT rate (t) that applies to the commodity, the proportion of output for the sector produced by registered business (r), the proportion of output for the sector that is exempt output (e) and the proportion of input credits for the commodity and the sector that is allowed to be claimed (n).

A concrete example for the parameter r is that there are thresholds for small businesses that define their liability for VAT. An example for parameter e would be use of financial services that are exempt as inputs. Finally, an example for parameter n is taxes paid for inputs that cannot be credited, such as VAT included in restaurant bills that are paid by companies.

For sector s, the potential net revenues (PV) from commodities indexed by c are as follows:

$$PV^s = \sum_c (M_c^s \times t_c) \times r^s + \left[\sum_c (Y_c^s - X_c^s) \times t^c\,(Y_c^s - X_c^s) \times t^c\right] \times r^s - \left[\sum_c (N_c^s + I_c^s) \times t_c\right] \times r^s \times (1 - e^s) \times n_c^s$$

The first term on the right-hand side is the amount of taxes to be collected from imports of commodity c for sector s that are produced by VAT registered businesses (r is share parameter). The second term is the amount of taxes on the output of sector s of commodity c to domestic markets that are produced by VAT registered businesses. The third term describes the VAT credits for inputs of sector s. It is adjusted for the share of firms registered for VAT, the share of output for a sector which is exempt output (1-e) and the share of input tax credits (n).

The sectoral data needed for the supply and demand variables is obtained from supply-use or input–output tables. Parameters t and n can be obtained from the current VAT rules. Parameter r must be estimated. This equation can be used both to calculate the potential revenues under current legislation or alternatives, such as if standard tax rates are applied for all commodities.[37] The VAT rate, the list of tax-exempt products or sectors and the rules that define the deductibility of inputs are policy variables.

The definitions in national accounts do not fully match with the definitions used for tax purposes. The way in which companies are allocated to various industries differs between national accounts and taxation. Another difference follows from the practice of national accounts of including the domestic consumption of non-residents under *exports* and the consumption of residents abroad under *imports*. This does not follow the practices of destination-based VAT collection. A further discrepancy is caused by the convention of associating the exports and imports directly with the sector of production and consumption, thereby neglecting the role of wholesale and retail trade. This gives rise to sectoral misallocation of the VAT gap. As an example, the sectoral tax gap estimation for Finland shows that the yearly tax gaps of the trade sector and manufacturing sector have high negative correlation (Thackray et al., 2015a). Another issue related to the wholesale and retail sector is that national accounts consider the output of the sector generated by trade margins, but the gross inputs and sales may be composed of products with different VAT rates.

There are also complexities related to specific policy rules that cannot be captured by the policy variables t, e and n of the model. For example, some companies can purchase specific products without VAT, or some types of households have lower VAT rates for some products. In the case of business-to-business transactions, tax exemptions reduce the overall tax revenues, but special rates may only influence the tax gaps across sectors.

6.3.2 Measuring collected VAT and the tax gap

The next step is to measure the actual collections. The VAT collected is a sum of VAT from imports[38] and VAT

due to output for domestic purposes minus the VAT creditable for inputs. Sector information for a taxpayer is available from the registers of the tax authorities. Subtracting the actual VAT collections from the potential collections provides the VAT gap of the sector.

There are several measures for the actual revenues. The *cash-based net revenue* measure aggregates the revenue actually paid and refunded during the period regardless of the period for which the payment is made. Therefore, the difference between the estimated potential revenues for the same period and the net revenue measure contains both the tax gap and the differences due to different timing in the collection and payments of refunds.

The second measure is based on *accrued net revenue*. It allocates the actual transactions to the period when the tax liability or credits arise. However, if the excess credits can be carried forward and matched with debits during the next periods, even the use of the accrual principle does not guarantee the correct timing, and the yearly tax gap measured may still be distorted.

The third measure uses VAT *assessment* data. It combines the self-assessed amounts declared by the taxpayer and possible additions of the tax authorities for the period. Comparing this amount to the potential tax revenues estimated, following current policy structure, yields the assessment gap discussed in Section 6.3.1.

Finally, there is a combination measure called *accrued collections*, which uses payment data for debits and assessments data for credits. This measure is designed to be used in the estimation of taxpayers' compliance. Here again, if it is possible to carry forward the credits, the yearly measure will be distorted if the timing is not corrected.

The RA-GAP method uses the *accrual collections* approach to measure the actual VAT. The other measures can, however, be useful for other purposes. The cash-based net revenues and accrued net revenues provide useful guidance for operational purposes. The assessed revenues can be used to separate the assessment gap and collections gap, which have different implications from the point of view of the effort of narrowing the compliance gap.

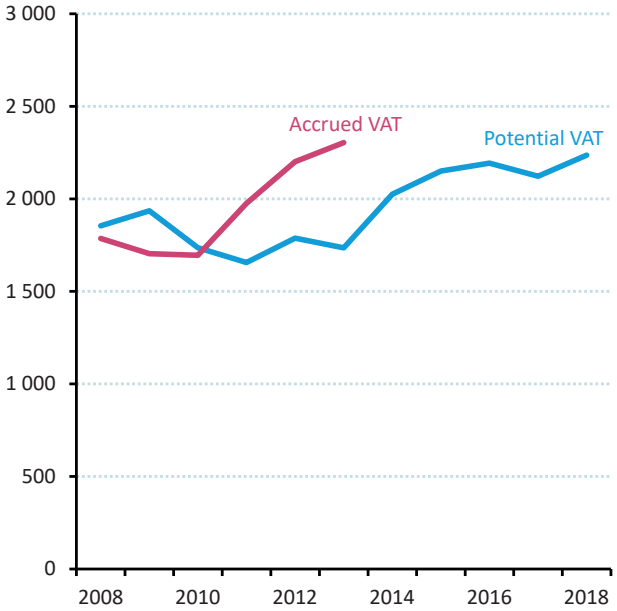
The VAT gap is calculated by deducting the actual VAT from the potential gap. The usual way to report the gap is either to express it as a share of GDP or to divide it by the relevant potential VAT revenues. For the case of the total VAT gap, the divisor would be potential VAT revenues measured using the reference policy framework (the standard rate applied to final consumption). For the compliance gap, the divisor would be potential VAT revenues measured using the current policy framework.

6.4 Estimating the VAT gap for digital products in Finland

This assessment of the VAT gap of digital products briefly illustrates the main concepts, the main features of the RA-GAP method of the IMF that is used and the results achieved by utilising the model of the FTA. The method is presented in detail in documents of the IMF, and there is also an online course provided by the IMF.

The potential VAT for digital products was estimated by the FTA with a model that is based on the RA-GAP method.[39] The idea was to apply the same list of digital products that was used in the analysis of the size of the digital economy. The results, presented in Figure 6.1, show that

Figure 6.1 Potential and accrued VAT revenues (mill. EUR)



Sources: The authors' calculations, based on data by Statistics Finland, and a simulation of the FTA.

the accrued VAT was larger during the period 2011–2013, which means that the tax gap was negative. The trends show that both the potential and realised VAT revenues have been increasing.

The potential VAT is divided by industry in Table 6.1 below. There are two industries that produce systematically negative potential VAT. Industries C26 and C27 produce both equipment and digital products and are export oriented.

The industries listed in Tables 6.1 and 6.2 are as follows:

- C18: Printing and reproduction of recorded media
- C26: The manufacture of computer, electronic and optical products
- C27: The manufacture of electrical equipment
- C28: The manufacture of machinery and equipment not elsewhere classified
- C33: The repair and installation of machinery and equipment
- J59: Motion picture, video and television programme production; sound recording and music publishing activities
- J60: Programming and broadcasting activities
- J61: Telecommunications
- J62: Computer programming, consultancy and related activities
- J63: Information service activities

The value added of the digital products of the corresponding industries are shown in Table 6.2.

Table 6 .1 Potential VAT by industry (mill. EUR)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
C18	208.4	189.5	162.7	164.8	170.2	185.9	174.7	174.4	151.2	137.9	140.7
C26	-110.9	-210.9	-105.3	-398.9	-89.1	-176.4	-81.8	-154.7	-103.8	-156.7	-129.8
C27	-11.6	20.6	45.4	-13.9	-153.6	-191.1	-106.6	-89.8	-106.1	-180.0	-251.8
C28	23.3	233.5	-28.8	13.0	119.2	-51.8	43.1	161.6	134.9	60.0	85.8
C33	437.4	410.9	399.9	424.4	445.1	463.9	466.5	484.8	499.2	532.4	551.9
J59–J60	177.6	177.1	186.5	217.2	223.8	240.0	283.2	296.6	293.1	306.9	309.0
J61	630.6	569.9	599.3	576.8	569.9	620.0	589.4	587.4	598.7	605.5	619.0
J62–J63	500.1	545.4	476.3	672.7	502.7	645.1	656.7	690.7	726.2	816.3	911.4
Potential VAT	1,854.8	1,936.0	1,736.1	1,656.1	1,788.2	1,735.5	2,025.1	2,150.9	2,193.5	2,122.3	2,236.2

Source: FTA.

Table 6.2 The value added of the digital products (mill. EUR)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
C18	208.4	189.5	162.7	164.8	170.2	185.9	174.7	174.4	151.2	137.9	140.7
C26	-110.9	-210.9	-105.3	-398.9	-89.1	-176.4	-81.8	-154.7	-103.8	-156.7	-129.8
C27	-11.6	20.6	45.4	-13.9	-153.6	-191.1	-106.6	-89.8	-106.1	-180.0	-251.8
C28	23.3	233.5	-28.8	13.0	119.2	-51.8	43.1	161.6	134.9	60.0	85.8
C33	437.4	410.9	399.9	424.4	445.1	463.9	466.5	484.8	499.2	532.4	551.9
J59–J60	177.6	177.1	186.5	217.2	223.8	240.0	283.2	296.6	293.1	306.9	309.0
J61	630.6	569.9	599.3	576.8	569.9	620.0	589.4	587.4	598.7	605.5	619.0
J62–J63	500.1	545.4	476.3	672.7	502.7	645.1	656.7	690.7	726.2	816.3	911.4
Potential VAT	1,854.8	1,936.0	1,736.1	1,656.1	1,788.2	1,735.5	2,025.1	2,150.9	2,193.5	2,122.3	2,236.2

Source: The authors' calculations, based on data by Statistics Finland.

The total value added of the digital products is compared to the potential VAT revenues in Figure 6.2. The fit is very good, which tells us that the estimate of the potential VAT revenues describes well the actual trends in the TB.

Another way of looking at the same information is to calculate an implicit potential VAT rate as the ratio of these time series and compare it to the actual standard VAT rate (see Figure 6.3). The trends in the rates correspond well, except in the year 2012, when there was a large drop in the value added and large negative potential VAT revenues in industry 26.

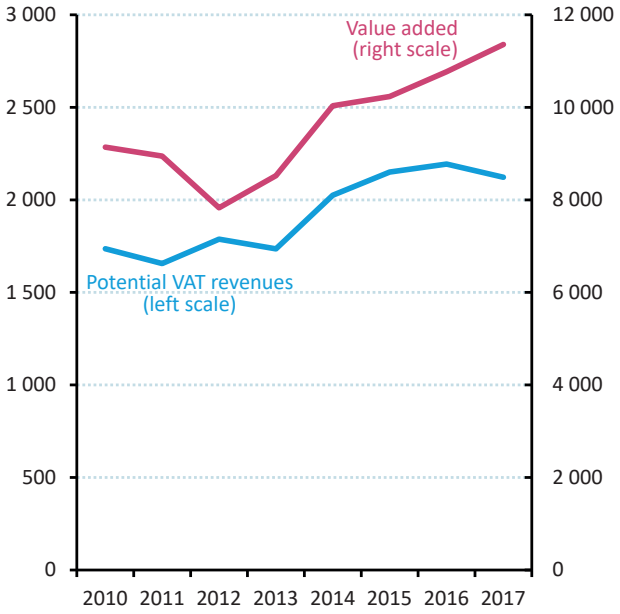
The IMF has evaluated the total and sectoral VAT gaps in Finland, covering the period 2008–2014 (Thackray, 2015a). The results show that the overall VAT gap is fairly small and consists mostly of the policy gap. The sectors that show highest non-compliance are the construction sector and the professional services sector. In both sectors the gap has, however, declined during the analysed period. From the viewpoint of our study, the most interesting observation is that the information and communication sector has a negative VAT compliance gap throughout most of the period studied. This is in line with the results generated here for digital products. The corresponding result from Denmark shows that the combined sectors of transportation, information and communication also generated a negative VAT gap during 2008–2012 (Thackray et al., 2015b).

6.5 Discussion

There were several problems that limited the preciseness of the estimate of the VAT gap. First, the VAT tables needed for the calculation of the accrued VAT revenue were only available up to 2013. Also, the definition of industries differs between national accounts and tax data. In tax data the companies represent only one industry when declaring VAT liability, but in national accounts the main activity of each establishment of the company is evaluated separately in the industry classification. This discrepancy especially affects the trade sector, which pays more VAT than the potential VAT revenue calculations show.

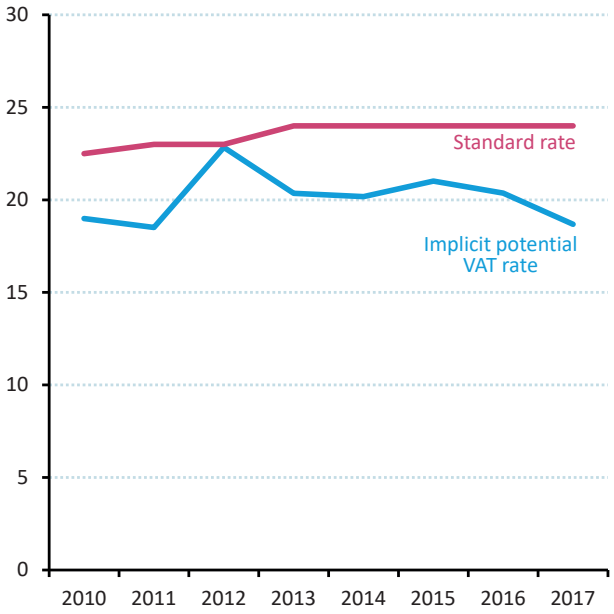
The third issue is that the products are classified as being produced by one industry only. The total production of the industry may also include products from other

Figure 6.2 Potential VAT revenues and the value added of the digital products (mill. EUR)



Sources: The authors' calculations, based on data by Statistics Finland, and a simulation of the FTA.

Figure 6.3 The implicit potential VAT rate of the digital products and the standard VAT rate (%)



Sources: The authors' calculations, based on data by Statistics Finland, and a simulation of the FTA.

industries. Furthermore, products classified into a given industry are also produced in other industries. The fourth problem is that the classification of digital products used in the evaluation of the size of the digital economy is more disaggregated than the product list used in the RA-GAP model.

The results of the analysis show that:

1. There are some industries which have negative potential VAT revenues. The main reason is likely to be an export orientation since exports are zero-rated.
2. The main reason for the implicit VAT rate being below the standard rate is likely to be the same: exports lower the VAT liability related to the value added.
3. Trends in the value added of the digital products closely follow the potential revenues calculated with the RA-GAP method, which supports the relevance of the measure.
4. The time series on the accrued VAT is too short to evaluate the most recent trends in the VAT gap, but the estimate from the earlier years and other information suggest that the trends in VAT compliance are not likely to create a marked problem in ICT industries.

7 The PIT gap: digital freelance workers

This chapter first discusses digitalisation and potential tax avoidance from a PIT perspective and introduces the methods used for assessing the PIT gap. It then presents the results from a survey targeted at the Finnish digital freelance workers. The survey results suggest that freelance workers are at the lower end of income distribution, and they get a fairly modest share of their income from platform work. The survey data further hint that, in general, Finnish freelancers comply with taxation rather well. Depending on the question probe, the results point to a compliance rate of between 80–95%. The chapter concludes by discussing possible policy interventions that could be used to decrease tax compliance costs and reduce the risk of tax non-payment.

7.1 The taxation of personal income

The personal income of individual taxpayers consists of employment income, capital income, business income and income transfers. In well-developed tax systems, such as Finland's system, domestic wages, income transfers and capital income are mainly reported directly to tax authorities by third parties, which limits the possibilities for non-compliance for individual taxpayers. Also, the exchange of information between countries on foreign capital income has limited the possibilities to avoid taxes. The potential remaining sources for non-compliance related to labour income taxes are self-reported income and income from employers that do not report the paid wages or that underreport their paid wages. Entrepreneurs have the most extensive possibilities to choose the amount of reported income and the income classes used. A tax audit study on individual income tax filers in Denmark shows that for income reported by third parties, the tax evasion rate was almost non-existent, but that it was substantial for self-reported income (Kleven et al., 2011).

There is an extensive literature on the effects of labour income taxes on the tax revenues collected. This literature uses the concept elasticity of taxable income to describe the change in the tax base that a tax policy change generates (Saez et al., 2012) The driving forces behind the elasticity are changes in labour supply (participation in labour markets and hours worked) and several other adjustments, which are strongly linked both to the policy gap and compliance gap. In the case of Finland, the elasticity of taxable income for wage earners is low (Matikka, 2018), which reflects both the limited labour supply reactions and high tax compliance, supported by the extensive reporting of taxable income by third parties.

The personal income from digital activities can be in the form of wage income (e.g. gig work) and capital income (e.g. rents from fixed assets, such as apartments and vehicles, and capital gains from the sales of virtual currencies). In the case of entrepreneurs, the division between personal income and business income is often blurred and this is especially so in the digital economy (Adam et al., 2017).

Labour is less mobile than goods or capital and personal income taxation has less cross-border links than VAT or CIT, which leaves more room for national tax systems. This also applies to the taxation rules. The relevant elements of the Finnish PIT system can be described as follows.

The taxation of capital income is rather straightforward, as rental income is taxable and the realisation principle is followed in the taxation of capital gains. All capital income is taxed with a flat rate of 30% or 34%, depending on the amount of taxable income.

If a person signs an employment contract, the wage taxes and social security contributions are withheld by the employer. If the work paid is based on assignments, the received pay is classified in Finland as *trade income*. If enrolled on the prepayment register, the individual must pay prepayments on the trade income. If not, the customer who pays the services must withhold the taxes. The taxation of the income of entrepreneurs depends on the legal form of the company. The profits are fully taxable as income for the owner-shareholder in the case of a self-employed professional individual, a self-employed business entrepreneur or a general or limited partnership. Some entity forms, including limited companies and the cooperative societies, are independently liable to pay as taxpayers. If a limited company distributes dividends to its shareholders, the shareholder-beneficiaries are to be taxed as provided by specific rules, wherein the tax rate depends on the amount of distributed profits and net wealth of the company (Verohallinto, 2020).

7.2 A description of income tax gap methods

Hidden income can be estimated either using macro or micro methods. Macro methods rely on calculations of potential income that are reached from independent sources. One example is to use national accounts data and the identity between consumption, saving and income to reveal the non-reported income. The problem is that the residual comprises both hidden income and all possible measurement errors from both sides of the identity. The more compliant the taxpayers are, the larger the probability of making mistakes in the interpretation. The role of mistakes is also higher when the method of using independent data from national accounts is applied to subgroups of taxpayers or single sources of income.

The second possibility is to use micro methods, mainly surveys and tax audits. The benefit of these methods is the broad information on the elements of non-compliance. The challenge is that the generalisation of the results presumes random sampling, which requires extensive resources to generate samples that are large enough. The difficulties related to the estimation of PIT gaps have limited the number of countries that produce gap estimates. There is no common methodology agreed upon by international organisations for calculating PIT gaps.

One of the problems related to the digital economy is that the amount of personal income received from digital activities is typically small, which in practice rules out traditional tax audits of individual taxpayers. If the number of people receiving income is also small, the issue is more about keeping up tax morale. But if the number of transactions explodes, tax compliance influences total tax revenues. The FTA have developed advanced data mining methods which use cross-border bank transaction data to identify transactions that are made between individuals and foreign platforms. Internationally agreed obligations for the platforms to declare the transactions to tax authorities are still needed.

7.3 Digital platform work in Finland

As already discussed, an increasing number of new digital products and services, as well as digital-based platforms, have been introduced in recent years, especially for the consumer market. Such businesses are, for instance, Uber, Wolt and Airbnb, which give individual taxpayers new means of generating income by providing different services through digital platforms.

There are no specific definitions for the digital economy in personal income taxation and the Finnish domestic legislation does not separately take into consideration the taxation of income received through the digital economy. Moreover, the judicial literature on the taxation of such income is very limited from the PIT perspective, and no particular concept are known to be applied in this context. However, the FTA has updated their guidance to regulate the taxation of, for example, rental income received from Airbnb[40] and the taxation of income received from peer-to-peer transportation services.[41] In general, based on our experience, it seems that the FTA publishes guidance on this topic on a regular basis, based on the current interest of the taxpayers.

As the Finnish income tax system is based on a comprehensive concept of income, generally, all income received by a Finnish resident taxpayer is subject to tax in Finland.[42] Accordingly, as the income received through digital platforms is not by any means exempted from taxation in Finland, it can be claimed that the current Finnish tax legislation is sufficient concerning the personal income taxation of income received through digital platforms and there is no compelling need to amend the Finnish tax legislation in this respect. At least this is the case when it comes to the taxation of tangible income received through digital platforms. This perception is also in line with the views of the experts from the FTA who have been interviewed on the subject.

Various liabilities may arise for the worker, the platform provider or for the party who purchases the services via a digital platform, depending on what has been agreed on with the parties involved and how potential employment or a commission relationship is formed. In the case when an employment or commission relationship is deemed to exist between the worker and the party purchasing the service via the platform, generally, the latter has the obligation to report the payments to the Finnish Incomes Register, either as salaries or business income (in Finnish '*työkorvaus*').[43] This may, in practice, turn out challenging due to the occasional nature of the activity and potential unawareness of the reporting liabilities, espe-

cially in cross-border situations. Furthermore, in the case when the worker is registered with the prepayment register, the party ordering and paying for the services via the platform does not have the liability to report the payments classified as business income to the FTA.[44]

In the case where the taxpayer has received income through a digital platform that has not been reported to the Finnish Incomes Register and is hence not automatically visible on her or his Finnish pre-completed tax return, the taxpayer herself or himself is liable to supplement the tax return with the missing information. Accordingly, if the FTA does not receive information about income received by an individual taxpayer through the digital platform from other parties involved, it is the sole responsibility of the taxpayer to report the income to the tax authorities.[45] This can be seen as challenging as the currently existing Finnish legislation relating to reporting income and paying taxes has been built around the concept of a traditional employment relationship and the responsibilities relating to taxation have traditionally been quite limited for the employee (Harmaan talouden selvitysyksikkö, 2019, p. 5).

A typical income receiver through digital platforms is an individual who occasionally receives income from the platforms and is not well aware of the applicable income tax legislation and the related reporting liabilities (Nieminen & Nykänen, 2018, p. 2). The challenge is that the reporting made by the taxpayer may not be entirely correct. The deficiencies in reporting may result from the complexity of the task but can also be intentional, at least in part.[46]

Currently, the supervision of the reporting of income received through digital platforms is basically based on the comparative information the Finnish tax authorities receive from banks. It seems that sufficient comparative information concerning payments received via platforms is not available to the FTA, especially if the platform is based abroad.[47]

Potential tax avoidance relating to the platform economy most likely arises in the situations described above wherein the platform provider is not subject to any reporting or tax withholding obligations in the country where the services are generated and the individual taxpayer and the other party involved (i.e. the party purchasing the service) neglect their reporting responsibilities either deliberately or inadvertently, without the tax authorities having any visibility of the said income generated in the digital economy.

Currently, the platform labour sector in Finland is nascent,[48] but international evidence suggests that it might be growing rapidly. The exact regulations related to income taxation vary slightly between platforms. For example, concerning rental income from Airbnb, the income is classified as capital income, and is always taxed at a capital income tax rate. If the income is occasional, it might remain untaxed. For more substantial incomes, the income is either classified as income from employment or entrepreneurial income.

Moreover, if the platform workers earn entrepreneurial incomes, and if their yearly incomes surpass the VAT threshold of EUR 10,000, they are also required to pay VAT of 24%, based on the generated turnover.[49]

Currently, only a minimal share of platform workers are classified as employed. Thus, a vast majority of digital platform workers are classified as solo entrepreneurs and are taxed accordingly.

To better understand the effects of digital freelancing on current and possible future tax gaps, we surveyed the Finnish population of online freelancers. In this survey, we explicitly limited our attention to fully digital work, where matching, transaction and payment are fully digital. Most of the problems related to tax coverage are especially pertinent to these types of platforms because they span national boundaries. Local tax authorities might have a better chance of tracking local labour platforms, such as Uber, because the transactions on these platforms always take place within a single country. Online work and local gig work platforms are also conceptually quite different, making it desirable to track them separately.

We have limited our attention to Upwork, the largest online freelancing platform. The reasons for this are mostly practical: as the largest (measured by turnover) platform, the bulk of most active freelancers would be likely to have an account on Upwork. Moreover, Upwork has an excellent search feature which allows us to search and filter for those residing in Finland.

While Upwork is an extreme example of fully digital work, we argue that, since it is an extreme example of the digitisation of labour markets, the findings from Upwork are generally applicable to other less extreme variations of digital labour markets.

Another appealing feature of Upwork as a survey participant pool is that the survey responses can be linked to background information downloaded from Upwork's developer application programming interface (API). This allows us to measure (and correct for) non-response according to observable background characteristics.

The purpose of the survey was to probe digital freelancers' tax compliance. Since it might be challenging to get honest answers to direct questions on whether one pays taxes, we developed several survey probes which we used as proxies for tax compliance. In addition to surveying for freelancers' tax avoidance, we have also linked the information to various surveyed and observed background characteristics.

7.4 An online freelancer survey (Focus Area 5)

There were 1,193 Finnish freelancers registered and searchable on Upwork in the spring of 2020. At the time of data collection, 599 of them had earned at least USD 1. This number should be seen as a lower limit of the true number of Finnish freelancers working on Upwork as it is possible for freelancers to set their profile onto an 'invisible mode'. They might wish to do this if they are employed full-time and do not want to be invited to new jobs or if they want to take a break from platform work.

We randomly sampled 350 workers from the pool of Finnish freelancers with positive earnings on Upwork and recruited them to take part in our online survey. We reimbursed USD 20 for each response. In total, our response rate was 52%. To account for potential selective non-response, the respondent sample was weighed so that the full population of Finnish positive-earnings freelancers matched the respondent sample. The weighing was done using the raking method (see Deville et al., 1993) by gender, earnings on the platform, time since registration, immigrant status and self-reported highest attained education.

Figure 7.1–7.3 depicts some descriptive statistics on the self-reported incomes of the sample. Figure 7.1 plots the self-reported annual income distribution within the survey respondents; Figure 7.2 reports the self-reported share of income from platform work; and 7.3 reports the association between the two.

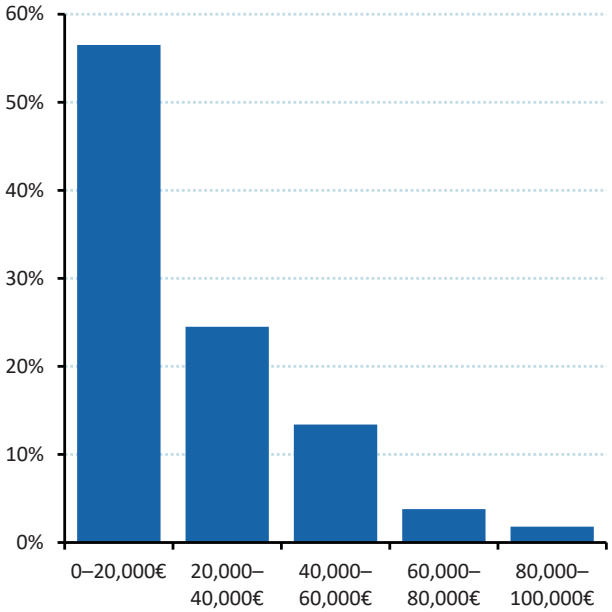
We find that almost 60% of the Finnish Upwork freelancers earn less than EUR 20,000 annually. While platform labour remains a source of additional income for the majority of the respondents (60% of the respondents reported that they earn less than a fifth of their income from platform work), there is a significant minority who earn a substantial share of their income from platform work. Using reported incomes and shares of income from platform work, we find that 23% of online freelancers have earned more than EUR 10,000, which places them above the VAT limit.

To probe the general tax morale of online workers, we asked two questions. First, we asked if the freelancers had themselves paid all the applicable taxes for their online income. We also separately inquired if they generally thought that people paid taxes on their online work income. The answers to these questions are plotted in Figure 7.4.

Figure 7.4 shows that, in general, the tax morale of online workers is relatively high. Over 90% of the respondents said that they always pay taxes, and 65% of the freelancers believed that their peers also generally pay taxes. This suggests that freelancers believe that, in general, tax evasion is difficult. These numbers are even surprisingly high. In comparison, an audit study from Denmark discussed showed that 45% of self-employed paid too little tax see Kleven et al., 2011).

Figure 7.5 plots the distribution of answers to the question 'Are you a solo entrepreneur, business owner or a partner in a company?' The questions are split by whether or not the freelancer has earned more than EUR 10,000 in 2019 on Upwork. The logic is the following: if a freelancer earns more than EUR 10,000 from online work, she or he goes above the VAT limit and is liable for VAT. This implies that the freelancer needs to be registered into the company register. Thus, if we observe freelancers who have earned more than EUR 10,000 but who are not solo entrepreneurs nor partners in a company, they might not be aware of their tax liability.[50]

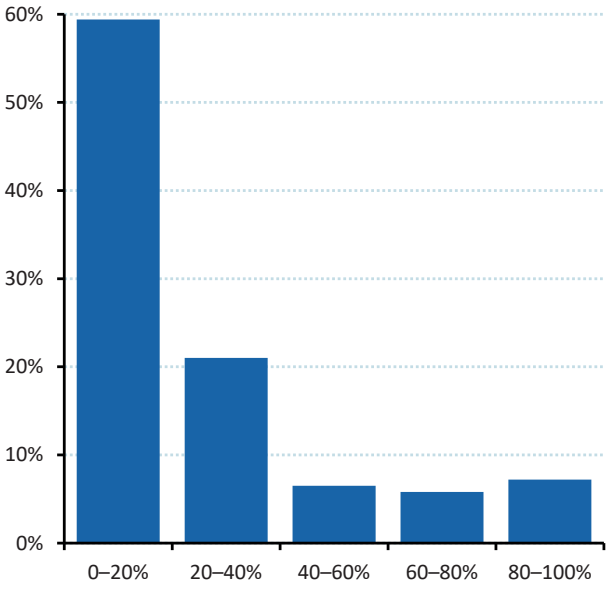
Figure 7.1 Respondents' total annual income (weighted)



Notes: This figure plots the self-reported annual earnings of respondents. Survey responses are weighed by gender, earnings on the platform, time since registration, immigrant status and self-reported highest attained education.

Source: The authors' calculations.

Figure 7.1 Respondents' share of income from platform work (weighted)



Notes: This figure plots the self-reported share of income from platform work as proportion of the annual income of respondents. Survey responses are weighed by gender, earnings on the platform, time since registration, immigrant status and self-reported highest attained education.

Source: The authors' calculations.

We find virtually no association between business ownership and platform earnings. This suggests that there is a non-trivial minority (15%) of freelancers who earn more than EUR 10,000 annually but do not pay VAT or other taxes on their earnings.

As such, this probe suggests that there is no systematic increase in tax non-payment among the high earners compared to the low earners.

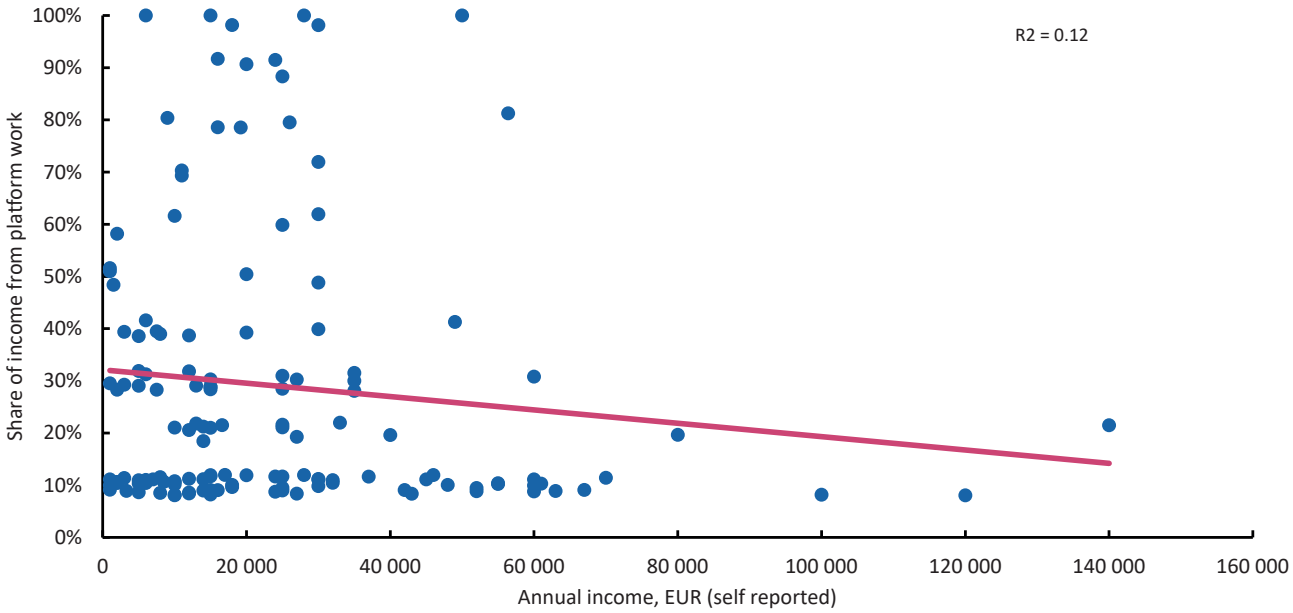
The 15% share of high earners who reported not being a partner in a company seems strikingly high. Nonetheless, there could be a few non-tax-evasion–related reasons for this. First, we cannot rule out survey recall or reporting bias. Moreover, it could be possible that some workers are based outside of Finland despite what their profile indicates. Nonetheless, since digital work is, by definition place independent (Braesemann, et. al., 2020), some freelancers, especially those from developing countries, conceal their location in order to fight negative country stereotypes (see, e.g., Lehdonvirta et al., 2018). Thus we cannot rule out that some freelancers who appear as Finnish, might actually operate under some other tax jurisdiction.

As another indirect probe on tax compliance, we study the method of payment for work. The FTA has a good chance to audit bank transfers to Finnish bank accounts. Thus, high earners who get paid into Finnish bank accounts would be likely to be caught in a tax audit.

If, instead, the payments go to non-Finnish bank accounts or an account in an international payment intermediation service, such as PayPal or Payoneer, they are more likely to be missed by the FTA. Figure 7.4 plots answers to the question 'How do you usually get paid for your online work?', split by earnings from Upwork.

Again, we find virtually no association between the method of payment and platform income. Roughly 15% of both high- and low-earning freelancers bill their work to a payment processing platform or a foreign bank account. As above, we cannot rule out the possibility of recall bias of fake freelancer locations of residence.

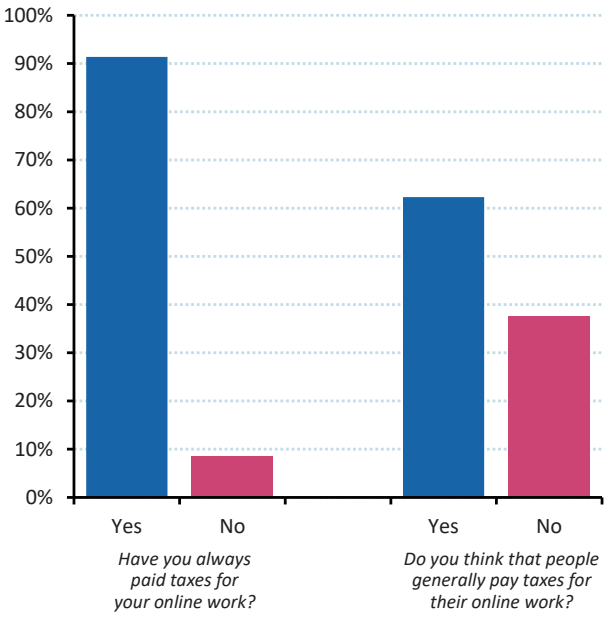
Figure 7.3 Association between total income and share of platform income



Notes: This figure plots the association between self-reported annual earnings and the share of earnings from platform work. Survey responses are weighed by gender, earnings on the platform, time since registration, immigrant status and self-reported highest attained education. Of the respondents, 23% earned more than EUR 10,000 annually from platform work.

Source: The authors' calculations.

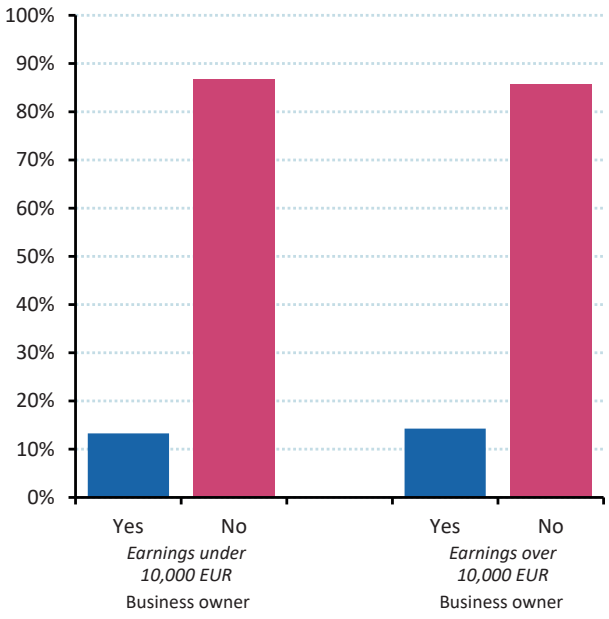
Figure 7.4 Freelancers' attitude towards taxation



Notes: Survey responses are weighed by gender, earnings on the platform, time since registration, immigrant status and self-reported highest attained education.

Sources: The authors' calculations.

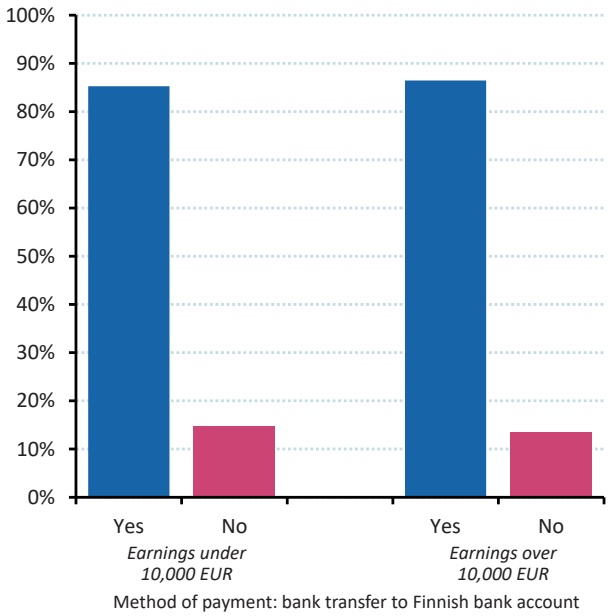
Figure 7.5 'Are you a solo entrepreneur or partner of a registered company?'



Notes: Survey responses are weighed by gender, earnings on the platform, time since registration, immigrant status and self-reported highest attained education. The earnings measure is annual income reported as reported by Upwork developer API.

Sources: The authors' calculations.

Figure 7.6 'How do you usually get paid for your online work?'



Notes: Survey responses are weighed by gender, earnings on the platform, time since registration, immigrant status and self-reported highest attained education. The earnings measure is annual income reported as reported by Upwork developer API.

Sources: The authors' calculations.

7.5 The summary of the results

Our findings of the tax gap effects of digital freelancing are quite positive. In general, we find that freelancers say that they pay taxes on their income and believe that their peers generally do so too. Many authors have argued that, due to their transnational nature, digital labour markets can make tax avoidance easier. Our findings suggest that, in some sense, they also make tax non-payment more difficult. Getting paid in cash is virtually impossible in digital labour markets. This is most likely a major reason for why we find that freelancers say that they pay taxes on their digital income and believe that their peers do so too.

The source for our data is from a single labour platform, Upwork. Thus, while we are quite confident about the internal validity of our results, one should exercise caution in extrapolating the results beyond the individual platform. Nonetheless, we argue that the affordances of Upwork for freelancers are highly similar to those on other similar platforms. Consequently, it seems reasonable that our findings would extrapolate to other similar platforms for digital work.

We do note that our results are likely to not be applicable to *capital-intensive* digital platforms, such as Airbnb and Uber. Indeed, recent tax audits done by the FTA suggests that tax non-payment from Airbnb is considerable.[51] We note, though, that the income from Airbnb should be directed to a Finnish bank account for Finnish renters, which makes it more likely to be captured by current tax audit schemes. Moreover, Airbnb has published fairly detailed instructions in Finnish on taxation.[52]

Uber, on the other hand, stipulates that their drivers should have a registered trade name (an '*Y-tunnus*') in order to drive,[53] which makes tax non-payment less likely.

Our other finding is slightly less optimistic: we find that, in general, high platform earnings are not associated with the probability of being in the VAT register or getting paid into a Finnish bank account. This indicates that high earners' income might not be taxed at appropriate rates. One reason for this might be the compliance costs. Nonetheless, we note that the share of high earners with a registered company is a fairly small proportion of the sample as a whole: a fifth of the sample earn more than EUR 10,000 annually, and 85% of them do not say that they are business owners.

Going forward, we expect that platform work will continue to expand globally, as it has done thus far (see Kässi and Lehdonvirta, 2018). Nonetheless, due to stark competition from lower-income countries and the high costs of living in Finland, we do not expect digital freelancing to grow significantly. According to our survey, we find that only 12% of our respondents said that they aspire to continue platform work five years from now.

7.6 Discussion

The tax non-compliance of the self-employed is often a result of a combination of factors including high compliance costs and inadvertent underreporting. The self-employed often have little tax knowledge, struggle to navigate complex compliance rules and cannot afford high compliance costs, such as the cost of a qualified accoun-

tant or tax advisor. They also have an increased opportunity for outright evasion because they can more easily under-declare their income, exaggerate their deductible or operate wholly in the shadow economy.

While direct tax evasion will be likely to remain a problem into the future and would need to be addressed by tax audits, tax authorities will have several ways of addressing the non-payment due to high compliance costs. Both individual countries and supranational entities (the EU in particular) should strive to create ways in which individual platforms could directly transfer information on incomes and taxes to national tax authorities. This effort is largely simplified by the fact that, while there are close 200 individual peer-to-peer employment platforms in the world, only a handful of them have significant numbers of registered workers and turnover. There are already existing pilots of this type in some EU countries, and there are existing plans for an EU shared model (Ogembo and Lehdonvirta, 2020). As explained above, this kind of obligation will be introduced in the European VAT System from the beginning of 2021.

The reduction of tax compliance costs does not necessarily require a complicated data transmission infrastructure between the platform and the tax authority. For example, France has set up an agreement with several prominent platform companies, according to which the platform automatically sends out an email about incomes and deductions (Ogembo and Lehdonvirta, 2020). This calculation can then be included as an attachment to individuals' tax returns. Similar low-cost interventions could also be devised in other EU countries, even in the absence of a unified intra-European model for the taxation of digital work.

An additional remedy for the non-reporting of income received from the platform could be simply to better educate the taxpayers on their liabilities related to taxation and online platforms. National tax authorities could already start piloting such models.

8 Conclusions

8.1 The size of the digital economy in Finland

This report aimed to shed light on the concept, size and composition of the digital economy in Finland, and further, its impact on the tax gap and tax system. Digital technologies have transformed society as they have become widely adopted and exploited across different sectors. Yet, we lack a generally agreed definition of *digital economy*. The contemporary industry and product classifications poorly suit measuring the extent or value of digitalisation in the economy. Consequently, there are only a few reported studies that attempt to assess the size of the digital economy.

Our quantitative analysis of the size of the digital economy employed two approaches. Our first calculation was based on the three-step approach proposed by the BEA. In the first step, digital goods and services, in contrast to non-digital ones, are identified via expert view classifications. Secondly, industries producing the defined goods and services are identified using the supply table. Thirdly, the digital value added of an industry is calculated as the share of the gross output of digital products multiplied by industry's value added. We find, using this approach, that the digital economy in Finland accounts for 6.4% of GDP – which is roughly the same as the size as the digital economy in the US (i.e. 6.5% of GDP).

Second, we developed a method that, unlike the BEA approach, explicitly takes into consideration those goods and services that are partly digital in the assessment of the size of the digital economy. This approach bases its computation of the size of the digital economy in non-ICT industries on the relative importance of ICT workers (measured by the ICT workers' wages' share of total wages) and online sales in an industry (measured by e-commerce's share of total sales). This modified model suggested that the digital economy comprises 10.9% of the GDP in Finland. We believe that this is a closer estimate of the real size of the digital economy, though we acknowledge that this measure does not yet fully capture the extent of digitisation. It neglects such digital solutions as those that firms purchase rather than develop in-house and may not fully take into consideration the extent of digital technologies embedded in products and services. However, to test the robustness of our baseline estimates, we developed alternative indicators based on the role of ICT purchases by industries. Despite the results being in line with our baseline estimates, we still see them as rather conservative.

When five big Finnish engineering companies were interviewed, they clearly indicated that digitalisation and software are having an expanding impact on their core business. The drive for the development comes from the request of the clients, who expect to receive digitalisation both as installed in the machinery, in order to provide information to the client, and as software through which by-products may be supplied to the client. Ancillary by-products were seen to have a rising role in the future business. Different data collected both for the client and the manufacturer may be used to increase the effectiveness of the business for the benefit of both parties.

The know-how of using technology and digitalisation in the final products was considered an asset that cannot be bought from outside. Based on experience, the development of the core business products was seen as something that companies had to do by themselves. Only ancillary by-products, such as maintenance services, could be outsourced in this respect.

Based on the interviews, digitalisation has not had an impact on the territorial establishment of the companies, and digitalisation has had very little or no impact on the business of the companies in such a way that the revenue streams would have shifted from one country to another. However, one company reported that the revenue streams stemming from services have slightly shifted to Finland.

Input to the development of software and digital solutions was estimated to grow a significant amount in the coming few years and digital solutions were estimated to have a bigger role in the future, both as an integral part of the main business product and as an ancillary by-product. However, the interviewed companies stressed that the main driver of the business is the core product, not digitalisation.

8.2 The evolution and prospects of the digital economy in Finland

Our analysis indicates that the share of value added generated by the digital economy in Finland has grown (at a relatively slow pace) during the 2010s. The rate of structural change from non-digital to digital value creation intertwined with investments in ICT and digitalisation, and changes in consumer preferences will, by and large, determine how the relative size of the digital economy evolves in the future.

The structural change towards digital value creation is obvious (e.g. an ongoing trend of digital servitisation in the manufacturing sectors), though the speed is uncertain. In Finland, the relative size of knowledge-intensive service sectors (i.e. the information and communication, financial and insurance activities sector; professional, scientific and technical activities sector; and the administrative and support-service activities sector) that are at the frontier of digitalisation and heavily utilise ICT have witnessed relatively slow growth. For instance, in Sweden, knowledge-intensive services' share of value added is five percentage points higher than in Finland. Furthermore, Finland has remained behind the international frontline in terms of investments in ICT. In 2017, the share of investments in ICT in Finland was about 45% smaller than in Sweden and over one third smaller than in the US.

Some recent developments indicate that the consumption patterns will be driving and may speed up the further digitalisation of the Finnish economy. Consumers are rather rapidly switching from brick-to-mortar transactions to the digital purchase of goods and services. The majority of everyday financial service usage, such as payment transactions, already take place in a digital format. The digital retail purchases in the domestic and international markets of the Finnish consumers grew 12% from 2018 to 2019. It is likely that corona pandemic further accelerates the growth in online trade as well as digital services. Survey information indicates that online stores and digital sales are becoming a common sales channel for Finnish companies. According to Statistics Finland, in 2018, only about 23% of Finnish companies sold goods and/or services via e-commerce. A recent survey of the Finnish Commerce Federation found that, in April 2020, about the half of the responding companies had an online store or used other digital sales.

It further seems that the digitisation and servitisation of manufacturing sectors will proceed swiftly, at least among the largest companies. Based on the interviews carried out by PwC for the research, engineering companies see the role of digitalisation as growing fast in the coming years, both in their final products and in the supply of the ancillary services sold in connection with the products.

8.3 CIT and VAT gaps and the digital economy

The second major goal of our analysis was to estimate tax gaps related to the digital economy in Finland. We first employed the RA-GAP method of the IMF to analyse the gap in the ICT sector and the VAT gap related to digital products. The method is based on the comparison of actual revenues with potential revenues, wherein the latter are estimated using independent data from Statistics Finland in our case.

It turned out that insurmountable data problems prevented the accurate estimation of the CIT gap in the ICT sector. The more detailed analysis of sub-industries revealed that the large variation in the financial income and expenditure, and extraordinary items of some large companies dominated the results. Therefore, as the RA-GAP method is based on industry data, it is not likely that even improved data access would have enabled precise estimation of the CIT gap in this sector during the studied period. The rougher indicators of CIT compliance, such as CIT efficiency, did not show any marked changes in the compliance trends in recent years. As the top-down methods seem to be unable to give more precise results, the main surveillance method of CIT gaps remains tax audits.

The estimation of the VAT gap related to digital products also runs into some problems with definitions and data. However, the potential VAT base trends generated by the simulations made with the RA-GAP model of the FTA fitted well with the trends in the value added of the digital products, suggesting that the model operates well. Unfortunately, the data on the actual VAT revenues did not span the most recent years. The results from earlier years showed that the VAT gap is not large and is even negative in some years. A strong recommendation is that more recent data should be compiled in Statistics Finland to verify the outcome.

8.4 The future of taxation in terms of the digital economy

8.4.1 Corporate income tax

Corporate income tax related gap can be understood as an issue of fair taxation – that is, where the profits should be allocated and the basis for their allocation – as well as an issue of tax compliance. The first issue is because the current methods of profit allocation do not consider the special features of the digital economy (e.g. market intangibles, user contributions or R&D expenses). Therefore, the current profit allocation methods are not applicable to digital business as such.

The second issue relates to tax compliance. At the moment, digitalisation enables a certain type of tax planning and thus it cannot be excluded that digitalisation has an impact on decreasing tax revenues. However, we have not been able to verify this fact. On the other hand, digitalisation surely has changed and will change the business environment, hence the modernisation of the existing international tax regime is essential in order to safeguard fair taxation and tax revenues in the location where they mostly belong.

Based on the interviews and the analysis above, it is clear that digitalisation is expected to evolve and expand during the upcoming years. The OECD continues negotiations on the final content of Pillars 1 and 2, which concern the new profit allocation method and global minimum CIT rate, and has agreed to keep working towards an agreement by mid-2021.

With regard to Pillar 1, the new rules would create either a system of profit allocation where the allocation key is based on the market jurisdiction and the users of the digital service or a system where R&D work acts as an allocation key. In both systems the focus would be on activities that can be measured despite the digital nature of the operating model. Unlike the current profit allocation methods, these kinds of approaches would recognise where the value is created in the case of digital services as the value creation is one of the biggest differences when comparing digital services to 'traditional' goods and services (i.e. physical presence).

With regard to Pillar 2, the aim of the OECD is to set out a certain global minimum tax rate which could have an impact, especially on the states of low or no taxation. Hence, the aim is to safeguard a certain amount of CIT at a global level. The final impact on the tax revenues depends on how many of the OECD member states implement the suggested pillars.

As the OECD level, guidance should be coming out by the time of publishing this report (or, if delayed due to the pandemic, in the near future), it is essential for Finland and the FTA to follow the discussion and the results when published. Based on the OECD guidance, it will be easier to determine the exact impact on Finland and Finnish companies, as well as the actions needed in order to be compliant with the guidance.

8.4.2 The impact of the digital economy on the VAT system

As explained earlier in this study, the European VAT system is taking ongoing steps towards the final VAT system, which is built on the principle of paying VAT in the country where the purchaser is established and, therefore, where she or he consumes the commodity. This general principle will be applied to all goods and services, no matter if supplied to another taxable person or to a private consumer. The value added of the supplied commodity would, in this respect, be taxed in the country of the customer. When working properly (i.e. all the input VAT may be deducted), the VAT system would only tax the output once, no matter at what the stage of the production chain the VAT is due. This would also mean that the digitalisation growing the value of the final product, or as a separate commodity per se, would only be taxed once, in the country where the final consumption of the commodity takes place.

The fact that the final VAT system is still in its implementation process makes it difficult to make any final conclusion about how the system will operate in practice. When VAT was first introduced to third-country operators supplying digital services to consumers in the EU area at the beginning of 2000, the regulation was called 'an honesty tax'. This is because monitoring these operators was nearly impossible. However, the final VAT system, currently in its implementation process, is built by taking into account the monitoring possibilities of the Member States. Moreover, this is because the operator is reporting its supplies to the tax authorities in the country of its fixed establishment. Therefore, the tax authorities have

better possibilities for surveillance. Taxable persons are also obliged to report their supplies at the EU level on a country-by-country bases. Also, regulation at the EU level has been implemented to enhance the exchange of information and cooperation between the tax authorities in Member States in order to make it possible to also inspect the operators in cross-border situations.

VAT systems are built to consider the interest of the exchequer in the best possible manner. Only the future will show how well it will fulfil the expectations and what kind of adjustments are needed. It is, however, evident that a tax system is never final and needs to be adjusted according to changes in business and the economy. At the same time, it should be remembered that a VAT system, or any other tax system, is introduced to tax the current economy and not a man-made illusion.

8.5 Personal income tax gaps and the digital economy

As a special focus area, we assessed the tax gaps among the digital freelance workers using a survey targeted to digital freelancers combined with transaction-level 'big data' from one of the leading online labour platforms.

According to the platform workers, they are at the lower end of the income distribution and they get a fairly modest share of their income from platform work. The median yearly earnings among the survey takers is under EUR 20,000, and they get, on average, less than 20% of their income online. A significant majority of almost 90% of the respondents said that they usually pay taxes for their platform income. Nonetheless, we are cautious in concluding that this implies a very high tax compliance level among freelancers; almost 40% said that they believed that their peers do not fully comply with taxes. This finding suggests that the workers quite often find tax non-compliance possible and somewhat likely. In theory, the non-compliance could be caused by either active tax avoidance or by ignorance of tax law. We also understand that non-compliance may in part result from unawareness of the related tax-reporting liabilities. Furthermore, it should be noted that even though the majority of respondents replied that they have paid all the applicable taxes for their platform income, this result does not indicate whether the respondents are fully compliant in this respect nor whether the reporting of income fulfils the prevailing quality standards.

To better probe potential tax avoidance, we asked two additional questions: we asked if the workers were entrepreneurs and if they got paid into a Finnish bank account. We assume that since more active platform workers, in general, earn entrepreneurial income and are liable to VAT, they should be registered as solo entrepreneurs or be a partner in a company. We found that only 15% of the high-earning sub-group of respondents were not entrepreneurs and are probably not paying taxes.

If the workers get paid into Finnish bank accounts from foreign platforms, it is likely that their income would be observed in tax audits made by the tax authority. On the other hand, if the payment takes place via an intermediary, such as PayPal, or if their payment is made to a non-Finnish bank account, it is considerably less likely that their payment would be captured in a transaction data audit. We found that about 10% of the respondents did not get their payments paid into a Finnish bank account, and this share showed no correlation with total earnings.

There are two main takeaways of the survey data analysis: platform incomes are more concentrated on the lower end of income distribution and only a minority of the workers' total income comes from platform work. On the other hand, there is a non-trivial minority among the high earners for whom tax non-compliance is likely.

The results of the survey are not alarming and, as previously mentioned, the current Finnish tax legislation in force seems sufficient concerning the personal income taxation of income received through digital platforms. This is because the tax legislation is based on a comprehensive concept of income and, hence, income received through digital platforms is generally also always subject to tax.

However, in order to ensure better tax compliance in the future and to reduce the administrative burden of individual taxpayers, in our view, the main focus should be on exploring the need for amending regulation on outsiders' duty so that the platform providers would be liable to provide income information directly to the FTA. Regulative adjustments concerning the reporting liability of the third party should be implemented in collabo-

ration with other countries to ensure their effectiveness in a global and digital environment.

Lastly, even though according to the survey conducted, currently the share of income received from the platform work performed seems to be relatively low, it is expected that new means of generating income through digital platforms will arise. As such, the amount of income generated in the digital economy will most likely increase, which highlights the importance of development initiatives that focus on facilitating the reporting of income in a timely, efficient and reliable manner.

Appendices

Appendix 1. The ICT sector as defined by the OECD

Using the statistical classification of economic activities (NACE Rev. 2), the OECD (2006) defined the ICT sector to include the following activities:

ICT manufacturing

Manufacture of electronic components and boards (NACE Group 26.1)
Manufacture of computers and peripheral equipment (NACE Group 26.2)
Manufacture of communication equipment (NACE Group 26.3)
Manufacture of consumer electronics (NACE Group 26.4)
Manufacture of magnetic and optical media (NACE Group 26.8)

ICT services

Wholesale of information and communication equipment (NACE Group 46.5)
Software publishing (NACE Group 58.2)
Telecommunications (NACE Division 61)
Computer programming, consultancy and related activities (NACE Division 62)
Data processing, hosting and related activities; web portals (NACE Group 63.1)
Repair of computers and communication equipment (NACE Group 95.1)

Appendix 2. Definitions of digital goods and services

Table A2.1 Digital economy goods and services by the BEA

Product code	Product name
182000	The reproduction services of recorded media
261100	Electronic components
261200	Loaded electronic boards
261090	Services connected with manufacturing of electronic integrated circuits; sub-contracted operations as part of the manufacturing of electronic components
262000	Computers and peripheral equipment
262090	Computers and peripheral equipment manufacturing services; sub-contracted operations as part of the manufacturing of computers and peripheral equipment
263010	Radio or television transmission apparatus; television cameras
263021	Line telephone sets with cordless handsets
263022	Telephones for cellular networks or for other wireless networks
263023	Other telephone sets and apparatus for the transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network)
263030	Parts of electrical telephonic or telegraphic apparatuses
263050	Burglar or fire alarms and similar apparatuses
263090	Sub-contracted operations as part of the manufacturing of communication equipment
264010	Radio broadcast receivers
264020	Television receivers, whether combined with radio-broadcast receivers or sound or video recording or reproduction apparatus
264030	Apparatus for sound and video recording and reproducing
264040	Microphones, loudspeakers, reception apparatus for radiotelephony or telegraphy
264050	Parts of sound and video equipment
264060	Video game consoles (used with a television receiver or having a self-contained screen) and other games of skill or chance with an electronic display
264090	Sub-contracted operations as part of the manufacturing of consumer electronics
267010	Photographic equipment and parts thereof
267020	Other optical instruments and parts thereof
268000	Magnetic and optical media
273100	Fibreoptic cables
273200	Other electronic and electric wires, and cables
282300	Office machinery and equipment (except computers and peripheral equipment)
289950	Parts of machines and apparatus of a kind used solely or principally for the manufacture of semiconductor boules or wafers, semiconductor devices, electronic integrated circuits or flat panel displays; parts of other special-purpose machinery
331300	Repair services for electronic and optical equipment
582000	Software publishing services
591100	Motion picture, video and television programme production services
591300	Motion picture, video and television programme distribution services
591400	Motion picture projection services
592000	Sound recording and music publishing services
600000	Programming and broadcasting services
611100	Fixed telephony services – calling features
611200	Fixed telephony services – data transmission

Product code	Product name
611300	Fixed telephony services – access and use
612100	Mobile voice services
612200	Mobile data services
612300	Carrier services for wireless telecommunications
619000	Other telecommunications services
620100	Computer programming services
620200	Computer consultancy services
620300	Computer facilities management services
620900	Other information technology and computer services
631100	Data processing, hosting and related services
631200	Web portal services

Original source: Barefoot et al. (2018) but applied to product classification used in Finland.

Table A2.2 Digital value added by industry (based on the method of the BEA)

Ind. code	Industry	Total value added, mill. EUR	The value added of digital goods and services, mill. EUR	The share of digital goods and services, %
26	Manufacture of computer, electronic and optical products	4,537.54	1,845.94	40.7%
35	Electricity, gas, steam and air conditioning supply	4,054.54	24.24	0.6%
18	Printing and reproduction of recorded media	425.00	23.79	5.6%
28	Manufacture of machinery and equipment n.e.c.	5,002.65	112.66	2.3%
71	Architectural and engineering activities; technical testing and analysis	3,571.40	10.52	0.3%
69–70	Legal and accounting activities; the activities of head offices; management consultancy activities	3,472.79	525.78	15.1%
61	Telecommunications	2,224.53	2,158.40	97.0%
33	Repair and installation of machinery and equipment	1,521.32	51.49	3.4%
10–12	The manufacture of food products, beverages and tobacco products	2,705.00	5.11	0.2%
31–32	The manufacture of furniture; other manufacturing	606.00	1.08	0.2%
53	Postal and courier activities	787.68	0.56	0.1%
22	The manufacture of rubber and plastic products	1,066.00	2.43	0.2%
37–39	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services	1,363.87	0.00	0.0%
29	The manufacture of motor vehicles, trailers and semi-trailers	617.00	0.00	0.0%
64	Financial service activities, except insurance and pension funding	3,533.57	24.80	0.7%
05–09	Mining and quarrying	934.55	0.00	0.0%
94	The activities of membership organisations	1,840.19	3.25	0.2%
74–75	Other professional, scientific and technical activities; veterinary activities	706.82	0.47	0.1%
20	The manufacture of chemicals and chemical products	2,204.00	5.63	0.3%
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	3,130.77	1.06	0.0%
13–15	The manufacture of textiles, apparel and leather products	356.89	0.15	0.0%
47	Retail trade, except that of motor vehicles and motorcycles	6,693.34	6.66	0.1%
66	Activities auxiliary to financial services and insurance activities	1,089.48	0.00	0.0%
79	Travel agency, tour operator reservation service and related activities	246.31	0.00	0.0%
87–88	Social work activities	8,541.19	0.70	0.0%
01	Crop and animal production, hunting and related service activities	1,327.00	0.00	0.0%
02	Forestry and logging	3,784.00	0.00	0.0%
03	Fishing and aquaculture	130.00	0.00	0.0%
51	Air transport	766.00	0.00	0.0%
55–56	Accommodation and food service activities	3,456.94	0.00	0.0%
68A	A of which: imputed rents of owner-occupied dwellings	14,057.59	0.00	0.0%
93	Sports activities and amusement, and recreation activities	1,262.84	0.00	0.0%
96	Other personal service activities	1,123.96	0.00	0.0%
97–98	Activities of households as employers; the undifferentiated goods- and services-producing activities of households for personal use	389.00	0.00	0.0%
24	The manufacture of basic metals	1,875.42	4.08	0.2%
52	Warehousing and support activities for transportation	2,278.00	1.95	0.1%
30	The manufacture of other transport equipment	450.56	2.70	0.6%
73	Advertising and market research	652.42	4.49	0.7%
50	Water transport	669.00	0.27	0.0%
49	Land transport and transport via pipelines	4,662.09	1.80	0.0%

Ind. code	Industry	Total value added, mill. EUR	The value added of digital goods and services, mill. EUR	The share of digital goods and services, %
16	The manufacture of wood and of products of wood and cork, except furniture; the manufacture of articles of straw and plaiting materials	1,310.20	1.36	0.1%
17	The manufacture of paper and paper products	3,251.00	4.81	0.1%
90–92	Creative, arts and entertainment activities; libraries, archives, museums and cultural activities; gambling and betting activities	1,257.88	2.35	0.2%
23	The manufacture of other non-metallic mineral products	1,126.65	7.74	0.7%
86	Human health activities	9,623.10	2.82	0.0%
41–43	Construction	13,871.08	8.15	0.1%
68	Real estate activities	8,016.35	2.88	0.0%
95	The repair of computers and personal and household goods	166.49	2.44	1.5%
65	Insurance, reinsurance and pension funding, except for compulsory social security	1,590.63	36.10	2.3%
78	Employment activities	2,271.52	15.18	0.7%
19	The manufacture of coke and refined petroleum products	1,003.00	4.20	0.4%
80–82	Security and investigation activities; services to buildings and landscape activities; office administrative, office support and other business support activities	3,405.12	6.49	0.2%
77	Rental and leasing activities	1,013.45	3.57	0.4%
25	The manufacture of fabricated metal products, except machinery and equipment	2,686.36	16.89	0.6%
21	The manufacture of basic pharmaceutical products and pharmaceutical preparations	1,582.41	8.57	0.5%
84	Public administration and defence; compulsory social security	10,975.72	54.37	0.5%
36	Water collection, treatment and supply	432.00	24.94	5.8%
72	Scientific research and development	1,449.50	19.13	1.3%
27	The manufacture of electrical equipment	1,846.65	221.16	12.0%
85	Education	9,966.97	41.50	0.4%
46	Wholesale trade, except that of motor vehicles and motorcycles	7,891.99	28.30	0.4%
59–60	Motion picture, video and television programme production; sound recording and music publishing activities; programming and broadcasting activities	943.98	744.51	78.9%
58	Publishing activities	2,598.32	1,325.25	51.0%
62–63	Computer programming, consultancy and related activities; information service activities	5,451.96	4,847.95	88.9%

Source: The authors' calculations and Statistics Finland.

Appendix 3. A summary of the checklist and the data sources

The following table, Table A3.1, reports the steps to be taken and the data requirements. The used abbreviations are as follows: SBFSS stands for *structural business and financial statement statistics* and NA stands for *national accounts*.

Table A3.1 The main steps that should be taken and the data required to calculate the CIT gap using the RA-GAP method for single industries in Finland

Steps	Required data
Check that the studied group fits the method	
1. A focus on non-financial companies liable to CIT	SBFSS
2. Remove the discrepancy between financial accounting statistics and national accounts when industries are defined	Data not public, Statistics Finland: NA and SBFSS
From GOS to FAP	
3. Add foreign source business income	Tax declarations
4. Subtract paid income transfers and add received income transfers	Data not public, Statistics Finland: NA
5. Subtract paid property income and add received property income	SBFSS
6. Subtract paid capital transfers and add received capital transfers	Data not public, Statistics Finland: NA
7. Add holding gains on inventories	Data not public, Statistics Finland: NA
8. Subtract depreciations	SBFSS
From FAP to potential C-TB	
9. Remove foreign income not liable to domestic CIT	Tax declarations
10. Subtract received dividends	Non-public SBFSS
11. Subtract special tax allowances and add disallowed expenses	Tax declarations
12. Add current year losses and subtract the deductions for carried-over loses	Non-public SBFSS, tax declarations
13. Adjust the reporting periods	Non-public SBFSS, tax declarations

Source: The authors.

Endnotes

1 See, e.g. OECD (2015), pp. 54–63, for further examples of digital business models.

2 Arvonlisäverolaki 30.12.1993/1501.

3 Laki elinkeinotulon verottamisesta 24.6.1968/360.

4 Tuloverolaki 30.12.1992/1535.

5 The methods are described in, e.g. the work of Hutton (2017; for evaluating the VAT gap) and of Ueda (2018; for the CIT gap).

6 For a discussion on the critiques of cross-country growth regressions, see, e.g. Levine and Renelt (1992).

7 The supply table belongs to a group of part input–output tables produced by statistical bureaus in each country.

8 In the US case, the supply table included about 5,000 categories of goods and services. Out of those categories, about 150 goods/services were considered to be primarily digital.

9 This detailed supply-use table is only available via special data request from Statistics Finland.

10 We used Statistics Finland table entitled 'Annual national accounts: 123h [– Income and production by sector and industry, annually, 1975–2018'.

11 We obtained permission from Statistics Finland to analyze their data at the unit level, following their terms and conditions of confidentiality.

12 This sum does not, however, exactly match the industry-level figures of national accounting. As a consequence, we corrected the sum to correspond with the national accounting.

13 The list of ICT occupations used in this study is very close to the list by the OECD (Calvino et al., 2018).

14 Relative to GDP in base prices.

15 Source: https://www.ficom.fi/ict-ala/tilastot/verkko-pankin-k%C3%A4ytt%C3%A4minen.

16 Source: https://www.ficom.fi/ict-ala/tilastot/verkko-pankin-k%C3%A4ytt%C3%A4minen.

17 Source: Eurostat.

18 Source: https://www.nordea.com/fi/media/uutiset-ja-lehdistotiedotteet/press-releases/2018/06-11-11h33-nordean-digitaalinen-sijoitusneuvoja-nora-auttaa-nyt-sijoittamaan.html.

19 Source: Statista.

20 Statistics Finland (Financial statements inquiry for enterprises).

21 This request has only been included in the survey since 2013. For that reason, alternative indicators cannot be calculated for 2010–2012.

22 Study and Reports on the VAT Gap in the EU-28 Member States: 2019 Final Report, available at: https://ec.europa.eu/taxation_customs/sites/taxation/files/vat-gap-full-report-2019_en.pdf, accessed 2.6.2020.

23 Myrsky and Linnakangas (2009), pp. 2–3.

24 Tax Foundation, March 2020.

25 See Section 3.3 in respect to this.

26 See ECJ Case Hallifax and others, C-255/02.

27 This section is mainly based on Ueda (2018).

28 Council Implementing Regulation (EU) No 282/201 laying down implementing measures for Directive 2006/112/EC on the common system of value added tax'.

29 See Annex 10.1.

30 Because of the difficulties created by COVID-19, the European Commission proposed to postpone the introduction of new e-commerce VAT rules by six months. Once adopted by the European Council, the rules will apply as of 1 July 2021 (instead of 1 January 2021), giving Member States and businesses enough time to prepare.

31 Study and Reports on the VAT Gap in the EU-28 Member States: 2019 Final Report, available at: https://ec.europa.eu/taxation_customs/sites/taxation/files/vat-gap-full-report-2019_en.pdf, p. 17 (accessed 2020-06-02).

32 European Commission (2020) 198 final.

33 There is a large amount of empirical research on the incidence of VAT, which suggests that at least in the short run, the pass-through of the tax onto consumer prices varies between industries (see, e.g. Benzarti et al., 2020; Buettner et al., 2019).

34 VAT collection efficiency is often measured with C-efficiency. It is the ratio of actual to potential revenue, where the potential revenue is calculated applying the standard rate to the total final consumption. The corresponding tax gap can be divided into a compliance gap and policy gap (see Ueda, 2017).

35 Study and Reports on the VAT Gap in the EU-28 Member States: 2017 Final Report, available at: https://ec.europa.eu/taxation_customs/sites/taxation/files/study_and_reports_on_the_vat_gap_2017.pdf (accessed 2020-06-02).

36 This section is mostly based on Hutton (2017).

37 The use of alternative tax rules implicitly assumes that taxes do not influence demand or supply. This is a strong assumption, especially in the case of applying the standard rate instead of current rates to all commodities. The VAT rate increases that are needed for commodities that currently have a reduced rate or are fully exempt would generate non-negligible income and substitution effects. Thereby, the total VAT revenue potential is overestimated, and the sectoral tax incidence is less precise.

38 Imports here cover both importation from 3rd countries and intra-community acquisitions.

39 We thank economist Aki Savolainen from the FTA for running the simulations with the RA-GAP model of the FTA and helping to interpret the results.

40 See the FTA's website: https://www.vero.fi/en/individuals/tax-cards-and-tax-returns/income/earned-income/sharing_economy/rental-income-from-airbnb/.

41 See https://www.vero.fi/syventavat-vero-ohjeet/kannanotot/47702/joukkoistetun_henkilokuljetustoiminnan_/.

42 Varonen (2018), p. 1.

43 Finnish Tax Administration (2020a).

44 Finnish Tax Administration (2020b).

45 Varonen (2018), p. 2.

46 Varonen (2018), p. 2.

47 Varonen (2018), p. 2.

48 'Noin 0,3 prosenttia suomalaisista sai vähintään neljäsosan ansioistaan digitaalisten alustojen kautta vuonna 2017' (http://www.stat.fi/til/tyti/2017/14/tyti_2017_14_2018-04-17_tie_001_fi.html).

49 Finland has introduced a measure for SMEs which relieves part of the payable VAT if the yearly turnover is under EUR 30,000. See Section 149a of the Finnish VAT Act.

50 For this question, we use the annual earnings measure downloaded from Upwork API rather than self-reported values.

[51] 'Airbnb-vuokraajien verovilunki tuplaantunut – Verottaja huomasi että tuloja jää ilmoittamatta jo 15 miljoonaa euroa', available at https://yle.fi/uutiset/3-11043579.

[52] 'Suomi – satunnaisten vuokratulojen verotus', available at https://assets.airbnb.com/help/airbnb-pwc-taxguide-finland-fi.pdf.

[53] See https://www.uber.com/fi/fi/drive/requirements/.

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