

Taxation and Multi-Sided Platform Industries: A Review

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TAXATION AND MULTI-SIDED PLATFORM INDUSTRIES: A REVIEW

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Abstract

Many of the largest and most influential industries in the global economy operate digitally as multi-sided platforms, catering to different groups whose interactions are interconnected through intergroup network effects. This paper provides a survey of the theoretical literature on the effects of taxing these firms via indirect and corporate taxes. It seeks to establish a framework for understanding why traditional insights from taxation in one-sided markets do not directly apply to firms in multi-sided markets.

1 Introduction

The digital economy refers to an economic system that is based on digital computing technologies. It encompasses a wide range of economic activities that use digitized information and knowledge as essential factors of production. Key aspects of the digital economy include E-Commerce, digital marketing, online services such as delivery of services over the internet (streaming media, online banking, cloud computing services, and more). In addition, mobile technologies (smartphones, for example), digital content creation (videos, music, e-books, and online articles) and data analytics are key elements of the digital economy.¹

Many of the largest and most influential industries in the global economy operate digitally, with transactions conducted over the internet. Understanding the behavior of such companies and their responses to public policy is crucial, especially given their rapid expansion and growing importance. However, it is important to distinguish between traditional e-commerce firms, which primarily use the internet to sell goods, and multi-sided platforms. The latter are unique in that they cater to different groups whose interactions are interconnected through intergroup network effects. These platforms maximize their profits by strategically fostering and facilitating value-creating interactions among different customer groups, and their response to policy changes can significantly differ from that of firms operating in one-sided (traditional) markets.²

¹ See, e.g., TechTarget ([What is the Digital Economy? | Definition from TechTarget](#)).

² The definition of two-sided markets is discussed in research contributions by Rochet and Tirole (2003, 2004, 2006), Caillaud and Jullien (2003), Armstrong (2006) and Weyl (2010).

The media industry (TV, Radio, newspapers, magazines, and news web portals) is an example of a two-sided industry. A newspaper has at least two distinct groups of customers; readers and advertisers. Readers derive a direct benefit from consuming the media product, whilst advertisers derive an indirect benefit from contracting potential customers from the group of readers. Other examples of two-sided industries and products are payment cards (merchants and cardholders), social media platforms (e.g., GOOGLE, Facebook, Instagram and X; users and advertisers), search engines (e.g., Crome; users and advertisers) and hardware and software systems (Mac OS, Windows; developers and end users).³

In this paper, we explore existing research on the implications of taxing products offered by multi-sided platforms. A notable insight from the literature is that traditional public finance principles, which suggest that the tax burden depends on the relative elasticity of supply and demand on each product, may not apply uniformly to these industries. In fact, higher taxation on goods in two-sided markets does not always negatively impact consumer purchasing behavior. This insight not only has implications for how we should expect tax changes to affect welfare, but it also challenges the arguments put forward in favor of uniform taxation. It also has profound implication for some tax-sheltered industries such as media firms (say, newspapers). Many countries have given some industries preferential tax treatment in the form of lower value added tax rates or even exemption from commodity taxation to stimulate their sales.⁴ The literature, however, demonstrates that preferential tax treatment towards certain customer groups served by multi-sided platforms may have counter-intuitive effects. Lowering the VAT rate on newspapers, for instance, might increase the price and reduce the circulation.

The complexity of taxing multi-sided platforms is further compounded by the fact that they frequently operate on an international scale with subsidiaries worldwide. Variations in corporate tax rates across different nations may influence their pricing strategies. Moreover, two-sided platform corporations often employ transfer pricing as a mechanism to shift profits to jurisdictions with lower tax rates. The interplay of disparate corporate tax environments, profit shifting strategies, and the inherent two-sided nature of these businesses adds a layer of complexity to the formulation and implementation of effective public policy.

³ In an early contribution Evans (2003) provided a range of examples and classifications of two-sided markets.

⁴ Digital and printed newspapers serve as a case in point. Governments consider newspapers essential for the dissemination of vital information, including topics such as culture, politics, and international affairs, and therefore aim for high circulation.

2 Basic Frameworks and Models

It is important to distinguish between the fundamental economic forces governing digital firms like Facebook on one hand, and Amazon on the other hand, and understand why the forces translate into different business models and regulatory challenges. Facebook operates within the digital economy as a multi-sided platform, leveraging user data to offer targeted advertising opportunities to businesses. Advertisers seeking access to Facebook's extensive user base must adhere to pricing structures set by the platform. This pricing framework is contingent upon factors such as the number of active Facebook users and the granularity of data accessible for targeting purposes. By monetizing user data through advertising, Facebook assumes a dual role as both a facilitator of user engagement and a conduit for businesses seeking to reach their desired audience.

In contrast, Amazon functions primarily as an e-commerce firm within the digital economy, facilitating transactions between buyers and sellers without dictating prices. Unlike multi-sided platforms, Amazon serves as an intermediary, enabling direct negotiation between customers and suppliers. While it plays a pivotal role in connecting parties, Amazon does not enforce pricing mechanisms or mediate transactions beyond facilitating the exchange.

Therefore, while both Facebook and Amazon contribute to the digital economy, their operational dynamics differ significantly. Facebook operates more as a multi-sided platform leveraging user data for targeted advertising, while Amazon operates primarily as an intermediary that facilitates transactions, illustrating the nuanced landscape of digital business models within the broader digital economy.

In determining their pricing strategies, multi-sided platforms must take into account the externalities that exist between their customer groups. In the media industry, for instance, advertising may be perceived as either a nuisance or a benefit by readers. A media firm can address this externality by appropriately charging advertisers to affect the advertising volume. If consumers dislike ads, the media firm will typically choose to sell less advertising space than the quantity that would maximize profits from the advertising side of the market, and vice versa if consumers perceive ads as a good (which might be the case in, e.g., fashion magazines). The externality arising between customer groups enables a platform to facilitate coordination more efficiently than bilateral relationships between distinct customer groups, and the substantial

number of readers makes it more efficient for advertisers to place ads on social media platforms (such as Facebook or Instagram) than to contact readers directly.⁵

Two-sided platforms often treat one side as a profit center and the other as a loss leader or, at best, as financially neutral. Facebook, for instance, allows its members to use its service for free in exchange for harvesting their data, and make money on the advertising side. Another example is the web-browser Crome, which can be used for free, but in return users give away their browsing history. By harvesting its users' browsing history, Crome offers tailored advertising to customers in different countries.

In some cases, platforms operate with multiple business models tailored to consumer preferences. Take X, formerly known as Twitter, for example. It offers free access to its basic features, allowing users to create accounts, post tweets, follow others, and engage with content at no cost. X generates revenue through advertising and data monetization from this user group. Additionally, X provides a premium subscription option for users who strongly dislike ads. These subscribers pay a monthly fee to enjoy an ad-free experience.

3 Taxation and Market Dynamics

Multisided platforms face both corporate and indirect taxes and fees. Since they typically operate across jurisdictions, it is important to understand international tax rules.

Corporate taxes on a firm are levied based on where the firm is tax domiciled. In most countries, a company is for tax purposes generally treated as a resident based on where its central management and control are exercised. The term "central management and control" refers to the highest level of oversight, usually as exercised by the board, rather than day-to-day management. For example, if the board of a company is located in another country than where the firm has a permanent establishment (such as a factory or sales outlet), the firm may be subject to tax in both countries depending on the tax treaty between the two countries.

In the context of international tax law, a "permanent establishment" refers to a fixed place of business through which the business activities of a company are wholly or partly carried out. This concept is crucial for determining tax domicile and obligations because it establishes a

⁵ Two-sided platforms must not be confused with standard microeconomic theory of complements. Complementary goods are products or services that are consumed together (and not by different customer groups), with demand for one good being positively influenced by the consumption of another good. When the price of one good increases, the demand for both goods decreases, and vice versa (see, e.g., Kreps, 1990, p. 61).

physical presence in a jurisdiction that typically triggers the right of that jurisdiction to tax the profits attributable to the activities conducted through the permanent establishment.

The definition of what constitutes a permanent establishment can vary between different tax jurisdictions and is often detailed in tax treaties between countries. Common examples of a permanent establishment include a place of management, an office, a sales outlet, or a factory. The significance of a permanent establishment lies in its role in allocating taxation rights between jurisdictions. Profits attributed to the permanent establishment may be taxed in the country where it is located, regardless of where the company's global headquarters or domicile for tax purposes is located. This concept helps prevent tax evasion and ensures that companies contribute taxes where they are economically active and generate profits. Tax domicile of firms is an important topic in the digital economy since most digital firms do not have a permanent establishment in many countries but export their services (data used by advertisers).

The other set of taxes that face firms in the digital economy are indirect taxes. Typical examples of indirect taxes are the value added tax (VAT) and the sales tax. A significant and enduring policy debate centers on whether traded commodities should be taxed in the consumer's country (destination principle) or in the producer's country (origin principle). Historically, global trade has predominantly adhered to the destination principle. In scenarios featuring perfectly competitive commodity markets, there is theoretical backing for this approach, as the destination principle helps prevent countries from competing over tax bases amid cross-border shopping.⁶

An important aspect of the new digital economy is the sale of digital products online. Such sales are subject to VAT in the country where the buyer is located. Prior to 2015, VAT was collected in the country where the seller resided. This led to tax competition among low-tax jurisdictions. Luxembourg, for example, reduced its standard VAT rate of 17 % to 3 % on digital products. In response, online platforms like Amazon, Google, and Apple decided to set headquarters in Luxembourg.⁷ At the time, the move was also facilitated by a relatively low corporate tax rate. The application of the destination principle on digital sales has eliminated the incentives to locate in a low VAT country, but low-tax jurisdictions will continue to be appealing for online sellers who consider corporate tax rates as a factor in their location decisions.

⁶ Lockwood (2001) surveys the literature.

⁷ The case of Luxembourg is discussed in Kind and Köthenbürger (2018).

The literature on tax and multi-sided platform firms is small and most of the literature concentrates on indirect taxes like a sales tax (unit tax) and VAT.⁸ We will discuss the main insight from this literature in what follows.

4 Multisided platforms and indirect taxes.

While most countries employ value-added taxes on goods and services, there are a few exceptions. Notably, the United States utilizes a sales tax (specific tax) when federal statutes impose such a tax. In two-sided markets, imposing indirect taxes on one side can prompt the platform to change business model. For instance, taxing advertising revenue might compel the platform to introduce subscription fees for users, potentially excluding those who place the lowest value on the service. Similarly, a tax on data flows could lead the platform to impose subscription fees to moderate the volume of data users willingly upload. Additionally, implementing taxes per user, whether levied on the platform or directly on users, could result in the exclusion of users who value the service the least.

We shall now consider some idiosyncratic effects of indirect taxation in two-sided markets, holding the business model fixed. To highlight the mechanisms at work, consider a media monopoly which sells n copies of a newspaper at price p^N . The inverse demand curve for the newspaper is downward-sloping, such that we have $p_n^N(n) \equiv \partial p^N / \partial n < 0$ (subscripts henceforth denote partial derivatives). Labelling the ad valorem tax rate by t , this implies that the media firm receives the price $p^N / (1 + t)$ per copy it sells of the newspaper. The newspaper further sells eyeballs to advertisers at a price p^A per ad. The inverse demand curve for ads is downward-sloping ($p_a^A < 0$), but the willingness to pay for ads is increasing in newspaper circulation ($p_n^A > 0$). We thus have a positive network externality from the reader side of the market to the advertising side.

From the above, we specify the newspaper's profit function as

$$\pi = \frac{np^N(n)}{1+t} + p^A(a, n)a - C(a, n) \quad (1)$$

where $C(a, n) \geq 0$ is the cost function, with $C_a \geq 0$ and $C_n \geq 0$. We assume that the cost and demand functions are well behaved, and that the second order conditions for profit-maximization hold. Note that the willingness to pay for newspapers is solely a function of n , and not of a . This means that readers are indifferent to the ad level (no network externality from

⁸ Myles (1966) studies the optimal combination of ad valorem and specific taxation in traditional markets..

advertisers to readers). However, this is not a critical assumption in our setting (see, e.g., Kind et al, 2010).

The media firm maximizes profits with respect to the advertising volume (a) and newspaper circulation (n). Setting $\partial\pi/\partial a = 0$ we find

$$p^A + ap_a^A = C_a. \quad (2)$$

Equation (2) has the standard interpretation that the marginal revenue of selling ads is equal to marginal costs in optimum. Solving $\partial\pi/\partial n = 0$ yields

$$\frac{p^N + np_n^N}{1+t} = C_n - ap_n^A. \quad (3)$$

The left-hand side of equation (3) measures the marginal revenue on the reader side of selling an extra copy of the newspaper. In optimum, this is equal to the marginal costs of selling the newspaper, C_n , minus the marginal gain on the advertising side of selling more newspapers. The latter is equal to the advertising volume, a , times the increased willingness to pay for each ad, p_n^A , if the newspaper offers one extra pair of eyeballs. Since ap_n^A is positive, it follows that the media firm will sell more newspapers (and charge a lower price) the more valuable it is for the advertisers to reach a large audience.

Now, let us look at the consequences of increasing the VAT rate on newspaper sales.

Differentiating (2) and (3) with respect to t we find

$$\frac{dn}{dt} = \phi(a, n) \frac{ap_n^A - C_n}{1+t} \quad \text{and} \quad \frac{dp^N}{dt} = p_n^N \frac{dn}{dt} \quad (4)$$

where $\phi(a, n) > 0$ whenever the second-order conditions hold.

Equation (4) has the stark implication that $dn/dt > 0$ and $dp^N/dt < 0$ if $ap_n^A - C_n > 0$. Consequently, we encounter the seemingly paradoxical scenario that an elevated VAT on newspapers results in higher sales (and a lower newspaper price for consumers). This phenomenon can be understood by considering the underlying rationale: when the value attributed to capturing an additional reader, ap_n^A , surpasses the marginal costs associated with serving that reader, C_n , it becomes profitable to marginally reduce the newspaper price. As a consequence, readership expands, enabling the media firm to augment advertising sales and accrue greater profits compared to scenarios where the newspaper prices is increased and newspaper output reduced.

The impact on advertising levels and prices of a higher VAT on newspaper sales hinges upon the specific characteristics of the demand and cost functions, and we will not

dwell into the details here. However, as shown in Kind et al., 2008, both advertising levels and newspaper sales will increase under reasonable assumptions. Whenever this is the case, it is welfare improving to increase the VAT rate. This result stands in sharp contrast to what we typically would observe in one-sided markets. The point is that a firm, which operates in a two-sided market can reduce its tax burden by shifting revenue to the side of the market where the tax rate is unchanged.⁹

Whether the condition $ap_n^A - C_n > 0$ holds, and thus whether a higher VAT will actually reduces prices, varies between different segments of the media sector. In the newspaper market, there is little doubt that the marginal cost per reader is relatively low. Indeed, for all practical purposes, it is equal to zero for digital newspapers. Consequently, according to this analysis, digital newspapers would unequivocally find it advantageous to lower reader prices in response to a VAT increase. Additionally, it's noteworthy that advertising stands as the primary or sole revenue source for certain media outlets, suggesting a relatively high value for ap_n^A . Therefore, it's plausible that $ap_n^A - C_n > 0$ even for media firms with significantly positive marginal costs. In either case, the key insight from this analysis is that a policy intervention of reducing VAT is unlikely to be an effective tool to reduce newspaper prices and increase newspaper circulation. Media firms certainly gain from a lower value-added tax, but the consumers might be harmed.¹⁰

The fact that the size of the VAT rate on newspapers affects the relative importance of raising revenue from advertisers versus directly from the readers might have implications for media diversity. The more a newspaper relies on advertising revenue, the more it will aim for the mass market, other things equal, to reach a large audience (see, e.g., Anderson and Jullien, 2015, and Anderson and Gabszewicz, 2005). If the VAT is reduced, it becomes more profitable to raise revenue from the reader market. The media firm will consequently try to enhance the readers' willingness to pay for the newspaper. One way of doing this is to further differentiate its content from what the rivals offer. This move away from the mass market could lead to increased media diversity. Thus, while reducing the VAT rate on newspapers might increase newspaper prices, as shown above, it could also lead to more media differentiation. The former is typically considered as negative by policy makers, and the latter as positive. Policy

⁹ See Fullerton and Metcalf (2002) for an overview over the tax incidence literature in one-sided markets.

¹⁰ See also Kind and Köthenbürger (2018), who analyze how changing the VAT rate may affect competition between, for example, printed and digital books, and influence the relative prices charged by media conglomerates.

makers thus face a trade off when they consider the VAT rate on newspapers. This is formally analyzed in Kind et al. (2013).

Agrawal (2012) study the effect the digital economy may have on sales tax rates. He shows that when legal limitations imply that it is up to consumers, not sellers, to pay taxes on online purchases, online sales might become essentially untaxed. This situation, where the tax base becomes more mobile, may lead jurisdictions to lower their tax rates to lessen the loss of revenue to the internet, which in this case serves as a tax haven.

Belleflamme and Toulemonde (2018) study the behavior of two symmetric platforms and find that under uniform taxation, specific (sales) taxes are fully passed on to consumers on the side on which they are levied. An ad valorem tax is the only indirect tax that allows the government to capture a share of the profit of a platform firm. They also analyze a situation where the tax authority wants to collect tax from only one platform.

Bloch and Demange (2018) analyze how a monopolistic platform that collects data on users and sells it to third parties behave and find that *“the optimal strategy of the platform is either to cover the market or to choose the highest data exploitation level, excluding users with high privacy costs from the platform.”* They also investigate how different tax instruments can be used to reduce the excessive level of data collection. A main finding is that taxing access revenues and data revenues at different rates, is the most effective way of reducing excessive data collection.

Related to Bloch and Demange (2018), Bourreau, Caillaud, and De Nijs (2018) set up a model in which a dominant (monopolistic) digital platform relies on users' personal data to provide personalized services and sell targeted advertising slots to online sellers. Their model aims to capture the effect of taxing data collection as proposed by both French and English authorities. A main finding is that the introduction of an ad valorem tax on data collection does not increase fiscal revenues if the rate is high enough.

Tremblay (2018) compares the effects of access and transaction taxes in a setting of a monopoly two-sided platform (taxation on platform content and taxation on the platform itself). He finds that welfare increases with a transaction tax if the side of the market with the larger network effect has the smaller transaction tax burden. In general, a tax on transactions has ambiguous effects.

The body of research on indirect taxes reveals that the inherent attributes of digital products and platforms, including (close to) zero marginal cost and intergroup network externalities, can unexpectedly alter the impact and optimal structure of taxation. Consequently, policy-making must deliberately consider these characteristics in the formulation of public policy. Traditional

approaches grounded in one-sided market theories are not effective in the context of two-sided markets and, as the literature demonstrates, can lead to unintended consequences that contradict the intended policy objectives.

Kind et al. (2008) examines the efficient provision of goods in two-sided markets and characterizes optimal specific and ad-valorem taxes. They find that a two-sided monopoly platform may have too high output compared to the social optimum and that excess output in some cases can be reduced by imposing negative value-added taxes (subsidy) or positive specific taxes. The difference between how ad valorem taxes and specific taxed work in two-sided platform firms can be explained as follows. There is a one-to-one relationship between tax payments and quantity under specific taxes, while there is no direct link between output and the burden of taxation under ad valorem taxation. In fact, following the imposition of a higher ad valorem tax, a firm can, in theory, reduce its tax liabilities and simultaneously boost sales by decreasing the price.

In one-sided (traditional) markets, Suits and Musgrave (1953) show that ad valorem taxes revenue-dominate unit taxes under monopoly, i.e. for any unit tax it is possible to find an ad valorem tax which generates higher tax revenues while leaving quantity choices unaffected. Subsequent literature shows that ad valorem taxes welfare-dominate, and even Pareto-dominate, unit taxes under imperfect competition.¹¹ The effect of ad valorem taxes and unit taxes in two-sided monopoly markets stand in sharp contrast to the traditional findings. Kind et al. (2009) show that the revenue and welfare dominance of the VAT do not hold in two-sided markets. They show that moving from ad valorem taxes (based on value) to unit taxes (fixed amount per unit) while maintaining the same level of monopoly output, can result in increased tax revenue. This occurs when there are significant spillover effects from one group of users to another. Furthermore, unit taxes can lead to greater overall welfare than ad valorem taxes in two-sided markets.

5 International Taxation and Profit Shifting

A key driver in the productivity of firms in the digital economy is intellectual property, including patents, copyrights and trademarks, and various apps that link customers with suppliers and that track search history. Empirical evidence shows that multinational companies strategically locate ownership of their intellectual property at tax-havens to save corporate tax burden (Karkinsky and Riedel (2012)). By locating intellectual property in a holding company in a low-

¹¹ See ; e.g. Delipalla and Keen (1992), Skeath and Trandel (1994) and Keen and Lahiri (1998).

tax jurisdiction, the common good nature of intellectual property means that it can be used by affiliates within a multinational group. Profits are shifted back to the holding company (owner of the intellectual property) through royalties or license fees. Empirical studies find that income shifting by multinationals is mainly driven by differences in statutory tax rates and that the amount shifted is quite staggering.¹² Tørsløv, Wier, and Zucman (2023), for example, estimate that about 36% of multinational profits are shifted to tax havens each year.

Companies in the digital economy have increasingly come under scrutiny, prompting public policy initiatives aimed at addressing the challenges they pose to tax revenue. Efforts led by the Organisation for Economic Co-operation and Development (OECD) through the Inclusive Framework on Base Erosion and Profit Shifting (BEPS) have resulted in significant developments, notably Pillar 1 and Pillar 2. These initiatives are focused on ensuring that multinational firms contribute a fair share to the tax base, thereby safeguarding against revenue losses for economies worldwide.

Pillar 1 specifically focuses on the allocation of taxing rights among countries, particularly in situations where businesses do not have a physical presence in a country but have significant digital presence. The details and implementation of Pillar 1 are subject to ongoing negotiations and discussions among participating countries within the OECD's Inclusive Framework. As far as we know, there does not exist research on how Pillar 1 would affect multi-sided platform firms given that the rules of Pillar 1 are yet to be agreed upon.

Pillar 2, like Pillar 1, is part of the global efforts to address the challenges of taxing multinational enterprises (MNEs) in the context of the digital economy. Pillar 2 was agreed on in 2021 (October), with 136 countries signing the treaty. It establishes a minimum tax of 15 % for large MNEs with consolidated revenues of more than 750 million Euro. The aim of Pillar 2 is to reduce profit shifting to tax havens and ensure that profits are subject to a minimum level of taxation globally.

To guarantee that corporations pay a tax of a minimum of 15 %, the effective tax rate of a subsidiary in a low-tax country must be calculated. If this rate is below 15 % the MNE must pay a top-up tax to bring its rate to 15%. The top-up tax percentage is the difference between 15% and the subsidiary's effective tax. This rate is applied to the gross income used to calculate the subsidiaries effective rate of tax and is called GLOBE income. However, the subsidiary may deduct from the GLOBE income costs related to its physical presence in a low-tax country. This deduction, called Substance-based Income Exclusion (SBIE), allows the subsidiary to tax-deduct

¹² Karinsky and Riedel (2012) find that the corporate tax rate (differential to other group members) exerts a negative effect on the number of patent applications filed by a multinational affiliate Dharmapala (2014) surveys the literature.

a percentage share of 5 % (in the long run) of payroll costs and user costs of tangible assets from its GLOBE income before the top up tax is applied.

Since costs related to payroll and tangible assets are also deductible when GLOBE income is calculated, these costs are partly deducted twice. Schjelderup and Stähler (2023) show that Pillar 2 dampens tax-motivated transfer pricing, but changes the employment, investment and import incentives, and that for a sufficiently large cost share of labor and/or capital, the SBIE is equivalent to a production subsidy. Their analysis is done by examining non-platform firms. However, some lessons can nevertheless be drawn. One takeaway is that since the SBIE is only allowed if a firm has a physical presence in a low-tax country, platforms with shell companies in tax havens will face an effective rate of 15 % and thus see their after-tax profits fall. This begs the question if such shell companies - often in the form of a holding company that owns a technology - will relocate. If the sole purpose of such firms is to lease the use of technology or a patent, relocating to another country does not make sense, as it will not result in increased physical activity (and consequently a positive SBIE). For multi-sided platforms that have activity, relocating for tax reasons does not make sense either, since these firms will get the SBIE anyhow.

A key question is whether Pillar 2 will impact the pricing strategies of multi-sided platform firms. The answer to this question is complex. Consider a social media app. If the app's ownership is registered with a subsidiary in a tax haven, and this subsidiary books the income from leasing the use of the app to affiliates in high-tax countries, Pillar 2 will negatively affect the after-tax profits of the affiliate. This means that the value of the technology behind the app is diminished, but it does not affect the pricing for the consumer groups the firm serves. Similarly, if income from the use of the web browser Chrome is booked by a shell company in a tax haven, Pillar 2 implies lower after-tax profits for this firm. However, the platform firm has no incentive to charge Chrome users since doing so would reduce the number of users and, consequently, harm revenue from advertisers.

Related to Pillar 2 is Kotsogiannis and Serfes (2010), who set up a model that incorporates both vertical and horizontal differentiation. Within this framework, jurisdictions engage in competition by offering public goods and imposing taxes, aiming to attract firms and consumers. The study focuses on examining the noncooperative equilibrium that emerges from this competitive scenario and the effect of policy coordination such as Pillar 2. They find that the interaction of the two markets affects the intensity of tax competition and the degree of optimal vertical differentiation chosen by the competing firms.

Schindler and Schjelderup (2010) develop a model featuring a multinational platform company (referred to as the parent) headquartered in one country with subsidiaries across multiple countries. For explanatory purposes, they use the example of the parent company distributing customized editions of a newspaper to its affiliates in different countries at a specified transfer price (imagine the New York Times US and its European edition). These affiliates function as retailers. Additionally, the parent firm sells advertisements, with ad prices depending on the newspapers' readership. Their analysis reveals that, in the absence of taxes, network externalities between readers and advertisers lead to a transfer price that deviates from the marginal cost of production (the actual cost). This deviation from traditional transfer pricing in one-sided markets is primarily influenced by the strength of network externalities, which dictates whether the price is set above or below the production cost. In scenarios devoid of any network externalities or taxes, the transfer price would match the true cost of the product. When incorporating taxes and network externalities into their analysis, they find that variations in international tax rates can cause the transfer price to either diverge further from production costs or align more closely with the actual production cost. A crucial insight from their study is that transfer pricing in multi-sided platform firms significantly differs from that in one-sided markets, suggesting that policies aimed at addressing abusive transfer pricing need to consider the unique two-sided nature of such firms.

6 Concluding Remarks

A key insight emerging from the research on multi-sided platforms is that traditional tax policies often yield unexpected outcomes, and the principles gleaned from conventional markets are not directly transferable. Notably, the classic preference in public finance for ad valorem taxes over unit taxes does not necessarily apply in two-sided markets. Additionally, in such markets, the price of a product may actually decrease following the imposition of an ad valorem tax. Furthermore, a tax on value-added on one side of the market can prompt a fundamental shift in the business model of a two-sided platform. For instance, an increase in VAT on user access fees might lead a platform to offer free internet access to users and instead derive all its revenue from advertising.¹³

The reason behind these unexpected results is that tax policies significantly interact with the externalities among the different customer groups served by multi-sided platforms. The magnitude of the cross-group externalities plays a pivotal role in shaping market outcomes. Traditional approaches to taxation might produce effects contrary to the intended objectives.

¹³ These results follow from Kind et al. (2008, 2009, 2010), leading to two main results.

This situation is particularly concerning given that some of the largest multinational enterprises operate as multi-sided platforms, including major companies such as Apple, Facebook, and Google. Therefore, advocating for further research that considers the international context in which these firms operate is essential. Differences in corporate taxation across countries may interact not only with the externalities between customer groups in multi-sided platforms but also with indirect taxes. It is crucial to gain a comprehensive understanding of these effects to formulate effective public policies that specifically target multi-sided platforms.

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Many of the largest and most influential industries in the global economy operate digitally as multi-sided platforms, catering to different groups whose interactions are interconnected through intergroup network effects. This paper provides a survey of the theoretical literature on the effects of taxing these firms via indirect and corporate taxes. It seeks to establish a framework for understanding why traditional insights from taxation in one-sided markets do not directly apply to firms in multi-sided markets.

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