Price Elasticity of Demand in the Market for Governance in Businesses Location Decisions in

OECD Nations from 2015-2019

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Abstract

This study proposes a framework of viewing the competition between governments to attract businesses into their jurisdiction as a competitive market. Literature is reviewed on the market forces and incentives of businesses and governments in location decisions. A possible gap in the literature of quantifying the price elasticity of competition between national governments for business activity is identified. OECD data is analyzed using equations supported by literature and results are evaluated to better understand the elasticity of international location decisions. The results of this study indicate that elasticity varies widely between countries, and countries with smaller economies may face more elastic demand than more powerful nations.

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in OECD Nations from 2015-2019

Local, state, and national governments face pressure to attract businesses to their locality for economic development purposes. Businesses offer governments employment for their citizens, tax revenue, and access to a good or service that might not have otherwise been supplied in that area. Therefore, when a company considers where to relocate, governments will often compete with one another to lure the company to their jurisdiction. Literature shows that this competition is governed by market forces, where governments compete for business activity in a similar way to businesses competing for customers. Governments compete by improving services such as law enforcement, infrastructure, and education and by providing tax incentives. An examination of the price elasticity of the demand of businesses for these offerings on an international scale will inform tax policy and provide a foundation for future research.

Literature Review

A well-developed body of scholarly literature indicates that the competition among governments to attract business activity resembles a market and is governed by market forces. Literature provides working definitions of a market, competition, and market forces, which are used throughout this study. Governments offer access to a market, law enforcement, infrastructure, and education, and research shows that these factors are significant to attraction of businesses. A substantial body of literature indicates that governments seek business activity to raise tax revenue, provide employment, and offer more diverse consumer experiences. An empirical study confirming that tax incentives are a function of competition between governments is examined (Mast, 2020). Studies on bids for Amazon's second headquarters show a highly competitive bidding process that tax incentives, infrastructure, and education

played a large role in deciding. Scholarly literature also indicates that, while resembling market competition, there are differences between government and business interactions and consumer markets that may make businesses less sensitive to changes in tax rates (Clausing, 2018). Literature on the economic concept of price elasticity of demand is also reviewed to inform the methodology of this study. Finally, an attempt to quantify the elasticity of the competitive international market for business activity is identified as a possible gap in the literature.

Defining a Market and Market Forces

The current literature focuses on an exchange between two parties under the influences of market forces when defining a market. Rothbard (2007) defined a market as a series of exchanges where each party believes that what is received is of more value than what is given. Prices were described as the economic tool that conveys information about the value of the exchanged good. The price where both parties believe they are receiving more value than they are giving is called the equilibrium price, where the forces of supply and demand intersect (Rothbard, 2007). Gaur (2009) contributed to the discussion of markets by differentiating between the uses of the word market to describe a physical location where exchanges take place or a group of buyers and sellers of a particular good or service. Another contribution was the categorization of markets into business markets, where companies provide the good or service for businesses, consumer markets, where households are buyers, and institutional markets, where the suppliers of the service are responsible for caring for the buyers (Gaur, 2009). "Markets" from *The Gale Encyclopedia of US Economic History* (2015) added that money must be exchanged for the good or service in a market exchange; and both parties must voluntarily participate in the transaction. Two important conditions for a market to be efficient are that prices must be able to freely fluctuate due to changes in supply and demand and that there must

be a free flow of information about the product and pricing to all parties involved in the exchange ("Markets," 2015).

Literature on market forces can be useful in identifying these forces in location negotiations between businesses and governments. Current theory suggests that prices are vital to efficient markets. According to Romstad (2008), prices communicate the value of a good or service and also help allocate resources in the market. On communicating value, prices demonstrate what a consumer is willing to pay, but they also communicate the producer's marginal costs by the producer's decision to produce at a given price. Prices allocate resources by ensuring that consumers can have less of a good when it becomes scarcer and that producers are more incentivized to make a scarce good (Romstad, 2008). Prices also interact closely with the economic laws of supply and demand. The law of supply is that the quantity of a good or service supplied will increase as the price increases. Meanwhile, the law of demand states that the quantity of a good or service that consumers demand will decrease as price increases (Ehrbar, 2007). According to Ehrbar (2007), while producers would always like to charge more for their product, the price is limited by demand even if there is no competition. Likewise, while producers always want a lower price, their consumption of a cheap good would be limited as producers would lose the incentive to create it (Ehrbar, 2007). Competition is a market force that is particularly important to business location decisions. Competition occurs when a seller attempts to be more attractive than other sellers in a market or when buyers attempt to outbid other buyers. Kasper (2007) identified that competition can exist in different forms as price competition, innovation, or advertising. Sellers engage in price competition when they lower their price to attract buyers away from other sellers. Innovation is the application of new ideas or processes to create a product that is of higher quality or is more efficient that what sellers are

offering. Advertising is simply the effort to attract the attention of buyers. According to Kasper (2007), many firms would rather not compete because competition is costly. However, outside of a cartel or government interference, refusal to compete in a competitive market will reduce market share.

Government Competition in a Market Framework

The body of literature on economic development contains sufficient coverage of government competition to attract businesses, and the current understanding of the phenomenon places it well within the framework of a competitive market defined above. Literature suggests that governments react to market forces, which provide evidence of the existence of a competitive market. First, an element of competition exists between governments to attract businesses to the areas under their jurisdiction. According to Conroy, Deller, and Tsvetkova (2016), the first wave of economic development theory saw states provide low-tax, business friendly environments as the basis of their competition with other states. This form of competition resembles the description of price competition in Kasper (2007) as the states were reducing the prices businesses would pay by lowering taxes. Another competitive government strategy that is growing in popularity is investment in infrastructure to attract businesses (Adama, 2018). Infrastructure investments represent a form of innovation as described in Kasper (2007), as the governments are improving their offering to business to gain a competitive advantage.

If the laws of supply and demand are also evident in business location decisions, they provide more evidence for the existence of a competitive market. When there is more of a good supplied than demanded, the price of the good decreases (Ehrbar, 2007). Likewise, as the number of governments competing to host a business increases, the price the business pays should decrease. Current literature suggests that with other factors held constant, government tax

rates are sensitive to the supply of other governments that are potential location options for

businesses and the number of businesses available on the demand side of the market. The

quantitative study in Mast (2020), showed that one competitor to a prospective hosting

government leads to a 5% increase in the probability of tax exemptions, which decreases costs

for the business. On the demand side, a recent study found that business capital structures are

sensitive to state tax rates and increases in tax rates cause them to increase long-term debt

(Heider & Ljungqvist, 2012). These studies seem to indicate that the laws of supply and demand

apply in interactions between governments and businesses.

If the competition between governments to host businesses is a market, it could be

described as an institutional market under the framework in Gaur (2009) because it can be

argued that the governance provided to businesses is a form of care. However, there are nuances

to the situation that make it different from other institutional markets or other markets of any

type. The medical care provided by hospitals or education provided by schools are valuable

services that the recipients reimburse by paying an amount of money. In business location

decisions, the goods and services being exchanged are more complex.

The Supply Side: Government Offerings to Businesses

Market Access

A wide body of literature discusses the many ways governments service businesses.

First, studies suggest that governments provide businesses with access to a market of potential

customers. In some industries like taxi services or restaurants, governments issue licenses for the

legal right to do business in a region. Zapletal (2018) found that occupational licenses decrease

the market entry and exit rates for firms, which helps industry leaders maintain their dominance.

Another study found that government regulation, including licenses, make 80% of entrepreneurs

less likely to enter a market (Malone et al., 2019). While the existence of licenses makes it more difficult for businesses to start up, it also helps protect them from new competitors once they enter the market. Whether or not licenses exist in a given industry, all business must choose a location and submit to the regulations of that government in order to be recognized as a legal entity. This choice involves legal establishment of the business under the laws of a nation, a state or territory within that nation, and a city within the state or territory. It determines everything from the tax rates the business will pay to the labor laws and accounting standards it must follow. Granting the right to sell to a group of people is a service that governments offer businesses that is necessary for their very existence.

Law Enforcement

Current literature also highlights the importance of government law enforcement to provide businesses with a safe and fair marketplace. According to Berglöf and Claessens (2006), "enforcement of the rule of law is perhaps the central functional difference between developed market economies and developing economies" (p. 123). Their study focused on the enforcement of financial contracts. Berglöf and Claessens (2006) found that a combination of privately enforced codes of conduct and public enforcement was optimal for increasing the availability and decreasing the risk of financing. Thus, the government plays an important role in aiding business functions by enforcing contracts. For a government to be an effective enforcer of contracts and business regulations, it must not be corrupt. Studies show that corruption in law enforcement creates uncertainty from a business perspective and can tempt businesses into offering unethical bribes. A regression analysis in Du, Lu, and Tao (2008), showed that U.S. firms were more likely to invest in cities in China where contracts were enforced by the government and corruption was low.

Public enforcement of laws also helps protect businesses from the loss of their assets by theft or vandalism. Businesses always incur risks when investing in inventory, real estate, or other property, but locating in an area where law enforcement is sound can help mitigate that risk. Protection of intellectual property rights is increasingly being discussed in current literature as an important service that governments provide. Intellectual property protection is especially important for multinational corporations, and foreign governments create value for businesses when they provide such protection. Du, Lu, and Tao (2008) found that intellectual property rights enforcement, as measured by approved patents per capita and related variables, was positively correlated with U.S. foreign direct investment in China. Finally, law enforcement creates value for businesses when it prevents crimes against employees. In some cases, employers may be liable if employees are harmed or stolen from while working. Also, incidents of crime against employees can decrease employee morale.

Infrastructure

Another aspect of the supply side of business-government interactions is the provision and maintenance of public infrastructure. Infrastructure can take many forms that add value to businesses. According to Sullivan (2009), transportation assets like roads and bridges, public facilities like power or water, and less tangible social norms can all be considered infrastructure. Scholarly literature shows that the existence and quality of location-dependent, public infrastructure can be an important factor in business location decisions. Improvements in transportation can aid business activity by reducing commutes to work and shipping times. Local highway, railroad, and airport access has helped Reno, Nevada attract some of the largest businesses in the United States (Krizner, 2010). Advances in the technological and communication capabilities of a region can also benefit businesses.   A study found that the

addition of DSL broadband internet infrastructure had a significant positive correlation with new

domestic businesses in Ireland (McCoy et al., 2018). Much of the infrastructure that affects

businesses is provided by local or national governments.

Educated Workforce

Finally, in many situations, regional or national governments provide the businesses in its

jurisdiction with a well-educated, skilled workforce. Training employees can be costly for

businesses, and current literature suggests that governments can add value by using public funds

to provide citizens with education and skills and increase their usefulness to companies. Krizner

(2010) cited an educated workforce as one of the factors that made the U.S. Southwest an

attractive location for manufacturing firms. Conversely, Tang and Wang (2005) found evidence

that shortages in skilled workers "go hand in hand" (p. 333) with low productivity in Canadian

manufacturers. While job-specific training usually comes from companies after a hiring, general

skills like communication and computer literacy often come from publicly funded universities.

In conclusion, literature shows that when governments compete to host a business in their

jurisdiction, they offer their markets, laws, infrastructure, and the knowledge and skills of their

people.

The Demand Side: Business Payment for Government Services

In a traditional consumer market, customers pay money to compensate a business for

providing a good or service. The compensation businesses give to governments for the services

provided comes in the form of taxation. However, like businesses offering coupons and special

promotions, governments offer tax incentives to businesses to help secure the decision in their

favor. This shows that the competition among governments follows the laws of supply and

demand similarly to business markets. Current literature suggests that the presence of businesses

in a community provides more benefits to a government than what is quantified by tax revenue. First, businesses employ people who live in the surrounding area. This provides income to citizens which can then be taxed by the government. Also, in the case of retailers or service providers, the presence of businesses in an area can provide citizens with access to goods or services that can improve quality of life. Scholarly literature identifies tax revenue, employment, and access to helpful goods or services as three benefits businesses provide to the governments they interact with, which can be seen as the compensation that businesses give in exchange for governance.

Tax Revenue

Current literature demonstrates that taxes play an important role in decision making, both for businesses in minimizing costs and governments in maximizing revenues. The research of Hanlon and Heitzman (2010) showed that a decrease in tax rates leads to an increase in foreign direct investment, and that the sensitivity of businesses to tax rate changes varies by industry and country. While businesses try to lower tax rates paid, governments are incentivized to use tax rates to increase revenue. The need to raise revenue is ever present at all levels of government, as revenue funds all of the projects and public works governments provide and the salaries of decision-makers. Raising business tax rates is a popular strategy to increase public funds, but it may not always achieve the desired effect. As theorized by economist Arthur Laffer in the famous Laffer curve, the tax rate that creates the most government revenue lies somewhere between zero and one hundred percent. A decrease in the tax rate may increase government revenue if the previous rate was prohibitively high (Wanniski, 1978).

Since businesses seek the lowest overhead costs including tax rates, and governments seek maximum revenue, situations can exist where tax reductions bring both incentives into

alignment. If taxes paid by businesses are compensation for the services governments offer, tax

incentives resemble coupons issued by governments to secure more sales and revenue. Jensen,

Malesky, and Walsh (2015) found that mayor-council structures of local government have more

political incentive to offer tax breaks because the mayor bears individual pressure and can be

voted out of office if he or she fails to provide results in economic growth. While tax incentives

reduce the amount of tax revenue the government would receive if the incentive had not been

offered, it still results in an increase in revenue if it brings in a business that would have located

somewhere else.

Employment

Governments also seek to attract businesses for the positive externalities they offer. First,

businesses usually employ citizens that live near the place where the business is located. Studies

show that the factor of higher employment tends to be an important motivator for governments:

"countries, states and local governments offer lucrative location-based incentives in order to

attract job-creating investments to their districts" (Jensen et al., 2015, p. 332). Data shows that,

consistent with theory, business activity does create jobs in a region. Moscarini and Postel-

Vinay (2012) found that small and large businesses were positively correlated with lower

unemployment rates. Their data showed that larger businesses contribute more toward

employment in economic booms but cause more lost jobs in recessions (Moscarini & Postel-

Vinay, 2012). Employment provides citizens with a source of income that enables them to

improve their quality of life, invest in their communities, and pay taxes to their government. The

incomes of employed individuals represent another source of tax revenue for governments, who

already receive taxes from the business entities. Literature suggests that there are also societal

benefits of increasing employment. According to Koursaros (2017), unemployment can have a

significantly high psychological cost on an individual, especially where employment is a social

norm. The study presented a model where the psychological cost can be considered along with

the total economic cost of unemployment, which emphasizes the importance of promoting

employment in monetary policy decisions (Koursaros, 2017). The added benefit of increased

employment is a large factor in the competition to attract businesses.

Access to Goods and Services

The second positive externality businesses provide is access to a wide variety of goods

and services. More options for consumers have the potential to improve the prices they pay and

provide more diverse shopping experiences. Literature on the relationship between business

activity and quality of life is fairly scarce, but some studies show that attracting businesses

activity in rural or underserved communities can allow residents to experience consumer trends

that otherwise might only be available in large cities. According to Meltzer and Schuetz (2012),

a variety of retail options can positively affect quality of life. They suggested a philosophy of

economic development that focused more on the consumer demand side of the economy. Tax

revenue, employment, and quality of life combine to create a strong incentive for governments to

compete to host businesses.

Amazon HQ2

The location of Amazon's second headquarters is a highly publicized example of large-

scale competition between municipal governments for business investment. The body of

literature on the events surrounding Amazon's decision indicates that local governments

competed for Amazon like many sellers competing for a highly valued sale. In 2017, Amazon

announced plans to build a second headquarters, causing it to receive 238 proposals from cities

in North America (Parilla, 2017). While Amazon's solicitation focused on obtaining tax

subsidies, it was designed to gain an understanding of the values of the prospective communities

(Nager, Lowe Reed, & Langford, 2019). The factors Amazon considered were "the education

and skills of their workforce, the quality of their transit and built environment, the strength of

their schools and universities, and the livability of their communities" (Parilla, 2017, p. 379).

This scenario reveals what attracts businesses when they select a local government with which to

partner. These factors also inform the way governments recruit businesses. Parilla (2017)

reported that wealthy cities like Boston and Toronto offered to invest in a technically educated

workforce and infrastructure, while other cities that were unable to afford up-front expenditures

offered billions of dollars in direct tax incentives. Some of the most common themes in the text

analysis of Nager, Lowe Reed, and Langford (2019) of the proposals for Amazon's headquarters

were educational institutions, quality of life, and a business-friendly government. They

concluded that the proposals emphasized their respective cities as being both a quality option and

a cost-saving option by using subsidies.

        In the end, Amazon decided to build its second headquarters in Arlington, Virginia. The

move resembled a market exchange between business and government, as Amazon's presence in

Virginia represented an estimated three-billion-dollar gain in state tax revenue over twenty years

and twenty-five thousand created jobs (Martz, 2018). In addition to the normal services provided

by governments, the state of Virginia offered five hundred fifty million dollars of direct tax

subsidies and offered to invest in higher education and transportation in the region (Martz, 2018).

The combination of Arlington, Virginia's law enforcement, educated workforce, infrastructure,

and the tax incentives were enough for the Seattle-based ecommerce giant to agree to pay taxes

to the local government and employ its citizens.

Business-Government Market Idiosyncrasies

While the interactions between businesses and governments behave like a competitive market in the ways described above, there are idiosyncrasies with those situations that distinguish them from simpler examples of a competitive market. Most impactfully, businesses must be located somewhere and must pay taxes to some government entity given that the business is established legally. This removes the leverage from the demand side that exists in other markets. If a consumer dislikes the price of an item of clothing at a department store, he or she can wait as long as desired to find a more appealing price. In the market for governance, businesses must exist in the jurisdiction of some government. Potential startups may take time researching tax structures of different locales before choosing a location from which to operate, but once in the market, businesses must endure changes to tax rates or undergo what is usually a lengthy relocation process. Current literature suggests that on an international level, the market may be more inelastic than previously thought on the side of the businesses. Clausing (2018) studied the location decisions of the world's two thousand largest companies in relation to changes in corporate tax rates. Some of the factors found to be statistically correlated with nations that host the largest companies were the size of the economy, favorable geography, education, and infrastructure (Clausing, 2018). The regression analysis showed a strong negative correlation between corporate tax and the count of large companies when considering all nations, but the correlation was much weaker in the large, wealthy nations (Clausing, 2018). Clausing (2018) used this finding to recommend against corporate tax cuts in wealthy nations, as the study indicates that large companies in those nations may be less responsive to tax rate changes.

Price Elasticity of Demand

Scholarly literature on the topic of price elasticity of demand includes many studies of the elasticity of demand curves in various industries, as well as multiple different views as to the origin of the economic concept. It is widely held that price elasticity of demand originated in *Principles of Economics* by Alfred Marshall, which was originally published in 1890. Marshall coined the term "elasticity of demand" to refer to the sensitivity of demand to a change in price:

> we may say generally:—The *elasticity* (or *responsiveness*) *of demand* in a market is great or small according as the amount demanded increases much or little for a given fall in price, and diminishes much or little for a given rise in price. (Marshall, 1920, III, IV, para. 2)

Marshall was credited for the idea in *Essays in the History of Economics* (Stigler, 1965) and Seldon (1986) cited Marshall as an early foundation of studies of elasticity. Some literature suggests that the general concept may not have originated with Marshall. According to Morrill (1983), early twentieth century economists John Maynard Keynes and Henry Schultz saw Marshall's definition as an elaboration on a concept Cournot put forth in 1838. The general consensus of the literature is that Marshall's definition in *Principles of Economics* is an important foundation to any study of price elasticity of demand.

Scholarly literature has added to and updated Marshall's depiction of price elasticity of demand in many ways. One notable development has been the calculation of price elasticity of demand as an arc rather than a line. According to Seldon (1986), the simple formula of change in quantity divided by change in price is said to be a general estimation of the elasticity of the demand curve. Marshall (1920) was concerned with real world examples with small changes in price where the arc could be reasonably treated as a line between the two prices, but large price

changes could lead to different elasticity values. Current textbooks teach calculating the

averages of price and quantity to better account for the differences in elasticity at different points

along the arc-shaped demand curve (Seldon, 1986). Seldon (1986) proposed the use of Lerner's

(1933) alternative method in teaching economics. Lerner (1933) modified an earlier formula for

price increases to treat every price change as an increase, with the lower of the two prices in the

numerator of the equation. Morrill (1983) also favored Lerner's modification, while pointing out

that all of the elasticity formula variants are simply indices to represent a concept, and one

cannot be universally true mathematically. Scholarly literature has refined the mathematical

definition of elasticity since Marshall, but the general concept of change in price compared to

change in quantity demanded remains.

Current literature reveals many applications of price elasticity of demand in a wide

variety of industries. In the German spot market for energy, a regression analysis found an

average elasticity in the five years after 2010 to be -0.43 (Bönte et al., 2015). According to a

study by Andreyeva et al. (2010), the price elasticity for food varies by item, with meats and soft

drinks being the most responsive to changes in price. A study of pesticides in Europe and North

America found the market to be relatively inelastic, warranting further research into the

effectiveness of taxes on pesticides (Böcker & Finger, 2017). In general, studies use price

elasticity of demand to inform economic policy related to the industry.

Research Gap: Elasticity of Tax Rates for Businesses

While there is a wide body of scholarly literature on the relationship between businesses

and governments, examining the impact of market forces and viewing the relationship as a type

of market is less common. Clausing's (2018) analysis of corporate tax rates and other studies

have been done to examine the correlation between tax increases or decreases and business

activity, which is similar to elasticity. However, there appears to be a scarcity of literature in an attempt to quantify the elasticity of the tax rates charged to businesses by governments. An OECD paper examined the sensitivity of foreign direct investment to tax rates and found that companies are sensitive to changes in tax rates, but there is asymmetry in that rising taxes repel business inflows more than falling taxes attract businesses (Bénassy-Quéré et al., 2005). Gravelle (2013) examined the impact of scholarly assumptions on the mobility of capital on the incidence of corporate taxes and found that most of the incidence likely falls on corporations, not labor. This study attempted to build on that research by applying the concept of price elasticity of demand to the relationship between businesses and national governments.

Method

A set of two related analyses were conducted based on elasticities calculated using a simple elasticity formula, percentage change in demand over percentage change in price, as demonstrated in Pass et al. ("Price elasticity of demand," 2006). The main study regarding elasticity was performed, and the significance of the findings to overall tax revenue was evaluated. Data were collected on locations at the national level, as the offerings of governments in the areas of law enforcement, education, and infrastructure are expected to vary more from nation to nation than between cities in the same nation. Foreign direct investment, or FDI, was selected as the variable to represent demand for each nation and its offerings to businesses. Use of FDI to represent businesses choosing their location and the taxes they pay is consistent with Bénassy-Quéré et al (2005), which evaluated the sensitivity of FDI to changes in tax policies. National taxes on corporate profits were used to represent the price paid by businesses. The study focused on the time period from 2015 to 2019 to make use of the most recently available data and provide an up-to-date view of elasticity in light of recent shifts in the global economy.

Sample

Data were analyzed on the tax rates and FDI flows of all 37 OECD member nations for the period of time between 2015 and 2019. The sample included most European countries; the United States, Canada, and Mexico from North America; and Colombia, Chile, Australia, New Zealand, Japan, and South Korea. A complete list of OECD member nations can be found in the datasets in appendices A and B.

Data

Corporate tax was represented by the official corporate tax rates of the 37 OECD member nations. The tax rate data was published by the Tax Foundation in its annual report on worldwide corporate taxes (Asen, 2020). The dataset listed each rate as a percentage and included countries and years that were not used in this study. The portion of the dataset for the corporate tax percentages used in this study can be found in appendix A.

The data on foreign direct investment in the 37 nations was provided by a publicly available OECD (2020) indicator. Foreign direct investment is defined as "the value of cross-border transactions related to direct investment during a given period of time" (OECD, 2020, para. 1). The data included transactions related to equity, reinvestment of earnings, and debt, and thus provided an indicator of the direction of business location decisions. Data on net FDI inflows were used in this study, which are defined as the value of transactions of the three types listed above that increase foreign investment in a given nation, minus the value of transactions in which foreign investment left the nation. The figures for each nation and year are given in terms of millions of U.S. dollars to account for currency differences. The full dataset for the net FDI inflows of the 37 OECD nations can be viewed in appendix B.

Outliers and Missing Data

The OECD FDI dataset was examined for outliers to avoid skewing results due to unusual values for corporate tax or FDI. The values for net FDI inflows were quite volatile, and outliers were identified used the method described in the *Encyclopaedic Dictionary of Psychology* (Hole, 2006). A larger sample of the years from 2005 to 2019 was considered, the mean of the sample for each nation was calculated, and values that were more than two standard deviations away from the mean of the larger sample were not considered in the analysis. This included Hungary, Iceland, the Netherlands, and the United States in 2015; Austria, the United Kingdom, and the United States in 2016; and Ireland, Israel, and Luxembourg in 2018.

In the corporate tax rate dataset, twelve of the OECD nations studied kept the same corporate tax rate throughout the time from 2015-2019. These nations were excluded from the elasticity portion of the study, as their fluctuations in FDI cannot be explained by a change in corporate tax rate.

Interventions

The analysis of the elasticity of the international market for business locations involved the elasticity formula of the percentage change in demand divided by the percentage change in price ("Price-elasticity of demand," 2006). With FDI used as an indicator of demand and corporate tax measuring the price charged by the government, the elasticity formula used is:

$$E = \frac{\Delta FDI_a}{\Delta T_a} \qquad\qquad (1)$$

for a country a in a given year, where E is the elasticity coefficient and T represents the corporate tax rate, and the absolute value of the quotient of the rates is taken. To accommodate this formula, the percentage change of FDI and corporate tax was calculated for each nation over the period of time where the corporate tax rate changed in the years 2015-2019. For example, if a nation

changed its corporate tax rate in the year 2017, the percentage change in FDI inflows from 2016-

2017 is calculated with the following formula for a given country:

$$\%\Delta FDI = (FDI_{2017} - FDI_{2016})/FDI_{2016} \qquad (2)$$

The full table of the percentage change of net FDI inflows over the entire period of the study for

each nation can be viewed in appendix C, and the percentage change of the corporate tax rate

over the same period is included in appendix D. The percentage change values corresponding to

the outliers identified above were included in the appendices but excluded from analysis.

In the main elasticity calculation, the years directly before and after each change in the

corporate tax rate were evaluated. The change in corporate tax rate and FDI inflows was

calculated with the difference between the year after the rate change and the year before using

(2). The percentage change values were used in (1) to derive one elasticity coefficient for each

nation for each change in corporate tax rate. A nation that changed its corporate tax rate multiple

times from 2015-2019 generated multiple observations of elasticity. The mean and median of

the elasticity coefficients were taken to derive an average elasticity for all OECD countries from

2015-2019.

A second intervention used a linear regression to determine whether FDI has a significant

impact on tax revenue. If the elasticity of demand for a business location as represented by

demand is elastic, a pertinent piece of information would be whether changes in FDI have a

strong effect on tax revenue. Such knowledge would help governments determine how an

increase in the corporate tax rate, if accompanied by a decrease in FDI, would affect total

revenue from corporate taxes. Publicly available OECD (2020) data on revenue from corporate

taxes in millions of U.S. dollars was used as the dependent variable in the linear regression. FDI

was the only independent variable employed in a simple linear regression technique, using the

formula:

$$NTR = a + b(FDI) \tag{3}$$

where N*TR* represents a nation's tax revenue from corporate taxes, *b* is the regression coefficient

of FDI, and *a* is the intercept where FDI equals zero. The *t*-statistic was used to determine

whether FDI's effect on tax revenue is statistically significant. Since it did not contain any

outliers for FDI, the year 2017 was used in the regression analysis. The 37 OECD countries

were divided into "Upper income" and "Upper-middle income" groups according to the World

Bank's (n.d.) lending classification system to provide a more nuanced result. A table of the

revenue and FDI data used in the regression can be found in appendix F.

Evaluating Results

The results of this study are significant if a clear understanding can be obtained of

whether the market for business location decisions is elastic, unit elastic, or inelastic for different

nations or regions. Additionally, this study provides information about the specific elasticities of

various OECD nations. The results were evaluated using the method described by Prasad (2011)

for interpreting elasticity coefficients. Coefficients with an absolute value less than one were

considered inelastic, equal to one meant unit elastic, and values greater than one were considered

elastic (Prasad, 2011). According to the law of demand, the price and the quantity demanded of

a good or service are inversely related, as an increase in price will decrease quantity demanded

(Ehrbar, 2007). Therefore, the elasticity coefficient should always have a negative sign, ranging

from zero to negative infinity (Prasad, 2011). However, many factors other than tax rates

contribute to FDI decisions. In practice, it is possible for FDI to increase in the same period that

corporate taxes increase, creating a positive elasticity value. The existence of positive elasticities represents one of the limitations of this study, that it is influenced by external factors.

Results

The elasticity calculation considered the time from 2015-2019 as a whole and calculated one elasticity coefficient for each nation that experience a change in corporate tax rate during the period. The mean elasticity coefficient of all OECD countries was 83.34, which represented elastic demand. The median elasticity was 12.18, which also indicated that demand was elastic in most cases. Of the 34 observations of elasticity coefficients due to a change in the corporate tax rate, 30 demonstrated elastic demand. The most elastic observations were Norway's most recent change, Belgium, and Germany, while inelastic nations were Colombia, Portugal, Korea, and the United States. A list of each nation, and the time period in question if there were multiple rate changes, along with its elasticity coefficient, is included in appendix E.

Several conclusions can be made from the elasticity analysis. First, elasticities varied widely from inelastic to elastic among OECD nations, implying that factors specific to individual nations may influence the level of competition between nations for business activity. FDI varied widely throughout the sample, but in many cases, it generally followed the theory of an inverse relationship with corporate tax rate. With some exceptions, the nations with the most elastic demand in business location decisions tended to be landlocked European nations. This could possibly be explained by ease of mobility between nations in the E.U. and the close geographical proximity of many other nations. On the other hand, all of the inelastic nations were nations with port access to an ocean. The only inelastic European nation, Portugal, has a large coastline along the Atlantic Ocean. The logistical advantage of location near a coast may be a factor causing foreign businesses to be less sensitive to tax increases. In particular, the United States

demonstrated highly inelastic demand. FDI has declined in the United States in recent years

despite declining tax rates, indicating that businesses might consider negative factors that

outweigh the tax cuts. In most cases, yearly FDI changes were more extreme than corporate tax

changes.

In the regression analysis of the effect of FDI on total tax revenue, all but three of the

OCED nations were classified as "Upper income" according to the World Bank (n.d.). For those

34 nations, the regression was NTR = 5440.68 + 1.409FDI, with the coefficient of 2017 FDI

indicating a positive relationship between FDI and tax revenue. The t-statistic was 9.892 for the

regression, confirming that the result was statistically significant. This suggests that FDI has a

significant impact in determining tax revenue, and the effect of tax rate on FDI should be taken

into account when determining tax policy. In the regression for Colombia, Mexico, and Turkey,

classified as "Upper-middle income" by the World Bank (n.d.), regression equation was NTR =

21435.65 + -0.598 FDI. However, with a t-statistic of -1.1, that result was not statistically

significant.

Conclusion

Implications

The addition of price elasticity of demand to international government competition to

host businesses has the potential to inform tax policy. In consumer markets, inelastic demand

signifies that sellers can raise prices while losing only a small amount of business, increasing

total profits. On the other hand, elastic demand indicates that sellers will likely lose a large share

of the market for an increase in price. Elasticity is used as an input to determine optimal pricing

for profit maximization for sellers in imperfectly competitive markets (Prasad, 2011). For

governments, elasticity is used in a similar way to determine the incidence of a corporate tax

increase. Gravelle (2013) proposed a model for tax incidence that relaxed capital mobility

assumptions and placed the majority of the burden on corporations. That study noted that the

size of the nation in question is one of the determinants of tax incidence, with small nations

being more likely to lose capital with a tax increase, burdening laborers (Gravelle, 2013). The

results of this study indicate that the elasticity of demand for business location decisions vary for

different nations. With some exceptions, a trend exists in the data of smaller or landlocked

European nations exhibiting higher elasticity, while large, economically powerful nations with

sea access may tend to be more inelastic. As taxing corporations is generally more politically

expedient than passing the tax burden to labor, nations with inelastic demand are incentivized to

use corporate tax as a large part of their revenue raising strategies. On the other hand, smaller

nations in stronger competitions with neighboring countries may consider reducing corporate tax

rates or offering tax incentives to better attract business activity.

Suggestions for Further Research

Since the data varied widely, future studies could use longer periods of time and a larger

sample of countries to smooth noise in the model. Additionally, nations could be divided into

categories based on the size of their economies in terms of total GDP to test the hypothesis that

smaller nations face more elastic demand. The effect of economic unions like the European

Union on capital mobility and tax incidence could also be examined. The variance of FDI in this

study compared to relatively stable corporate tax rates suggested that other factors might have

more influence on business location decisions than corporate tax. A regression analysis could be

conducted with change in net FDI inflows as the dependent variable and change in corporate tax

as one of the independent variables. The other independent variables could relate to changes in

education, infrastructure, law enforcement, and other factors. This would empirically evaluate

the theory that those government offerings attract businesses to a location. Finally, countries that

tended to be strongly elastic or inelastic could be examined historically to determine whether

their results were caused by circumstantial events of the time or deeper political and economic

trends.

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Appendix A

Corporate Tax Rates 2015-2019

Location	2015	2016	2017	2018	2019
Australia	30	30	30	30	30
Austria	25	25	25	25	25
Belgium	33.99	33.99	33.99	29.58	29.58
Canada	26.7	26.7	26.7	26.8	26.62
Chile	22.5	24	25	25	25
Colombia	25	25	34	33	33
Czech Republic	19	19	19	19	19
Denmark	23.5	22	22	22	22
Estonia	20	20	20	20	20
Finland	20	20	20	20	20
France	37.9962	34.43	34.43	34.43	34.43
Germany	30.175	30.175	30.175	29.825	29.897059
Greece	26	29	29	29	24
Hungary	19	19	9	9	9
Iceland	20	20	20	20	20
Ireland	12.5	12.5	12.5	12.5	12.5
Israel	26.5	25	24	23	23
Italy	31.29275	31.29275	27.8064	27.8064	27.8064
Japan	32.11	29.97	29.97	29.74	29.74
Korea	24.2	24.2	24.2	27.5	27.5
Latvia	15	15	15	20	20
Lithuania	15	15	15	15	15
Luxembourg	29.22	29.22	27.08	26.01	24.94
Mexico	30	30	30	30	30
Netherlands	25	25	25	25	25
New Zealand	28	28	28	28	28
Norway	27	25	24	23	22
Poland	19	19	19	19	19
Portugal	29.5	29.5	29.5	31.5	31.5
Slovak Republic	22	22	21	21	21
Slovenia	17	17	19	19	19
Spain	28	25	25	25	25
Sweden	22	22	22	22	21.4
Switzerland	21.148581	21.148581	21.148581	21.148581	21.148581
Turkey	20	20	20	22	22
United Kingdom	20	20	19	19	19
United States	38.9975	38.923934	38.906474	25.83858	25.886141

Appendix B

FDI flows, Inward, Million US dollars, 2015 – 2019

Location	2015	2016	2017	2018	2019
Australia	29584	48291	45300	68033	41761
Austria	1295	-8401	14926	5409	846
Belgium	-70573	59185	-706	30801	2886
Canada	43853	36062	26518	43450	50613
Chile	20594	12281	6444	7013	11765
Colombia	11724	13848	13837	11535	14314
Czech Republic	465	9814	9518	11010	7577
Denmark	3617	235	3771	1199	3587
Estonia	36	1058	1938	1497	3091
Finland	2109	8573	2858	-2170	13612
France	45355	23055	24780	38162	33964
Germany	30534	15618	60225	73524	36358
Greece	1268	2762	3477	3971	5019
Hungary	-14545	-5439	3527	8401	1165
Iceland	709	-427	-41	-382	-253
Ireland	217820	39377	52722	232723	81102
Israel	11336	11988	16893	21515	19047
Italy	19631	28441	23996	37659	18152
Japan	-2251	19357	9354	9255	14548
Korea	3076	7415	12699	13299	10566
Latvia	739	254	708	968	875
Lithuania	1055	302	1019	976	1169
Luxembourg	31408	81378	-23157	-76414	14791
Mexico	35412	30996	34177	33769	34079
Netherlands	191560	65276	40990	120238	42238
New Zealand	-309	2844	2429	2397	4278
Norway	-2515	-3900	-5922	226	14322
Poland	13063	16596	9537	16376	10994
Portugal	9180	5684	6696	6865	7808
Slovak Republic	106	805	4008	1643	2449
Slovenia	1675	1245	896	1383	1227
Spain	8557	31538	41877	53462	8514
Sweden	8395	19153	14252	3553	18774
Switzerland	75289	88619	107321	-53150	-21741
Turkey	18978	13745	11033	12988	8799
United Kingdom	39189	258570	96401	65285	51466
United States	483849	480016	314977	243424	282053

Appendix C

Percentage Change in FDI Relevant to the Change in Corporate Tax

Country	Change FDI 2015-2019
Australia	41.1608%
Austria	-34.6718%
Belgium	-4462.7479%
Canada	15.4151%
Chile	-42.8717%
Colombia	22.0914%
Czech Republic	1529.4624%
Denmark	-0.8294%
Estonia	8486.1111%
Finland	545.4244%
France	-25.1152%
Germany	19.0738%
Greece	295.8202%
Hungary	-121.4194%
Iceland	-135.6841%
Ireland	105.9629%
Israel	68.0222%
Italy	-7.5340%
Japan	-746.2905%
Korea	243.4980%
Latvia	18.4032%
Lithuania	10.8057%
Luxembourg	-52.9069%
Mexico	-3.7643%
Netherlands	-35.2932%
New Zealand	-1484.4660%
Norway	-669.4632%
Poland	-15.8386%
Portugal	-14.9455%
Slovak Republic	2210.3774%
Slovenia	-26.7463%
Spain	-0.5025%
Sweden	123.6331%
Switzerland	-128.8767%
Turkey	-53.6358%
United Kingdom	31.3277%
United States	-10.4528%

Canada 2018-19	-0.6716%
Chile 2016-17	4.1667%
Colombia 2017-18	-2.9412%
Germany 2018-19	0.2416%
Israel 2016-17	-4.0000%
Japan 2017-18	-0.7674%
Luxembourg 2017-19	-7.9025%
Norway 2016-17	-4.0000%
Norway 2017-18	-4.1667%
Norway 2018-19	-4.3478%

Appendix D

Percent Change in Corporate Tax Rate from 2015-2019

Country	Change in Corporate Tax Rate 2015-2019
Australia	0.0000%
Austria	0.0000%
Belgium	-12.9744%
Canada	-0.2996%
Chile	11.1111%
Colombia	32.0000%
Czech Republic	0.0000%
Denmark	-6.3830%
Estonia	0.0000%
Finland	0.0000%
France	-9.3857%
Germany	-0.9211%
Greece	-7.6923%
Hungary	-52.6316%
Iceland	0.0000%
Ireland	0.0000%
Israel	-13.2075%
Italy	-11.1411%
Japan	-7.3809%
Korea	13.6364%
Latvia	33.3333%
Lithuania	0.0000%
Luxembourg	-14.6475%
Mexico	0.0000%
Netherlands	0.0000%
New Zealand	0.0000%
Norway	-18.5185%
Poland	0.0000%
Portugal	6.7797%
Slovak Republic	-4.5455%
Slovenia	11.7647%
Spain	-10.7143%
Sweden	-2.7273%
Switzerland	0.0000%
Turkey	10.0000%
United Kingdom	-5.0000%

United States   -33.4657%

Appendix E

Country	Elasticity	Elastic/Inelastic
Belgium	343.9655335	Elastic
Canada	170.4820876	Elastic
Chile	6.054918908	Elastic
Colombia	0.002206496	Inelastic
Denmark	14.64878813	Inelastic
France	5.238587003	Elastic
Germany	19.03800391	Elastic
Greece	38.45662461	Elastic
Hungary	3.132083104	Elastic
Israel	1.016113856	Elastic
Italy	1.402812571	Inelastic
Japan	144.0341946	Elastic
Korea	0.346483975	Elastic
Latvia	1.101694915	Inelastic
Luxembourg	17.53965916	Elastic
Norway	7.434393638	Elastic
Portugal	0.372274492	Elastic
Slovak Republic	87.53540373	Elastic
Slovenia	2.382730924	Elastic
Spain	25.0659499	Inelastic
Sweden	157.0794634	Elastic
Turkey	1.771956857	Elastic
United Kingdom	29.19798923	Elastic
United States	0.676340315	Inelastic
Canada 2018-19	24.54524997	Elastic
Chile 2016-17	11.40688869	Elastic
Colombia 2017-18	5.656428417	Elastic
Germany 2018-19	209.2227555	Elastic
Israel 2016-17	10.22897898	Elastic
Japan 2017-18	1.379103104	Elastic
Luxembourg 2017-19	20.73678777	Elastic
Norway 2016-17	12.96153846	Elastic
Norway 2017-18	24.91590679	Elastic
Norway 2018-19	1434.549	Elastic

Appendix F

2017 FDI and Tax Revenue

	2017 FDI Net Inflows	2017 Tax Revenue (in million USD)
Australia	45300	40401
Austria	14926	1743
Belgium	-706	22016
Canada	26518	54618
Chile	6444	5587
Colombia	13837	5921
Czech Republic	9518	7526
Denmark	3771	15106
Estonia	1938	874
Finland	2858	10933
France	24780	119296
Germany	60225	138879
Greece	3477	7846
Hungary	3527	5417
Iceland	-41	92
Ireland	52722	7624
Israel	16893	11478
Italy	23996	82047
Japan	9354	153147
Korea	12699	41169
Latvia	708	948
Lithuania	1019	1404
Luxembourg	-23157	2409
Mexico	34177	1869
Netherlands	40990	32202
New Zealand	2429	6582
Norway	-5922	15451
Poland	9537	17962
Portugal	6696	7537
Slovak Republic	4008	3261
Slovenia	896	1799
Spain	41877	44361
Sweden	14252	23976
Switzerland	107321	1932
Turkey	11033	21197
United Kingdom	96401	87569
United States	314977	522586