

***SUPERIORITY OF THE VAT TO TURNOVER TAX  
AS AN INDIRECT TAX ON DIGITAL SERVICES***

Karl Russo

*Countries seeking to address the challenges of taxation in a digitalizing economy have proposed or enacted indirect digital services taxes (DSTs) rather than income taxes in part to satisfy international income tax treaty obligations. The VAT is superior on efficiency grounds to these turnover taxes. The DSTs are likely to have a similar incidence to the VAT in raising prices to final consumers. However, the turnover taxes are more likely to distort production decisions by firms and to risk cascading and double taxation. The DST could be viewed as a special higher rate VAT on digital services. The paper explores possible economic rationales for a special higher rate of indirect tax: taxing leisure complements, taxing items with lower costs of avoidance or evasion, and taxing items that generate negative externalities. It is far from clear that any of these conditions hold in the case of digital services. The administrative and other concerns with implementing a higher rate tax weigh against doing so even if the case could be made. The economic analysis here suggests continuation of efforts to ensure the VAT system applies effectively in the digitalizing economy would yield superior outcomes relative to interim measures that tax turnover while the broader international community seeks a consensus-based long-term solution.*

*Keywords: value added tax, turnover tax, incidence, efficiency*

*JEL Codes: F0, H21, H22, H25*

## Introduction

While the discussion at the OECD continues to consider the allocation of taxing rights in the digitalizing economy, the OECD acknowledged in the 2018 Interim Report that countries could pursue various interim measures including a turnover tax on digital services. In that paper it was suggested, however, that countries imposing such a tax needed to respect existing tax treaties and other international obligations. In part to respect these treaty obligations, the digital services taxes (“DSTs”) that have been proposed have been characterized as indirect taxes rather than as direct taxes on the income of companies providing the services.<sup>1</sup> In addition to any tax treaty considerations, an indirect tax would be subject to the national treatment requirements of the World Trade Organization (“WTO”).<sup>2</sup> Furthermore Turina (2018) suggests that a response to tax concerns about the digitalizing economy “would not necessarily lie in the realm of income taxation” and that an indirect tax following “destination-based logic would seem to more accurately depict [sic.] the underlying shift that the concerned policy developments would seem to convey.”

If governments decide to impose an indirect tax on digital services, the value added tax (“VAT”) and similar goods and services taxes are economically superior to turnover taxes. Among the advantages of VAT over a separate turnover tax with respect to digital services are (1) VAT does not distort business production decisions (*e.g.*, the choice between digital versus print advertising) and (2) VAT does not vary based on the number of companies in the supply chain (*i.e.*, VAT does not cascade). Experience has shown that VAT can be applied to digital

---

<sup>1</sup> See, for example, “[C]rediting the new tax (an indirect tax) against corporate income tax (a direct tax) or vice versa would compromise the legal nature of the tax and impact double tax conventions.” European Commission, Impact Assessment “Fair Taxation of the Digital Economy,” Staff Working Document 82, March 21, 2018, p. 57.

<sup>2</sup> Article III General Agreement on tariffs and trade “The products of the territory of any contracting party imported into the territory of any other contracting party shall not be subject, directly or indirectly, to internal taxes or other internal charges of any kind in excess of those applied, directly or indirectly, to like domestic products.”

services effectively, and the OECD and European Commission (“EC”) are actively engaged in further refinement of the VAT rules to enhance collection of tax on digital services.<sup>3</sup> For example, both the OECD and the EC have recommended that online platforms be liable for collection of VAT on imports. A separate indirect tax with respect to digital services may constitute a special higher rate of tax on a special class of services, which can only be justified under limited circumstances. Furthermore, to the extent that the cost of digital intermediate inputs is reflected in the price of final goods and services, they are already taxable in countries that impose VAT or other broad-based consumption taxes.

This paper begins with a discussion of the international obligations that constrain tax policy choices. Second, it briefly describes enacted and proposed DSTs. Next, it reviews the current treatment of digital services under existing EU VAT rules. It then describes how the VAT differs from a turnover tax and the associated economic effects, including a review of the literature. The next section explores the economic arguments for special higher indirect taxes and whether a DST or a special VAT rate on digital services may be justified on those grounds. The final section concludes.

---

<sup>3</sup> European Commission, Impact Assessment “Fair Taxation of the Digital Economy,” Staff Working Document 82, March 21, 2018, p. 5: “the VAT system is effectively being adapted to the digital economy.” Council Directive (EU) 2017/2455, available at [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2017.348.01.0007.01.ENG&toc=OJ:L:2017:348:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2017.348.01.0007.01.ENG&toc=OJ:L:2017:348:TOC); OECD, “The Role of Digital Platforms in the Collection of VAT/GST on Online Sales,” March 2019, available at <http://www.oecd.org/tax/consumption/the-role-of-digital-platforms-in-the-collection-of-vat-gst-on-online-sales.pdf>. Some have correctly pointed out that a VAT regime may not be a silver bullet. Economic actors that one normally looks to for tax enforcement may be physically absent under a consumption tax regime as they would be under an income tax regime (Hellerstein, 2014). The basis for charging VAT when no identifiable remuneration changes hands is unclear (Schippers and Verhaeren, 2018). However, these issues are also present under the proposed digital services tax regimes. Therefore, efforts to resolve these issues may be better spent in service of an option that creates fewer economic distortions.

## International obligations

The European Commission (2017) acknowledges that turnover taxes may not be compatible with double-taxation treaties, State aid rules, fundamental freedoms, and international commitments under the free trade agreements and WTO rules. In part to address potential concerns with income tax treaties, the digital services taxes that have been proposed have been characterized as indirect taxes rather than as direct taxes on the income of companies providing the services.<sup>4</sup> However, indirect taxes are not immune from international concerns.<sup>5</sup> Even if certain tax measures are permissible under WTO rules, it may be inadvisable for Members to use them (Daly 2016).

The European Union Council Directive (2006) forbids creation of turnover taxes other than VAT.<sup>6</sup> The European Court of Justice has determined that the essential characteristics of VAT are (1) the tax applies generally to transactions relating to goods or services; (2) it is proportional to the price charged by the taxable person in return for the goods and services which he has supplied; (3) it is charged at each stage of the production and distribution process, including that of retail sale, irrespective of the number of transactions which have previously taken place; and (4) the amounts paid during the preceding stages of the process are deducted from the tax payable by a taxable person, with the result that the tax applies, at any given stage, only to the value added at that stage and the final burden of the tax rests ultimately on the consumer. The EU impact assessment recognizes the need to characterize the DST as a tax which lacks all the criteria of VAT so that it is treated as a permissible indirect tax that is not a

---

<sup>4</sup> For example, European Commission (2018a, p. 57) states that "...[C]rediting the new tax (an indirect tax) against corporate income tax (a direct tax) or vice versa would compromise the legal nature of the tax and impact double tax conventions."

<sup>5</sup> In 2014, Hungary introduced a tax on advertising services, which was subsequently suspended due to a State aid challenge from the European Commission (Commission Decision (EU), 2017).

<sup>6</sup> Selective excise taxes may be permissible but must comply with other obligations, as discussed below.

turnover tax. However, in its assessment of the economic effects of the digital services tax, the European Commission refers to the “turnover base” (European Commission, 2018, p. 56); a tax rate “applied on turnover” (p. 58); “a pure turnover tax” (p. 75); “a new tax on turnover” (p. 75); and “‘equalization levy’ imposed on the turnover” of digitalized companies (p. 139). OECD (2018) characterizes the Indian equalization levy, the Italian levy on digital transactions, the Hungarian advertisement tax, and the French tax on online and physical distribution of audio-visual content as turnover taxes, while in addition Hadzhieva (2019) does so for proposals in Germany and Spain. While names are not dispositive, they are suggestive.

In addition to EU requirements, WTO requirements may constrain the policy options for DSTs. Daly (2016) has noted that WTO rules encompass not just import tariffs, but also direct as well as indirect internal taxes, especially insofar as these taxes affect international trade in goods and services. The General Agreement on Tariffs and Trade Article III provides limits on the internal taxes, including excise taxes, that contracting parties may apply that might afford protection to domestic production. Specifically, imported products shall not be subject, directly or indirectly, to internal taxes or other internal charges of any kind in excess of those applied, directly or indirectly, to like domestic products (World Trade Organization, 1994a). The General Agreement on Trade in Services Article XVII on National Treatment requires that each member country accord to services and services suppliers of any other member, in respect of all measures affecting the supply of services, treatment no less favorable than that accorded to its own like services and service suppliers (World Trade Organization 1994b). It further provides that, whether the treatment is formally identical or different, it shall be considered to be less favorable if it modifies the conditions of competition in favor of services or service suppliers of the host country compared to like services or service suppliers of any other country. The European

Union has pledged national treatment for computer-related services and advertising, which are most likely to be implicated by any DST (Hufbauer and Lu, 2018). Obligations under GATT and GATS embody the commitment countries have made to avoid protectionism and discrimination in the application of internal taxes. In assessing the scope of the proposed EU DST, the European Commission (2018) acknowledged that “a specific threshold above EUR 50 million could risk a de-facto discrimination” because it could provide less favorable treatment to foreign providers of digital services. It is an open question whether the various thresholds being considered by individual WTO Members on a unilateral basis violate the national treatment commitments they have made. In contrast, it has been observed in another context that “the EU’s regime for taxing the sale of all electronic services....should not violate national treatment obligations under Article III of the GATT and Article XVII of the GATS” (Grinberg, 2017, pp. 809–810).

Turina (2018) questions whether as a matter of policy “stressing the dissimilarity of equalization levies from VAT should be encouraged or, instead, the potential for convergence should be seized as an opportunity ... to provide a response to the current tax challenges of the digital economy....[I]t forces one to contemplate whether, at least from an EU perspective, the most suitable avenue for intervention might lie not so much in the realm of direct taxation (or of a direct tax ‘disguised’ as an indirect one) but, rather, in a comprehensive reform of indirect tax rules dealing with digital supplies.” Insofar as the DST fails to share the characteristics of VAT, it results in a turnover tax that is economically inferior, as discussed below.

## Enacted Digital Services Taxes

**France.** In 2016, France expanded the scope of a preexisting tax on audio-visual content to include advertising revenue related to video-on-demand services provided to the customer for

free (OECD, 2018). France imposes a tax of two percent (10 percent in the case of certain explicit or violent content) on 1) the consideration paid (exclusive of VAT) for the purchase, rental, or access to online audio-visual content and 2) the consideration paid (including through an advertising intermediary) for the display of advertisements and/or sponsorships linked to a particular online audio-visual content. Liability for online services arises if the audience is located in France, without regard to the location, residence, or status of the supplier. Threshold exemptions apply for amounts in 2) above. A taxpayer is allowed a deduction of four percent (66 percent where the audio-visual content is created by private users for the purpose of sharing and exchanging among members of a community sharing interests), and only the remaining amount in excess of EUR 100,000 is subject to tax.

**Hungary.** In 2014, Hungary introduced a tax on advertising services, which was subsequently suspended due to a State aid challenge from the European Commission (Commission Decision (EU), 2017). A modified version of the advertisement tax took effect July 1, 2017. Advertisement tax applies to certain advertising services, including advertising services made available over the internet, television, radio, billboards, newspapers, vehicles, and others. The tax applies in respect of advertisements that are published in Hungarian, or where the advertisement is available on a website/webpage that is mainly in Hungarian. In the case of primary taxpayers (companies providing the advertising service), the tax is based on total trading revenue (exclusive of VAT) at a rate of zero percent for the first HUF 100 million and 7.5 percent thereafter. The tax does not apply to self-promotion, and advertisement tax liability arises only for publishing as business activity.<sup>7</sup> While penalties apply for noncompliance, “local

---

<sup>7</sup> <http://taxsummaries.pwc.com/ID/Hungary-Corporate-Taxes-on-corporate-income>

tax authorities have reported relatively low levels of compliance of non-resident enterprises with the measure and, consequently, no meaningful tax revenue” (OECD, 2018).

**India.** Effective June 1, 2016, India imposes an equalization levy of 6 percent of the gross amount of consideration paid by an Indian business, or non-resident having a permanent establishment in India, to a non-resident for the provision of any specified service (Finance Act, 2016). A specified service means online advertisement, any provision for digital advertising space or any other facility or service for the purpose of online advertisement, and includes any other service as may be notified by the Central Government. The tax does not apply where the non-resident providing the specified service has a permanent establishment in India and the specified service is effectively connected with such permanent establishment. The tax also does not apply where the aggregate consideration for specified services for a year does not exceed INR 100,000 (about \$1450). The levy is effective for payments made from June 1, 2016.

## Proposed Digital Services Taxes

**Austria.** On April 4th, 2019, the Austrian Ministry of Finance submitted the draft Digital Tax Act 2020 for consultation. The Act applies a digital services tax of 5 percent to revenues generated in Austria through sales of online advertising space, such as banner advertising and search engine advertising. The tax applies to corporations with total annual worldwide revenues exceeding EUR 750 million and domestic revenues deriving from sales of online advertising space exceeding EUR 25 million. The entity in receipt of the taxable revenues calculates and pays the digital services tax. After fiscal year end, the company files a digital services tax return.

Further, record-keeping requirements apply with regard to the online advertising services rendered, the customers, and the calculation base.<sup>8</sup>

**Chile.** On June 21, 2018, the Chilean finance minister announced that the government's proposal for tax modernization would include taxation of the digital economy (Salgado and Ugalde, 2018). On August 23, 2018, Chile introduced a proposal to tax digital services.<sup>9</sup> The proposed tax applies to digital services provided by persons or entities domiciled or resident abroad to Chilean natural persons. Digital services include 1) digital intermediation between providers and users of services that may be concluded by electronic means; 2) paid entertainment services for digital content, including images, movies, series, videos, music, games, and other digital entertainment provided through download, streaming, or other technology; 3) certain advertising and promotional services and the use and subscription of internet platform services; and 4) data storage services, including cloud services. The rate of tax is 10 percent. If payment for services is made in cash, the tax is due by the provider of the digital services. If payment is made by electronic means, the issuer of the electronic payment has an obligation to withhold the tax from the payment for services.

**European Commission.** The European Commission (2018b) proposes a digital services tax of three percent on the gross revenues (net of value added tax or similar taxes) resulting from the provision of certain digital services. Taxable services are 1) the placing on a digital interface of advertising targeted at users of that interface, 2) the making available to users of a multisided digital interface which allows users to find other users and to interact with them, and which may also facilitate the provision of underlying supplies of good or services directly between users,

---

<sup>8</sup> <https://www.pwc.at/de/newsletter/austrian-tax-news.html>

<sup>9</sup> Mensaje de s.e. el Presidente de la República con el que Inicia el Proyecto de Ley que Moderniza la Legislación Tributaria, Cámara de Diputados, Mensaje No. 107-366, Boletín No. 12043-05, August 23, 2018, available at [https://www.camara.cl/pley/pley\\_detalle.aspx?prmID=12561&prmBL=712043-05](https://www.camara.cl/pley/pley_detalle.aspx?prmID=12561&prmBL=712043-05).

and 3) the transmission of data collected about users and generated from users' activities on digital interfaces. A user is any individual or business. A digital interface means any software accessible by any individuals or businesses. Several exceptions to the definition of taxable services apply.

The digital services tax is only chargeable in a Member State on the portion of taxable revenues obtained by a taxable person in a calendar year that is treated as obtained in that Member State. A taxable person means an entity with 1) total worldwide revenues for the year that exceed EUR 750 million and 2) total taxable revenues obtained within the European Union for the year that exceed EUR 50 million. The determination of the location of taxable revenues (and thus liability for the tax and the distribution of tax revenue among Member States) is generally made on the basis of the location of users with respect to taxable services.

**France.** On April 9, 2019, France's National Assembly (lower house) passed a bill that would impose a 3 percent tax on companies providing certain digital services in France with global annual revenue in excess of EUR 750 million and revenue in France exceeding EUR 25 million.<sup>10</sup> The proposed tax would apply to digital gross sales (net of VAT) realized as of January 1, 2019. Services within the scope of the tax include the following services derived from users located in France (generally meaning accessed on a terminal located in France): 1) digital intermediation (e.g., online marketplaces, dating services, and app stores) except with respect to goods subject to excise tax (e.g., wine, alcohol, gas, tobacco, etc.), and 2) sale of targeted online advertising placed on a digital interface based on the interface user's data collected or generated through the use of such interface, which could include the purchase, storage, and distribution of advertising messages, advertising control, and performance

---

<sup>10</sup> Draft Law 1838 presented to the National Assembly on April 3, 2019, available at <http://www.assemblee-nationale.fr/15/ta-commission/r1838-a0.asp>.

measurement, as well as services for managing and transmitting user data. Services outside the scope of the tax include: 1) provision of a digital interface primarily used to provide digital content (e.g., video and audio streaming), communication services (e.g., messaging), or payment services, which should exclude e-commerce, online advertising that does not involve user data, and the sale of data if not collected online or used for advertising purposes; 2) regulated financial services; and 3) services provided between companies in the same group. The tax is generally collected and controlled according to the procedures that apply to the French VAT. Taxpayers not subject to French VAT or otherwise not established in a country with a mutual assistance agreement on the collection of taxes must appoint a tax representative subject to French VAT to pay the tax in its place. The tax should be deductible for French corporate tax purposes.<sup>11</sup>

**Israel.** The Israel Tax Authority and the Ministry of Finance have been considering a DST similar to the French proposal. A previous proposal to require internet companies that engage in business-to-consumer transactions to pay VAT was blocked by the Ministry of Finance. It is unclear whether the DST is a substitute for the VAT change or if Israel also plans to pursue expansion of the VAT.

**Italy.** In December 2018, Italy passed the 2019 Italian Budget Law that introduces a new digital services tax and repeals the previous digital services tax that never entered into force due to the lack of implementing secondary legislation.<sup>12</sup> The new tax enters into force 60 days after the Ministry of Finance issues an implementation decree (i.e. secondary legislation). This implementation decree will include more detail on the scope of the tax, which is expected to be

---

<sup>11</sup> <https://www.pwc.com/us/en/services/tax/library/insights/france-proposes-digital-tax-delay-in-corporate-rate-reduction.html>

<sup>12</sup> <https://www.pwc.com/gx/en/tax/newsletters/tax-policy-bulletin/assets/pwc-italy-2019-budget-law-introduces-a-digital-service-tax.pdf>

similar to the European Commission's proposals from March 2018.<sup>13</sup> The tax rate is 3 percent of the gross revenues net of VAT. A taxable entity is one with 1) total worldwide revenues for the year that exceed EUR 750 million and 2) total taxable revenues within the Italian territory for the year that exceed EUR 5.5 million. Tax assessment, penalties, tax collection, and dispute resolution procedures are the same as for the Italian VAT.

**Turkey.** Presidential Decree No. 476 was published in Turkey's Official Gazette dated December 19, 2018, stating that payments made to those providing digital advertising services (or to those who intermediate advertisement services on the internet) will be subject to income/corporate withholding tax in Turkey.<sup>14</sup> The following rates apply from 1 January 2019: 1) 15 percent of payments to real persons, regardless of whether they are taxpayers or not; 2) 15 percent of payments to non-resident corporations; and 3) zero percent of payments to agencies with corporation tax liability in Turkey.

**United Kingdom.** In the Budget presented to Parliament on October 29, 2018, the UK proposed a digital services tax effective April 2020.<sup>15</sup> The two-percent tax applies to revenues that are linked to the participation of UK users and that are generated from the provision of search engines, social media platforms, and online marketplaces. The first £25 million of revenue linked to the participation of UK users is exempt. Groups that generate global revenues from such business activities in excess of £500 million per year are subject to the tax. A safe harbor exempts loss-making firms and reduces the rate of tax on businesses with very low profit

---

<sup>13</sup> European Commission, 2018/0073 (CNS) "Proposal for a Council Directive on the common system of a digital services tax on revenues resulting from the provision of certain digital services," available at [https://ec.europa.eu/taxation\\_customs/sites/taxation/files/proposal\\_common\\_system\\_digital\\_services\\_tax\\_21032018\\_en.pdf](https://ec.europa.eu/taxation_customs/sites/taxation/files/proposal_common_system_digital_services_tax_21032018_en.pdf).

<sup>14</sup> <https://www.pwc.com/tr/en/hizmetlerimiz/vergi/bultenler/2019/turkey-introduces-withholding-tax-on-online-advertising-revenue.html>.

<sup>15</sup> HM Treasury, Budget 2018, October 29, 2018, available at [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/752201/Budget\\_2018\\_print.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/752201/Budget_2018_print.pdf), p. 44.

margins. The tax applies to revenue derived directly or indirectly from online advertising only to the extent they are related to the provision of a search engine, social media platform, or online marketplace.<sup>16</sup> Financial and payment services, the provision of online content, sales of software and hardware and television and broadcasting services are not subject to tax. The tax is intended to apply temporarily, is subject to formal review in 2025, and may be terminated sooner if an appropriate international solution is in place. The digital services tax is a deductible expense for purposes of the corporate income tax, but it is outside the scope of double tax treaties and is therefore not creditable against the corporate tax.<sup>17</sup>

## Existing VAT treatment of digital economy

A number of countries apply value-added taxes (VAT) to digital products and services.<sup>18</sup> The following provides a brief description of those taxes in a selection of those countries.

**Australia.** Since July 1, 2017, Australia's Goods and Services Tax (GST) has applied to digital products and services provided by nonresident suppliers, including streaming or downloading of movies, music, apps, games, and e-books, and architectural and legal services.<sup>19</sup>

**European Union.** The European Commission has declared that the VAT system is effectively being adapted to the digital economy (European Commission 2018a). Since January 1, 2015, the European Union (EU) has required that VAT be applied to suppliers of digital products and services to EU-based residents, including apps, games, software downloads,

---

<sup>16</sup> HM Treasury, Budget 2018: Digital Services Tax, available at [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/752172/DST\\_web.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/752172/DST_web.pdf), p. 1.

<sup>17</sup> *Ibid*, p. 2.

<sup>18</sup> See, for example, Taxamo, "Digital Tax Rules in Operation Across the Globe," available at <https://blog.taxamo.com/insights/digital-tax-rules-in-operation>.

<sup>19</sup> Tax and Superannuation Laws Amendment (2016 Measures No. 1) Bill 2016, available at <https://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p?query=Id:%22legislation/billhome/r5613%22>.

ebooks, music and video streaming.<sup>20</sup> The VAT tax rate that applies is based on the location of the consumer. The VAT only applies to consumer sales, not business-to-business sales. Non-EU companies register for VAT under the Mini One-Stop Shop system, meaning registration is only required in one EU member state. In 2017, the EU announced new rules to clarify and simplify the VAT regime for e-commerce.<sup>21</sup> Under these rules, which come into force by 2021, online marketplaces facilitating distance sales of imported goods are deemed to have received and supplied those goods themselves, and are thus liable for VAT on those sales. Pierre Moscovici, Commissioner for Economic and Financial Affairs, Taxation and Customs has noted that “[b]rick by brick and piece by piece, a new VAT system is being built that is fit for purpose and within which internet companies operating across borders can thrive. At the same time, we are making sure that non-EU businesses do not get preferential treatment when selling to EU consumers - both directly and through online marketplaces.”<sup>22</sup>

In proposing a definition of digital services for purposes of the turnover threshold in its interim DST, the European Commission suggested that the VAT definition of electronically supplied services could serve as inspiration. Electronically supplied services include “services which are delivered over the Internet or an electronic network and the nature of which renders their supply essentially automated and involving minimal human intervention, and impossible to ensure in the absence of information technology” (Council of the European Union, 2011). In particular, the “provision of advertising space including banner ads on a website/web page” is specifically included in the definition of electronically supplied services.

---

<sup>20</sup> European Commission, “e-Commerce Directive,” available at <https://ec.europa.eu/digital-single-market/en/e-commerce-directive>.

<sup>21</sup> Council Directive (EU) 2017/2455, available at [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2017.348.01.0007.01.ENG&toc=OJ:L:2017:348:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2017.348.01.0007.01.ENG&toc=OJ:L:2017:348:TOC).

<sup>22</sup> European Commission, “VAT: Commission welcomes agreement on simpler and more efficient rules for businesses that sell goods online,” December 5, 2017, available at [http://europa.eu/rapid/press-release\\_IP-17-4404\\_en.htm](http://europa.eu/rapid/press-release_IP-17-4404_en.htm).

**Japan.** The VAT in Japan applies when a business transfers goods, provides services, or imports goods into Japan.<sup>23</sup> The current applicable tax rate is 8 percent, and increases to 10 percent on October 1, 2019. Since 2015, the VAT has applied to the cross-border provision by foreign service providers of digital services, including e-books, news, music, movies, games, online shopping, booking, advertising, and cloud services, but excluding telecommunication services and online banking services. In this respect, a reverse-charge mechanism is applicable for business-to-business (B2B) transactions, and foreign digital service providers may need to register for VAT purposes with regard to business-to-consumer (B2C) transactions.

**New Zealand.** Since 2016, New Zealand's Goods and Services Tax (GST) has applied to all remote services, including digital services involving user value creation. The GST does not currently apply to low-value imported goods, but the government is in the process of finalizing its preferred approach for collecting GST on such goods.<sup>24</sup>

**South Korea.** In December 2018, South Korea's National Assembly passed legislation to apply the country's VAT to certain digital services provided by foreign service providers to consumers, including online ads and cloud computing, effective July 1, 2019. The VAT had already applied to a limited range of digital services, including app sales.<sup>25</sup>

## VAT vs Turnover Tax

### Incidence

Understanding the incidence of a tax, that is how the tax affects prices, is necessary to its economic analysis. The change in price of a good as a result of imposition of a tax depends on

---

<sup>23</sup> <http://taxsummaries.pwc.com/ID/Japan-Corporate-Other-taxes>.

<sup>24</sup> New Zealand Government's Tax Working Group, "Future of Tax, Interim Report," available at <https://taxworkinggroup.govt.nz/resources/future-tax-interim-report>, p. 81.

<sup>25</sup> William Hoke, "Korea Expands VAT to Business-to-Consumer Digital Sales," Tax Notes, December 13, 2018.

how sensitive consumer demand and producer supply are to changes in prices, that is, on the price elasticity of demand relative to the price elasticity of supply (Fullerton and Metcalf, 2002).<sup>26</sup> For an analysis of the economic incidence of a tax, it is this structure of the market that matters and not whether the tax is a direct tax such as a corporate income tax or an indirect tax such as a turnover tax or what the statutory incidence might be. In the case of competitive markets, an excise tax is borne by consumers in the form of higher prices.

Some may question the degree of competition in digital markets. OECD (2015) describes network effects as an important feature of many businesses in the digital economy and that network effects combined with low incremental costs may cause markets to tend toward monopoly or oligopoly. However, this may mischaracterize the relevant market. For example, Lowry (2019) notes that even if one company dominates the search engine market, it may still compete against other firms, such as one that dominates social networking, in the market for digital advertising. Digital economy firms that sell digital advertising space also compete with firms providing advertising services via television, print, and radio, which could constrain their ability to set prices well above their marginal cost of production.

The empirical<sup>27</sup> evidence suggests that consumers bear the burden of indirect taxes such as turnover taxes, value-added taxes, excise taxes, and sales taxes in the form of higher prices, though some studies have found that prices may rise by more or less than the full amount of the tax depending on market conditions. Retail prices have been found to change with changes in

---

<sup>26</sup> For a general discussion of the incidence of taxes under various market conditions, see Weyl, E. Glen and Michael Fabinger, 2013. "Pass-Through as an Economic Tool: Principles of Incidence under Imperfect Competition." *Journal of Political Economy* 121 (3), 528–583.

<sup>27</sup> A *theoretical* paper shows that if a monopolist supplies a service at zero marginal cost, a tax on the service may not increase the price of the service. The incidence of the tax falls on the seller of services or on consumers in the form of lower quality. Wolfram F. Richter, "Taxing Direct Sales of Digital Services: A Plea for Regulated and Internationally Coordinated Profit Splitting," Munich Society for the Promotion of Economic Research, CESifo Working Paper 7017, April 2018, pp. 16.

sales taxes in the United States (Poterba, 1996) and Canada (Smart and Bird, 2009a) and changes in the standard VAT rate in Europe (Benedek, et al. 2015). Besley and Rosen (1999) find that prices rise by the amount of the tax for half of the goods studied and by more than the amount of the tax for the remainder. In the context of taxes on beverages, studies have found that companies have absorbed some of the tax, that is, prices have risen by less than the full amount of the tax (Etile, Lecocq, and Boizot-Szantai, 2018; Cawley and Frisvold, 2017; Berardi et al., 2016), the full or almost full amount of the tax (Berardi et al., 2016), and more than the full amount of the tax (Bergman and Hansen, 2017). Another finds that excise taxes are more than shifted to consumers, though there is less shifting if the tax change is larger relative to the price of the good and in the case of tax reductions as compared to tax increases.<sup>28</sup> The degree of over- or under-shifting of excise taxes may be a function of nominal pricing rigidities (Conlon and Rao, 2017).

Various studies have examined the effect of excise taxes on prices in less than perfectly competitive markets. For tobacco products, there is evidence of full or near full shifting (DeCicca, Kenkel, and Liu, 2015) and over-shifting (Delipalla and O'Donnell, 2001) of excise taxes to consumer prices. Alm, Sennoga, and Skidmore (2009) find “strong and consistent evidence of full shifting of gasoline taxes to the final consumer.” Even in the rural markets in which a gas station may be the sole provider of gasoline for many miles and firms may exhibit some monopolistic pricing power, nearly 95 percent of the excise tax is still passed on to consumers. Marion and Muehlegger (2011) find at least full pass through of Federal and State diesel and gasoline excise taxes to consumers, though less than full pass through for diesel taxes when U.S. refinery capacity utilization is high.

---

<sup>28</sup> U. Michael Bergman and Niels Lynggård Hansen, “Are Excise Taxes on Beverages Fully Passed Through to Prices? The Danish Evidence, June 26, 2017, available at <https://www.researchgate.net/publication/268429840>.

## Production efficiency

Blundell and Preston (2019) identify one of the key arguments for the superiority of the VAT as a way of collecting taxes is that VAT is “designed to fall on transactions between firms and households, but should leave transactions between firms untaxed.” The DST may act as a tax between firms on business inputs, for example, advertising. As part of an optimal tax system, taxes on business inputs should generally be avoided as they may distort production decisions by firms and prevent production efficiency.<sup>29</sup> Such taxes may distort not only decisions about which inputs to purchase but also about whether such inputs are purchased in markets or produced in-house.<sup>30</sup> The intuition behind the desirability of production efficiency is that business transactions should not be taxed because any distortion of production decisions reduces total economic output. Unless taxation of intermediate goods can be justified on the grounds that the intermediate goods generate externalities, “production efficiency ... remain[s] the best guiding principle for practical tax design. The requirement of production efficiency...is a key reason for the use of the VAT” (Crawford, Keen, and Smith, 2010, p. 283–4). The desirability of production efficiency “implies that turnover taxes are inefficient” (Heady, 1993, p. 38). To the extent that a turnover tax on digital services alters production decisions by firms, it violates the principle of neutrality.

---

<sup>29</sup> Peter A. Diamond and James A. Mirrlees, “Optimal Taxation and Public Production I: Production Efficiency,” *American Economic Review*, vol. 61, no. 1, March 1971, p. 24. It has been observed that the production efficiency theorem articulated by Diamond and Mirrlees relies on assumptions that may not be satisfied. However, one researcher has commented that the theorem “provides a very useful bench-mark that is widely applicable. It is best to presume the desirability of production efficiency, and place the burden of proof on the people who are arguing for an exception.” Christopher Heady, “Optimal Taxation as a Guide to Tax Policy: A Survey,” *Fiscal Studies*, vol. 14, no. 1, February 1993, p. 39.

<sup>30</sup> Michael Smart and Richard M. Bird, “The Impact on Investment of Replacing a Retail Sales Tax with a Value-Added Tax: Evidence from Canadian Experience,” *National Tax Journal*, vol. 62, no. 4, December 2009, p. 595.

## Cascading

VAT is superior to turnover taxes because it avoids tax cascading (Keen, 2009; Smart and Bird, 2009b; Bengtsson, Pallot, and Slack, 2013). Tax cascading occurs when a turnover tax is levied on each sale of an item as it passes through each stage of the production and distribution process and no relief is provided for prior-stage taxes. The total tax on the final product thus depends on the number of stages of production. This discriminates against multistage production processes and creates an incentive for firms to vertically integrate to reduce tax liability (Department of the Treasury, 1984; Metcalf 1995). However the main issue with cascading is that a turnover tax distorts the relative prices of business inputs throughout the value-added chain (Smart and Bird, 2009a). As such, the fundamental source of deadweight loss is not cascading *per se* but the distortion of input prices and the effect of this distortion on relative input prices on the choice of inputs, as discussed above, which occurs even with only one stage of production. The additional effect of cascading is that it increases the effective tax rate on inputs, thus leading to potentially greater distortions in the input prices (Keen 2013). To the extent that input taxes are shifted forward, cascading also alters the relative prices of final goods and distorts consumption decisions with attendant welfare losses (Barbé, 2014).

Cascading may not seem at first blush to be a significant consideration for DSTs as there would need to be a sale from one digital service provider to another that is also subject to tax. Two caveats are in order. First, avoidance of this type of cascading is not automatic. The European Commission (2018b), in what it explicitly states is an effort to mitigate possible cascading effects, provides that in cases where the supplier of advertising services and the owner of the digital interface are different entities, the latter should not be considered to have provided a taxable service. Furthermore, the economic incidence of an upstream tax on digital advertising

is likely to be borne not only by purchasers of the digital advertising but also by downstream consumers of the advertised products (Lowry, 2019). To the extent that the purchases of digitally-advertised products are subject to VAT, there may be cascading effects of the DST. The effective rate of the DST is increased by the portion passed through times the VAT rate.

## Special rate on digital services

The DST in some ways may be similar to a special higher rate commodity tax on a particular class of services. Such differential taxation may be justified under certain limited circumstances. However, these circumstances are unlikely to apply in this context. In the presence of an income tax that distorts labor supply, higher indirect taxes on goods and services that are complements to leisure can improve economic efficiency by alleviating the distortions of the income tax (Corlett and Hague, 1953; Slemrod, 1990; Jacobs and Broadway, 2014). By taxing more heavily goods and services that are consumed more the more leisure one enjoys, indirect taxes may discourage leisure and encourage more work effort, offsetting the negative effects on labor supply of an income tax. Conversely, those goods and services that are complements to labor supply, or are close substitutes for domestic production (Kleven, Richter, and Sørensen, 2000), should bear less tax. However, complementarity with leisure may be difficult to establish with certainty as indirect effects must also be considered. Abramovsky, Phillips, and Warwick (2017) suggest that optimally varying VAT rates is a very complex business that could potentially backfire. The authors conclude that given the additional administrative and compliance burdens associated with differentiated rates, “it is difficult to ascertain whether potential [efficiency] gains are worthwhile.”

Another argument for VAT-rate differentiation relates to the propensity for tax evasion. Cremer and Gahvari (1993) show that revenue can be raised more efficiently by taxing more

heavily those goods and services less subject to evasion and taxing more lightly those with a lower cost of evasion. This reasoning may suggest lower tax rates on digital services. To the extent evasion is reflected in elasticities, this finding is a special application of Ramsey (1927). It is also analogous to the concept in the optimal income taxation literature that the revenue maximizing marginal tax rate is inversely related to the elasticity of taxable income, one component of which is tax avoidance and evasion opportunities (Diamond and Saez, 2011).

A final argument in favor of differential tax treatment is the presence of positive or negative externalities. However, Institute for Fiscal Studies et al. (2011) argue that even in the presence of externalities that might make the rationale for VAT rate differentiation valid, the conditions under which it “is appropriate are demanding, and unlikely to be met in many cases.” First, the externality would need to be correlated with the price of the good or service. Second, if the externality is attributable to a business input, the reclamation of VAT by registered firms makes them unaffected by the imposition of higher or lower VAT rates. Crawford, Keen, and Smith (2010, p.283) argue that externalities are the “one exception” to eschewing any tax that would distort firm production decisions, noting that “commodities generating external effects should on this account be taxed at the same rate whether used as intermediate goods or as final consumption (the damage done by CO<sub>2</sub> emissions being the same, for instance, whether fueling industry or private travel).” Business to business purchases would be missed by a differential VAT rate. In summary, unless the externality relates to the price of a final consumer product, a special VAT rate is unlikely to be an appropriate response.

These three arguments are unlikely to provide much support for a special DST. While Keen et al. (2019) suggest that using social media is likely complementary with leisure, Twenge, Martin, and Spitzberg (2018) show social media substitutes for other leisure. The indirect effect

on other leisure complicates the determination of the status of social media as a leisure complement. It is even less clear whether internet search is a complement to leisure or labor. Bughin et al. (2011) estimate the value of search engines measured as the value of the productivity gains made by knowledge workers—including time saved—at \$49 to \$73 billion in the United States, exceeding the estimated \$41.9 billion value of search for consumers. They further note that the number and proportion of knowledge workers in the economy is growing such that the value of search measured by productivity gains among these workers is expected to increase over time. Whatever the status of these digital services as leisure complements, the enacted and proposed DSTs do not tax social media or internet search use directly, but rather digital advertising, which is a business input. Because the proposed DSTs apply to business inputs, it seems more likely that they are taxing complements for labor rather than leisure.

If digital services have a lower cost of evasion, then higher taxes may be appropriate. While such a determination is an empirical question, it would seem surprising to proponents of the DSTs, who argue one reason to levy the tax on revenues rather than profits is because of the presence of tax avoidance and evasion with respect to digital services (European Commission, 2018a).

With respect to externalities, Lowry (2019) doubts that the use of digital platforms creates the negative spillovers to society that would justify the use of a special excise tax. Acquisiti, Taylor, and Wagman (2016) summarize the literature on the economics of privacy, including discussion of the externalities associated with data protection and disclosure. Aggregation of consumer data may generate negative externalities related to adverse price discrimination (Odlyzko, 2003) unsolicited marketing and concealment and deflection costs (Hann et al., 2008), or opportunity cost from foregoing services to protect data privacy

(Acquisiti, 2010). However, there may also be positive externalities related to reducing the risk of bringing to market niche products (Blattberg and Deighton, 1991) or easier access to insurance and credit (Jentzch, 2003). Acquisiti (2010, p.11) suggests there is a positive externality from digital services that provide more convenient or efficient use of other digital services, such as “Facebook Connect[, which] enables seamless authentication on third-party Web sites, reducing the user’s cost of signing up across different platforms.” Analysis of web search data has been used in medicine to unveil unexpected drug interactions (White et al., 2013) and to monitor infectious disease in surveillance for influenza (Clemente, Lu, and Santillana, 2019), dengue (Yang et al., 2017), Zika (McGough et al., 2017) and malaria (Ocampo, Chunara, and Brownstein, 2013). If the magnitude of the positive externalities from digital services exceeds that of the negative externalities, an economic case could potentially be made for subsidy rather than higher tax.

Even if the economic case could be made for a special rate of tax, there may be other reasons not to implement a special higher or lower indirect tax rate on digital services. European Commission (2018a) has acknowledged that “higher VAT rates for certain digital services would run counter to the principle in the VAT Directive that all goods or services could only be taxed up to the standard rate.” Rate differentiation requires significant data and judgment to be done optimally, adding to administrative and compliance costs, and invites rent seeking, such that the process is “more likely to be driven by lobbying and political realities than unbiased econometric analysis—a very compelling reason for keeping special cases to an absolute minimum” (Benge, Pallot, and Slack, 2013, p. 496). Furthermore, the feasibility of implementing a VAT on the digital economy is doubtful, “because the digital economy is increasingly becoming the economy itself, it would be difficult, if not impossible, to ring-fence the digital economy from the rest of

the economy for tax purposes” (OECD 2015, p. 54). Restricting any tax to cover only some digital services (e.g. only advertising) may exacerbate any ring-fence effect (Baez and Brauner, 2018).

## Conclusion

Countries seeking to address the challenges of taxation in a digitalizing economy have proposed or enacted indirect taxes on digital services in part to satisfy international obligations. The VAT is superior on efficiency grounds to these turnover taxes. While likely having a similar incidence to the VAT in raising prices to final consumers, the turnover taxes are more likely to distort production decisions by firms and to risk cascading and double taxation. While a special higher rate of indirect tax may be justified if applied to leisure complements, if the costs of avoidance or evasion are lower, or if there are negative externalities, it is far from clear that any of these conditions hold in the case of digital services. The administrative and other concerns with implementing a higher rate tax weigh against doing so even if the case could be made. Meanwhile, countries have made advances in ensuring that the VAT system applies effectively to the digitalizing economy. The economic analysis here suggests continuation of these efforts would yield superior outcomes relative to interim measures that tax turnover while the broader international community seeks a consensus-based long-term solution to the tax challenges arising from digitalization.

## ACKNOWLEDGEMENTS AND DISCLAIMERS

I thank William McBride and Peter Merrill for comments. Any views expressed are those of the author and not necessarily those of PwC, its partners, or its clients.

## DISCLOSURES

The author of this paper is employed by PricewaterhouseCoopers LLP, but the research findings included in the paper may not necessarily relate to the interests of PwC.

## REFERENCES

Abramovsky, Laura, David Phillips, and Ross Warwick, 2017. “Redistribution, Efficiency, and the Design of VAT: A Review of the Theory and Literature.” Institute for Fiscal Studies, Briefing Note BN 212, available at <https://www.ifs.org.uk/uploads/publications/bns/BN212.pdf>.

Acquisiti, Alessandro, 2010. “The Economics of Personal Data and the Economics of Privacy.” Background Paper #3 presented at the Joint WPISP-WPIE Roundtable on “The Economics of Personal Data and Privacy: 30 Years after the OECD Privacy Guidelines,” December 1, sponsored by the OECD Working Party on Information Security and Privacy and the Working Party on the Information Economy, Paris, France.

Acquisiti, Alessandro, Curtis Taylor, and Liad Wagman, 2016. “The Economics of Privacy.” *Journal of Economic Literature* 54 (2), 442–492.

Alm, James, Edward B. Sennoga, and Mark Skidmore, 2009. “Perfect Competition, Urbanization, and Tax Incidence in the Retail Gasoline Market.” *Economic Inquiry* 47 (1), 118–134.

Báez Moreno, Andrés and Yariv Baruner, 2018. “Policy Options regarding Tax Challenges of the Digitalized Economy: Making a Case for Withholding Taxes.” Available at SSRN: <https://ssrn.com/abstract=3167124>.

Barbé, André J., 2014. “The Efficiency of Gross Receipts Taxation” in *Tax Policy Analysis in a Flexible Computable General Equilibrium Model: Applications to Energy and Gross Receipts Taxation*. Ph.D. dissertation. Rice University, Houston, TX.

Benedek, Dora, Ruud De Mooij, Michael Keen, and Philippe Wingender, 2015. “Estimating VAT Pass Through.” IMF Working Paper 15/214.

Benge, Matt, Marie Pallot, and Hamish Slack, 2013. “Possible Lessons for the United States from New Zealand’s GST.” *National Tax Journal* 66 (2), 479–498.

Berardi, Nicoletta, Patrick Sevestre, Marine Tépaut, and Alexandre Vigneron, 2016. “The Impact of a ‘Soda Tax’ on Prices: Evidence from French Micro Data.” *Applied Economics* 48 (41), pp. 3976–3994.

Besley, Timothy J. and Harvey S. Rosen, 1999. “Sales Taxes and Prices: An Empirical Analysis.” *National Tax Journal* 52 (2), 157-178.

Bergman, U. Michael and Niels Lynggård Hansen, 2017. “Are Excise Taxes on Beverages Fully Passed Through to Prices? The Danish Evidence,” available at <https://www.researchgate.net/publication/268429840>.

Blattberg, Robert C. and John Deighton, 1991. “Interactive Marketing: Exploiting the Age of Addressability.” *MIT Sloan Management Review* 33 (1), 5–14.

Blundell, Richard and Ian Preston, 2019. “Principles of Tax Design, Public Policy and Beyond: The Ideas of James Mirrlees, 1936-2018.” *Fiscal Studies* 40 (1), 5–18.

Bughin, Jacques, Laura Corb, James Manyika, Olivia Nottebohm, Michael Chui, Borja de Muller Barbat, and Remi Said, 2011. “The Impact of Internet Technologies: Search.” McKinsey & Company.

Cawley, John and David Frisvold, 2017. “The Pass-Through of Taxes on Sugar-Sweetened Beverages to Retail Prices: The Case of Berkeley, California,” *Journal of Policy Analysis and Management* 36 (2), 303–326.

Clemente, Leonardo, Fred Lu, and Mauricio Santillana, 2019. “Improved Real-Time Influenza Surveillance: Using Internet Search Data in Eight Latin American Countries.” *JMIR Public Health and Surveillance* 5 (2), e12214, 2–7.

Conlon, Christopher T. and Nirupama S. Rao, 2017. “Discrete Prices and the Incidence and Efficiency of Excise Taxes.” Paper presented at an Industrial Organization Society session of the Allied Social Science Associations annual meeting, January 7, Chicago, IL, <https://www.aeaweb.org/conference/2017/preliminary/paper/YNrFr52Q>

Corlett, W. J. and D. C. Hague, 1953. “Complementarity and the Excess Burden of Taxation.” *The Review of Economic Studies* 21 (1), 21–30.

Commission Decision, 2017. (EU) 2017/329 of 4 November 2016 on the measure SA.39235 (2015/C) (ex 2015/NN) implemented by Hungary on the taxation of advertisement turnover (notified under document C(2016) 6929), 2016 O.J. L 49, February 25, 2017.

Council of the European Union, 2006. “Council Directive 2006/112/EC on the common system of value added tax.” Official Journal, L 347/1–118, as amended.

Council of the European Union, 2011. “Council Implementing Regulation (EU) 282/2011 of 15 March 2011 laying down implementing measures for Directive 2006/112/EC on the common system of value added tax.” Official Journal, L 77/1–22.

- Crawford, Ian, Michael Keen, and Stephen Smith, 2010. “Value Added Tax and Excises” in *Dimensions of Tax Design*, edited by Sir James Mirrlees, *et al.*, 275–422, Oxford University Press.
- Cremer, Helmuth and Firouz Gahvari, 1993. “Tax Evasion and Optimal Commodity Taxation.” *Journal of Public Economics* 50 (2), 261–275.
- Daly, Michael, 2016. “Is the WTO a World Tax Organization? A Primer on WTO Rules for Tax Policymakers.” International Monetary Fund Fiscal Affairs Department, Technical Notes and Manuals 16/03.
- DeCicca, Philip, Donald Kenkel, and Feng Liu, 2015. “Reservation Prices: An Economic Analysis of Cigarette Purchases on Indian Reservations.” *National Tax Journal* 68 (1), 93–118.
- Delipalla, Sophia and Owen O'Donnell, 2001. "Estimating Tax Incidence, Market Power and Market Conduct: The European Cigarette Industry," *International Journal of Industrial Organization* 19 (6), 885–908.
- Diamond, Peter A. and James A. Mirrlees, 1971. “Optimal Taxation and Public Production I: Production Efficiency.” *American Economic Review* 61 (1), 8–27.
- Diamond, Peter and Emmanuel Saez, 2011. “The Case for a Progressive Tax: From Basic Research to Policy Recommendations.” *Journal of Economic Perspectives* 25 (4), 165-190.
- Etilé, Fabrice, Sébastien Lecocq, and Christine Boizot-Szantai, 2018. “The Incidence of Soft-Drink Taxes on Consumer Prices and Welfare: Evidence from the French “Soda Tax,” PSE Working Paper no. 2018-24, March 7, 2018
- European Commission, 2017. Communication from the Commission to the European Parliament and the Council “A Fair and Efficient Tax System in the European Union for the Digital Single Market,” 547 final.
- European Commission, 2018a. Impact Assessment “Fair Taxation of the Digital Economy,” Staff Working Document 81.
- European Commission, 2018b. Proposal for a Council Directive on the Common System of a Digital Services Tax on Revenues Resulting from the Provision of Certain Digital Services, 148 final.
- Finance Act of 2016, Chapter VIII Equalisation Levy, Secs. 163ff., available at <https://www.incometaxindia.gov.in/Pages/acts/finance-acts.aspx>.
- Fullerton, Don, and Gilbert E. Metcalf, 2002. “Tax Incidence.” In Auerbach, Alan J., Raj Chetty, Martin Feldstein, and Emmanuel Saez (eds.), *Handbook of Public Economics, Volume 4*, 1788–1872. Elsevier, Amsterdam, Netherlands.
- Grinberg, Itai, 2017. “A Destination-Based Cash Flow Tax Can Be Structured to Comply with World Trade Organization Rules.” *National Tax Journal* 70 (4), 803–818.

- Hadzhieva, Eli, 2019. “Impact of Digitalisation on International Tax Matters: Challenges and Remedies.” Study for the Committee on Financial Crimes, Tax Evasion and Tax Avoidance, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg.
- Hann, Il-Horn, Kai-Lung Hui, Sang-Yong T. Lee, and Ivan P. L. Png, 2008. “Consumer Privacy and Marketing Avoidance: A Static Model.” *Management Science* 54 (6), 1094–1103.
- Heady, Christopher, 1993. “Optimal Taxation as a Guide to Tax Policy: A Survey.” *Fiscal Studies* 14 (1), 15–41.
- Hellerstien, W., 2014. “Jurisdiction to Tax in the Digital Economy: Permanent and Other Establishments.” *Bulletin of International Taxation* 68 (6/7),
- Hufbauer, Gary Clyde and Zhiyao (Lucy) Lu, 2018. “The European Union’s Proposed Digital Services Tax: A De Facto Tariff.” Peterson Institute for International Economics Working Paper 18-15.
- Institute for Fiscal Studies, CPB Netherlands Bureau for Economic Policy Analysis, CAPP, CASE, ETLA, IFO, IHS, 2011. “A Retrospective Evaluation of the Elements of the VAT System.” Report for the European Commission (DG TAXUD), available at [https://ec.europa.eu/taxation\\_customs/sites/taxation/files/docs/body/report\\_evaluation\\_vat.pdf](https://ec.europa.eu/taxation_customs/sites/taxation/files/docs/body/report_evaluation_vat.pdf).
- Jacobs, Bas and Robin Broadway, 2014. “Optimal Linear Commodity Taxation under Optimal Non-linear Income Taxation.” *Journal of Public Economics* 117, 201–210.
- Jentzsch, Nicola, 2003. “The Regulation of Financial Privacy: The United States vs. Europe.” European Credit Research Institute Research Report No. 5.
- Keen, Michael, 2009. “What Do (and Don’t) We Know about the Value Added Tax? A Review of Richard M. Bird and Pierre-Pascal Gendron’s *The VAT in Developing and Transitional Countries*.” *Journal of Economic Literature* 47 (1), 159–170.
- Keen, Michael, 2013. “Targeting, Cascading, and Indirect Tax Design.” IMF Working Paper No. 13/57. International Monetary Fund, Washington, DC.
- Keen, Michael, et al., 2019. “Corporate Taxation in the Global Economy.” IMF Policy Paper No. 19/007. International Monetary Fund, Washington, DC.
- Kleven, Henrik Jacobsen, Wolfram F. Richter, and Peter Birch Sørensen, 2000. “Optimal Taxation with Household Production.” *Oxford Economic Papers* 52, 584–594.
- Lowry, Sean, 2019. *Digital Services Taxes (DSTs): Policy and Economic Analysis*. CRS Report R45532. Congressional Research Service, Washington, DC.
- Marion, Justin and Erich Muehlegger, 2011. “Fuel Tax Incidence and Supply Conditions.” *Journal of Public Economics* 95 (9), 1202–1212.

McGough, Sarah F., John S. Brownstein, Jared B. Hawkins, and Mauricio Santillana, 2017. “Forecasting Zika Incidence in the 2016 Latin America Outbreak Combining Traditional Disease Surveillance with Search, Social Media, and News Report Data.” *PLoS Neglected Tropical Diseases* 11 (1), e0005295, 1–15.

Metcalf, George, 1995. “Value-Added Taxation: A Tax Whose Time Has Come?” *Journal of Economic Perspectives* 9 (1), 121–140.

Ocampo, Alex J., Rumi Chunara, and John S. Brownstein, 2013. “Using Search Queries for Malaria Surveillance, Thailand.” *Malaria Journal* 12 (390), 1–6.

Odlyzko, Andrew, 2003. “Privacy, Economics, and Price Discrimination on the Internet.” In Camp, L. Jean and Stephen Lewis (eds.), *Economics of Information Security*, 187–212. Kluwer Academic Publishers, Norwell, MA.

Organization for Economic Cooperation and Development, 2018. “Tax Challenges Arising from Digitalisation – Interim Report 2018.” OECD/G20 Base Erosion and Profit Shifting Project, available at [https://www.oecd-ilibrary.org/taxation/tax-challenges-arising-from-digitalisation-interimreport\\_9789264293083-en](https://www.oecd-ilibrary.org/taxation/tax-challenges-arising-from-digitalisation-interimreport_9789264293083-en).

Organization for Economic Cooperation and Development, 2015. “Addressing the Tax Challenges of the Digital Economy, Action 1: 2015 Final Report.” OECD/G20 Base Erosion and Profit Shifting Project.

Poterba, James M., 1996. “Retail Price Reactions to Changes in State and Local Sales Taxes.” *National Tax Journal* 49 (2), 165–176.

Ramsey, Frank, 1927. “A Contribution to the Theory of Taxation.” *The Economic Journal* 37 (145), 47–61.

Salgado, Rodrigo Winter and Raul Fuentes Ugalde, 2018. “Taxes on the Digital Economy in Chile.” *International Tax Review*, September 26, 2018, available at <http://www.internationaltaxreview.com/Article/3834717/Taxes-on-the-digital-economy-in-Chile.html>.

Schippers, Martijn L. and Constantijn E. Verhaeren, 2018. “Taxation in a Digitizing World: Solutions for Corporate Income Tax and Value Added Tax.” *EC Tax Review* 27 (1), 61–66.

Slemrod, Joel, 1990. “Optimal Taxation and Optimal Tax Systems.” *Journal of Economic Perspectives* 4 (1), 157–178.

Smart, Michael and Richard Bird, 2009a. “The Economic Incidence of Replacing a Retail Sales Tax with a Value-Added Tax: Evidence from Canadian Experience.” *Canadian Public Policy* 35 (1), 85–97.

Smart, Michael and Richard Bird, 2009b. “The Impact on Investment of Replacing a Retail Sales Tax with a Value-Added Tax: Evidence from Canadian Experience.” *National Tax Journal* 62 (4), 591–609.

Turina, Alessandro, 2018. “Which ‘Source Taxation’ for the Digital Economy?” *Intertax* 46 (6/7), 495–519.

Twenge, Jean M., Gabrielle N. Martin, and Brian H. Spitzberg, 2018. “Trends in U.S. Adolescents’ Media Use, 1976–2016: The Rise of Digital Media, the Decline of TV, and the (Near) Demise of Print.” *Psychology of Popular Media Culture*

U.S. Department of the Treasury, 1984. *Tax Reform for Fairness, Simplicity, and Economic Growth, volume 3: Value-Added Tax*.

Weyl, E. Glen and Michael Fabinger, 2013. “Pass-Through as an Economic Tool: Principles of Incidence under Imperfect Competition.” *Journal of Political Economy* 121 (3), 528–583.

White, Reyen W., Nicholas P. Tatonetti, Nigam H. Shah, Russ B. Altman, and Eric Horvitz, 2013. “Web-Scale Pharmacovigilance: Listening to Signals from the Crowd.” *Journal of the American Medical Informatics Association* 20, 404–408.

World Trade Organization, 1994a. General Agreement on Tariffs and Trade, 1867 U.N.T.S. 190.

World Trade Organization, 1994b. General Agreement on Trade in Services, 1869 U.N.T.S. 183.

Yang, Shihao, Samuel C. Kou, Fred Lu, John S. Brownstein, Nicholas Brooke, and Mauricio Santillana, 2017. “Advances in Using Internet Searches to Track Dengue.” *PLoS Computational Biology* 13 (7), e1005607, 1–14.