AMERICAN UNIVERSITY OF ARMENIA

TAX INCENTIVES AND INVESTMENT IN ICTS: EVIDENCE FROM THE CENTRAL AND EASTERN EUROPE AND LESSONS FOR ARMENIA

MANOOGIAN SIMONE RESEARCH STUDY BY
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FEBRUARY 2020

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ACKNOWLEDGEMENTS

The author would like to thank the Government of Armenia and the American University of Armenia for the opportunity to conduct the research. The Manoogian Simone College of Business and Economics (CBE) dean and MSRF panel member Dr. Vache Gabrielyan provided guidance during writing the report, for which the author is grateful. She is indebted to the Political Science and International Affairs (PSIA) program faculty for having acquired knowledge and skills necessary for policy analysis. The author would also like to thank the AGBU Papazian Library staff for their assistance in finding the resources used in the study. The errors in the report are those of the author and should not be attributed to others.

EXECUTIVE SUMMARY

Background and Aim of the Research The research was funded by the Manoogian Simone Research Fund (MSRF), established by the Government of Armenia and administered by the American University of Armenia. It was carried out at the American University of Armenia from September 2019 to February 2020. The aim of the research was to: *first,* comparatively analyze the tax incentives provided to information and communication technology (ICT) and high-tech industries in the countries of Central and Eastern Europe and the Republic of Armenia; *second,* based on the evidence, provide recommendations to the Government of Armenia in its tax policy toward the industry.

Conceptual and Theoretical Frameworks Information and communication technologies (ICTs) are general-purpose technologies that have potential applications in all sectors of the economy. They contribute to economic growth and development via enhanced labor productivity, increased market efficiency due to reduced transaction costs and information asymmetries, and increased opportunities for consumer welfare. Because the public benefits from ICT investment outweigh its costs to private firms (there are positive externalities and spillover effects), government intervention in the market aimed at encouraging investment is justified.

Government revenue and expenditure account for at least one-fourth of the gross domestic product (GDP) in a typical economy, which implies that fiscal policy, i.e., the use of taxes and subsidies with the aim to affect supply and demand, can potentially be a means to encourage investment in ICTs and research and development (R&D). Taxes on

corporate profits, in particular, increase the cost of capital by reducing the return to investment and affect a range of business decisions, most notably the location of operations and tax filing. Since the 1980s, for both ideological and practical reasons (the coming in power of right-wing conservatives and the 'international tax competition' for attracting investment), statutory corporate income tax rates have been declining in both developed and developing countries, resulting in a cross-country convergence.

Average and marginal effective tax rates in developing and developed countries have been lowered through the provision of fiscal incentives for investment, defined as those 'provisions in the tax law that afford preferential treatment to some activities, assets, forms of organization or forms of financing over others.' The main types of fiscal incentives are tax holidays and exemptions, reduced (preferential) tax rates, tax credits and allowances, accelerated depreciation, and investment subsidies (see Box 1 below for definitions and examples and Figure 1 for a graphical representation). Along with providing tax incentives, governments allow for carry-forward of investment losses, provide foreign tax credits, and promote the formation of special economic zones (SEZ). All these measures aim at encouraging domestic and foreign investment and capital accumulation which is a source of economic growth.

Box 1. Main Types of Tax Incentives

Tax holiday: Temporary exemption of the newly-established firms or new investments from the tax liability. Holiday regimes typically pertain to the corporate income tax (CIT) and may be granted for a period of 1-20 years. The administrative requirements for firms, such as the need to file tax returns, may also be waived.

Tax exemption: Permanent (as far as the tax law is in effect unamended) deferral of the tax liability for specific firms, investments, or goods and services. E.g. 'small' businesses (defined by the number of employees or average annual turnover) may be tax-exempt; educational institutions in many countries are exempt from VAT.

Preferential (reduced) tax rate: A preferential tax rate applies when the tax rate for specific industries, firms or investments is lower than the statutory rate. E.g. firms whose activity is software development may be taxed at a rate of 10% in a country where the statutory CIT rate is 20%.

Investment tax credit: Deduction of a fraction of investment from the tax liability. Is applicable for investments in both tangible (plant and equipment) and intangible assets (R&D), ranging from 10 to 100 or more percent of the costs.

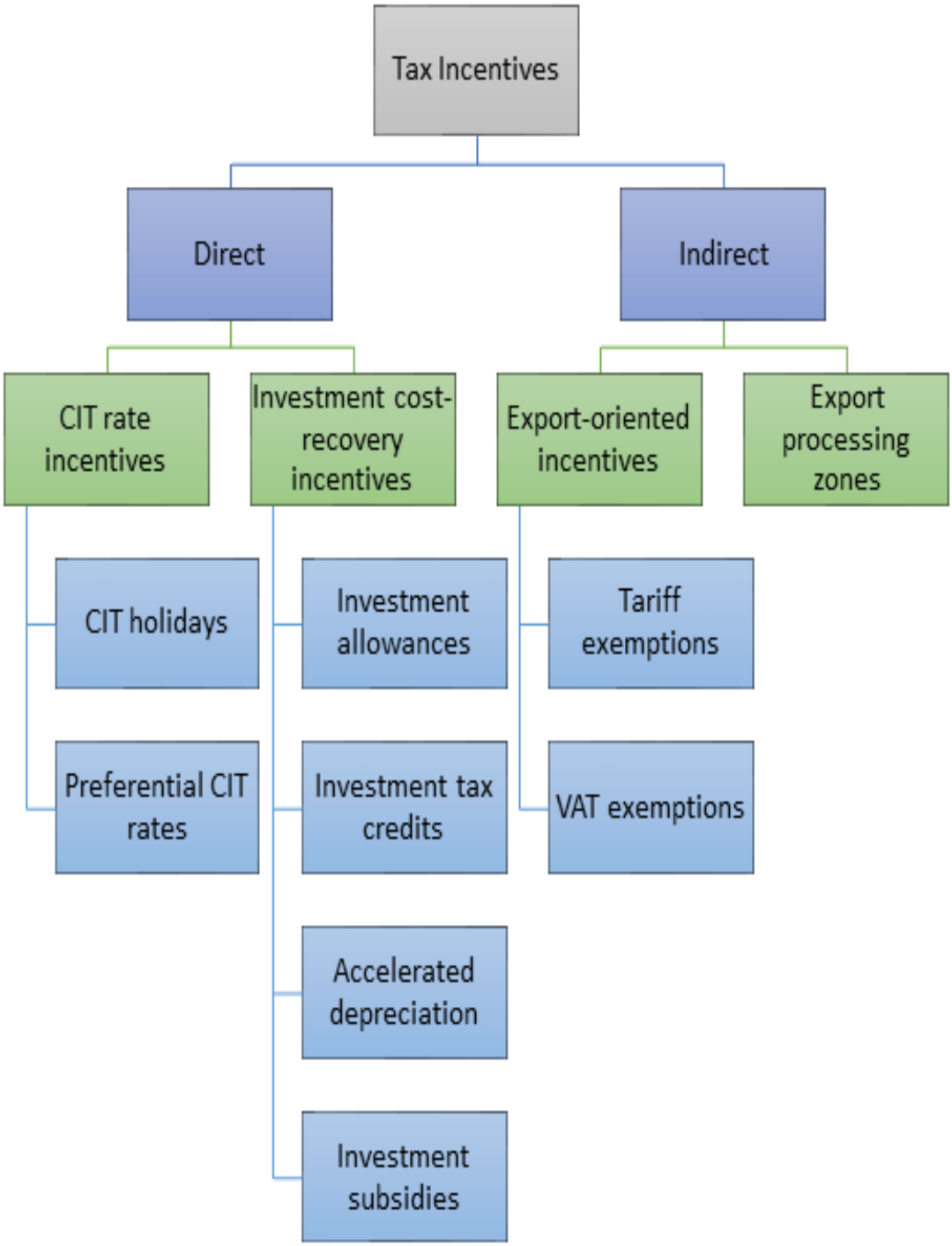
Investment allowance: Deduction of a fraction of investment from taxable profits, in addition to depreciation. The value of an allowance is the product of the allowance and the tax rate.

Accelerated depreciation: The deduction for tax purposes of the value of an asset at a faster rate than available for the rest of the economy. The 'economic' depreciation rate per year is 10%, and some assets (e.g. computer hardware and software) may be depreciated at a higher rate.

Investment subsidy: Provision of non-refundable or refundable funds for covering investment costs, e.g., expenses related to employment, representation, and repayment of loans.

Export tariff and VAT exemption: Accounting for tax purposes of exports of goods and services at a zero rate.

Figure 1. Main Types of Tax Incentives



Empirical evidence on the effectiveness of tax incentives in promoting investment and innovation is that with the exception of allowances for R&D, tax incentives are not cost-effective means to promote investment, i.e., do not result in additional investment per unit of foregone revenue. Most studies find that non-tax factors of the investment climate, such as macroeconomic and political stability, conditions of the labor market, and the quality of governance (government effectiveness, transparency, and accountability) matter more for investment, also affecting the effectiveness of tax incentives. In relative terms, performance-based incentives (investment tax credits and allowances) are considered to be superior over uniform incentives for all qualifying firms (tax holidays and preferential tax rates).

Evidence from CEE and Comparison with Armenia All CEE countries except Estonia and Latvia provide tax incentives targeted at investment in information and communication and high technology. Those are summarized in Table 1 below. The most widely used incentives are tax credits for R&D, allowances for the purchase of high-tech equipment, and accelerated depreciation. Though there are no specific incentives in Estonia and Latvia, all reinvested profits are tax exempt.

Since the adoption of the law on state support to the IT industry in December 2014, startup companies in Armenia are eligible for a five-year holiday reducing the CIT rate to 0% and the PIT rate to 10%. The tax code (revised as of January 2020) provides for an accelerated depreciation allowance for computers and communication equipment (1 year or 100%). No investment allowances or credits for tangible and intangible assets are available as of this writing.

Table 1. Summary of the Tax Incentives Provided in CEE Countries

	CIT holiday and exemption	Reduced tax rate	Investment tax credits and allowances (plant and equipment)	Investment tax credits and allowances (R&D)	Investment tax credits and allowances (other than P&E and R&D), grants and subsidies	Accelerated depreciation allowances	Export VAT and import tariff exemption	Special economic zones
Albania	✓	✓				✓		
Bosnia			✓		✓	✓	✓	
Bulgaria					✓	✓		
Croatia		✓	✓	✓	✓	✓		
Czechia				✓	✓	✓		
Estonia	✓	✓					✓	
Hungary	✓	✓	✓	✓	✓	✓		✓
Latvia	✓	✓			✓			✓
Lithuania		✓	✓	✓	✓		✓	✓
Macedonia	✓	✓					✓	✓
Poland		✓		✓	✓	✓	✓	✓
Romania	✓	✓		✓	✓	✓		
Serbia	✓		✓	✓	✓		✓	
Slovakia		✓	✓	✓	✓	✓		
Slovenia			✓	✓	✓	✓		

Along with providing fiscal incentives for investment and innovation, CEE countries ensure sound macroeconomic and regulatory environment for businesses and invest in STEM education. The average governance and ease of doing business scores in the region are 0.45 (on -2.5 to 2.5 scale, where -2.5 indicates weak and 2.5 strong governance) and 75 (0-100, where 100 is a most favourable environment for business). Armenia lags behind on both indicators with scores of -0.43 and 74.5. The average score of a CEE country on the International Property Rights Index is 5.8 (4.8 for Armenia), and the average rank is 61 among 129 countries (Armenia ranks 93rd). CEE students score higher on international standardized tests, such as PISA (science, mathematics, and reading scales), with an average score of 493 (443 for Armenia). An average of 23 % of all tertiary graduates in these countries enter the labor market with degrees in Science, Technology, Engineering and Mathematics (15% in Armenia).

Conclusion and Policy Recommendations As opposed to their counterparts in Central and Eastern Europe, businesses investing in ICTs in Armenia do not benefit from such incentives as exemption of reinvested profits, credits and allowances for investment in tangible and intangible assets, and subsidies for employment. Some of the non-tax factors affecting investment in high-tech industries, particularly the availability of skilled workforce and the protection of property rights, are less favourable in Armenia than in an average CEE country.

In its aim to stimulate domestic and foreign investment in ICTs through fiscal policy, the Government of Armenia should provide for performance-based tax incentives, such as credits and allowances. The credits for investment in tangible assets can be in the range of 40-50% of expense, while R&D expenditure can be fully deductible.

The current accelerated depreciation allowance for computers and communication equipment (1 year or 100%) is significantly higher than the average rate available in CEE countries (40%) and should be lowered. The Government of Armenia should increase the spending on secondary STEM education and subsidize the STEM programs in higher educational institutions. Governance and in particular the protection of intellectual property rights should be enhanced to ensure that businesses capture the profits from investment.

INTRODUCTION

The information and communications technology industry has been regarded as a priority field for the development of the Republic of Armenia since 2000 and is one of the fastest growing fields of the economy as of 2020. Policy measures implemented for encouraging industry growth have included, among others, the establishment of the Enterprise Incubator Foundation in 2002 and the adoption of the Law on State Support to the IT Industry in 2014.

Despite the accorded significance of the IT and high-tech industry by the government, companies investing in ICTs in Armenia do not benefit from fiscal incentives and other forms of state support that can be seen in the post-Soviet region and in the countries of Central and Eastern Europe in particular. The Law on State Support to the IT Industry provides for a five-year tax holiday but the regime applies to startup companies only and does not include provisions on exemption of expenses for investment in tangible high-technology assets and/or corporate R&D.

Funded by the Government of Armenia and carried out at the American University of Armenia, this study aimed to comparatively analyze the tax incentives and forms of state support provided to IT and high-tech industries in the countries of Central and Eastern Europe. Based on the evidence, it provides recommendations to the Government of Armenia in its tax policy toward the industry.

The report consists of sections on literature review, design and methodology, data analysis, discussion of findings, and recommendations. Details on the tax incentives provided in each of the CEE countries can be found in a companion Excel spreadsheet.

CHAPTER 1. LITERATURE REVIEW

1.1 Technology and Economic Growth

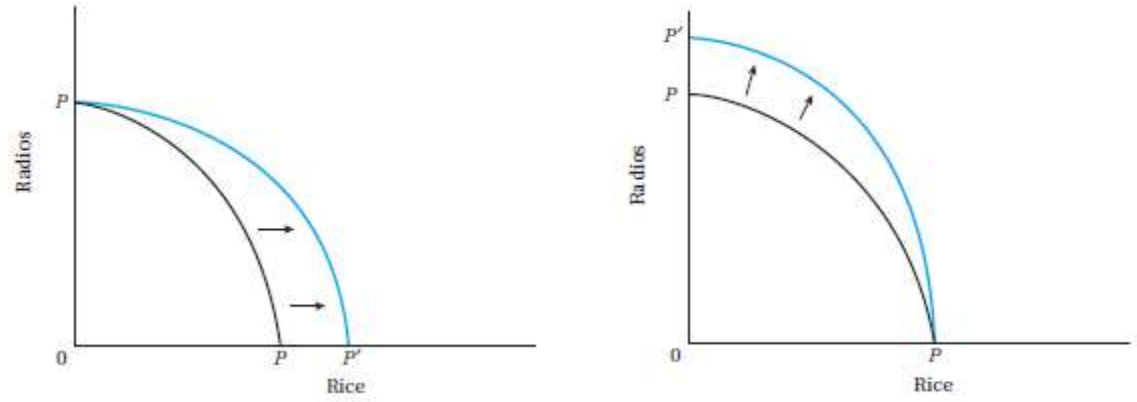
Along with labor, capital, and natural resources, technology is a source of economic growth and development (Krugman and Wells 2018; Todaro and Smith 2015; Weil 2013). Defined as *"the available knowledge about how inputs can be combined to produce output"* (Weil 2013, p. 31), it enters the aggregate production function of an economy as an either exogenous variable that increases the returns to the factors of production (Solow 1956, 1957; Swan 1956) or an endogenous variable that, like labor and capital, is a factor of production (Aghion and Howitt 1992; Barro 1990; Grossman and Helpman 1990, 1994; Lucas 1988; Romer 1986, 1990). Because the aggregate production function (for a specific representation, see Formula 1 below) exhibits *constant returns to scale* (i.e., increasing the inputs by a certain factor increases the output by the same factor) and *diminishing returns to capital* (additional units of capital, given fixed labor force and technology, increase the total output by increasingly smaller amounts), neoclassical theory predicts that sustained growth in the long run can be achieved only through technological progress (Acemoglu 2009; Barro and Sala-i-Martin 2005; Blanchard and Johnson 2013; Grossman and Helpman 1994). Thus, technology is a key driver of economic growth.

$$Y=AK^{\alpha}L^{1-\alpha} \quad (1)$$

where Y is total output (GDP), K is capital, L is labor, and A is technology. α is the share of capital in total output, $0<\alpha<1$.

Improved technology leads to growth in three distinct ways (Acemoglu 2009, pp. 58-59; Tadoro and Smith 2015, pp. 151-154). First *(neutral technological change)* implies a more efficient allocation of the available resources: More can be produced without increasing labor and capital inputs. Examples of this kind of technological change are the division of labor and specialization. The second *(labor-augmenting and labor-saving technological change)* enables increased production given fixed labor inputs, as well as automation of some aspects of the production process, thus decreasing or eliminating the need for additional labor. This kind of progress, which includes the invention of weaving and typing machines, computers, and the Internet, has been the primary source of industrial productivity since the late 19th century (Todaro and Smith 2015, p. 152). A third type *(capital-augmenting and capital-saving technological change)* enables improved utilization of the existing capital stock, thus decreasing the need for additional units of capital. Examples include hybrid crop seeds with greater yields (Griliches 1957) and quantum computers which "can solve problems classical computers cannot" (IBM 2020). Either of the three types of technological progress results in *an upward shift of the production possibility frontier* of the economy, i.e., the maximum attainable output combinations of goods and services that can be produced in a given time with fixed labor and capital inputs (see Figure 1 below).

Figure 1.1 The Effects of Technological Progress on Production Possibilities in a Two-Good Economy



a) Agricultural sector **b) Industrial sector**

Source: Todaro and Smith (2015), pp. 153-154.

Solow (1957) estimated that about 80% of the US growth in the period between 1909 and 1949 could be attributed to technical progress. The "Solow residual," i.e., the portion of output increase not attributable to increases in either capital or labor inputs, also referred to as *total factor productivity* (TFP) or *multifactor productivity* (MFP), is a major source of output growth at national, industry, and firm levels, and accounts for much of the cross-country differences in income per capita (Comin 2008).

ICTs and growth: Information and communication technologies (hereafter ICTs) are *general-purpose technologies* that have potential applications in all sectors of the economy and by that virtue are enablers of growth and development (Bresnahan and Trajtenberg 1995; David 2000; Jovanovic and Rousseau 2005). Studies that have examined the ways through which ICTs contribute to growth look at such aspects as

enhanced labor productivity, market efficiency due to reduced transaction costs and information asymmetries, and greater opportunities for consumer welfare.

Garbade and Silber (1978) documented the impact of the use of telegraphic communication on securities and foreign exchange markets in the United States and the United Kingdom. The "opportunities for accelerated search and order execution," as they hypothesized, should "induce more efficient arbitrage between markets, thereby reducing inter-market price differentials and increasing market integration." Data on price differentials for pre- and post-telegraph periods support the hypothesis.[1] One of the most significant welfare implications of improved communications, according to this study, can be isolated theoretically through a consumer surplus argument: *"Innovation of faster communications reduces the cost of searching for the best price in alternative markets"* (Garbade and Silber 1978, p. 822).

Using cross-sectional time-series data for 60 countries over a 13-year period, Hardy (1980) found empirical support for the hypothesis that the use of telephone leads to productivity growth. According to the findings, it does so through the impact on coordination of economic activity. Noting that economic development has occurred in the absence of the telephone and that its presence does not guarantee development either, the author views this technology as *not a necessary or sufficient, but a facilitating or contributing cause* of economic development (Hardy 1980, p. 280).

Leff (1984) discussed the socio-economic impact of investment in telecommunications using the framework of social cost-benefit analysis. Noting that a special feature of telecommunications infrastructure is the presence of *network*

[1] The reviewed literature includes peer-reviewed journal articles only, arranged in chronological order.

externalities, i.e., each subscriber's welfare rises with the number of other people who have access to the network, he underscores that *"the benefits of telecommunications investment increase exponentially as expansion permits new participants to join the system"* (p. 256). This means that "the expansion of telecommunications leads to a net social gain" (p. 257). By reducing the costs of transmitting information that is "current and hence useful for production, investment, and trading decisions," telecommunications improve efficiency in factor and product markets for public- and private-sector organizations alike (pp. 257-263).

Norton (1992) used a growth accounting model developed by Kormendi and Meguire (1985) to test the hypothesis that telecommunications reduce transaction costs in product and factor markets, thus leading to greater aggregate output. The estimates for a sample of 46 countries show that the presence of telecommunications infrastructure is associated with economic growth. Madden and Savage (1998) examined the relationship between gross fixed investment, telecommunications infrastructure investment, and economic growth for a sample of 27 transitional economies in Central and Eastern Europe. Their findings confirm the presence of a positive relationship for this sample of countries, as well: *Increases in telecommunications investment coincide with improvements in economic growth rates.* Regression models for production at aggregate and sectoral (industrial and services) levels show that telecommunications contribute positively to output growth; a Granger causality test reveals that the direction of influence is from economic growth to telecommunications investment, not vice versa *(changes in growth precede changes in economy-wide investment and changes in telecommunications investment).*

Using the Bureau of Economic Analysis (BEA) data for investment in the US, Jorgenson and Stiroh (1999) estimated that, as an investment good, computers contributed 0.26 percentage points to the national output growth between 1990 and 1996. *"The story of the computer revolution,"* as they state, *"is one of relatively swift price declines, huge investment in IT equipment, and rapid substitution of this equipment for other inputs"* (p. 110). Similarly, estimates by Oliner and Sichel (2000) show that information technology *capital* (computer hardware, software, and communication equipment) accounted for roughly 0.5 percentage point of output growth per year during 1974-90 and 1991-95, while *total factor productivity* (the portion of output growth not attributable to labor and capital inputs, which is equivalent to technological and organizational improvements) accounted for more than half of the increase in output. About two-thirds of labor productivity growth in the US nonfarm business sector between 1995 and 1999, according to this study, could be attributed to the use of information technology.

Addressing the concern expressed in the literature (see also Norton 1992, p. 181) that there may be a problem of reverse causality between telecommunications investment and economic growth, i.e., growth is causing an expansion in telecommunications infrastructure rather than the opposite, Röller and Waverman (2001) use a 'simultaneous approach' that enables control for causal effects. They estimate a model which endogenizes telecommunications investment by specifying a micromodel of supply and demand for telecommunications and then jointly estimate the micromodel with the macro-production equation. The results show that about one-third of the output growth in the sample countries (21 OECD members) during the observed period (1970-1990)

could be attributed to telecommunications. Given the presence of network externalities, it is more plausible that the impact of telecommunications on growth is not linear. The authors find that growth effects are significantly higher for countries whose telecommunications infrastructure has approached a near-universal coverage.

Like Garbade and Silber (1978), Jensen (2007) found micro-level evidence supporting the hypothesis that telecommunications reduce price differentials between markets, thus leading to greater integration and efficiency. The use of mobile phones in the fisheries market in Kerala state, India, according to the study, led to increased profits to fishermen, decreased prices for fish, and elimination of waste associated with storage. An important outcome was the increased adherence to the "Law of One Price" by market participants, according to which the price of a good should not differ between any two markets by more than the transport costs between them. These results, as the author notes, "demonstrate the importance of information for the functioning of markets and the value of well-functioning markets; *information makes markets work, and markets improve welfare"* (p. 919, italics added).

The growing importance of the telecommunications sector in the economies of both developed and developing countries and the presence of a strong correlation between the rate of mobile penetration and GDP per capita (r=0.56) are two observations that Gruber and Koutroumpis (2011) make before developing an econometric model for measuring the contribution of telecommunications infrastructure to economic growth. To control for reverse causality, they estimate three equations for the demand and supply of mobile infrastructure, as well as an infrastructure output function. The estimations using annual data for 192 countries over an 18-year period (1990-2007) show that

telecommunications contribute 0.20% to annual GDP growth in high-income countries (where the penetration rate is high) and 0.11% in low-income countries (where the penetration rate is low). *"Low mobile diffusion,"* as the authors conclude, *"has a high economic cost in terms of unrealized growth: low income countries forego 0.09% of annual growth due to the lack of mobile communications infrastructure"* (p. 413).

Vu (2011) examined the hypothesis that ICT penetration has a positive effect on economic growth at both theoretical and empirical levels. On the theoretical level, he argues that ICTs foster the diffusion of knowledge and innovation, improve the quality of individual and firm decision-making, reduce production costs, and increase demand and investment. At the empirical level, the author finds support for the hypothesis using panel data for 102 countries. Cross-country regression results show that the ICT penetration rate, alternatively measured by the number of personal computers, mobile phones, and internet users per 100 people, contributes positively to GDP growth. Results of the estimation of a system Generalized Method of Moments (GMM) model show that ICT penetration has a causal effect on growth.

The Negative Effects of Technological Change: Technological change is tantamount to the process of creative destruction as defined by Joseph Schumpeter:

> The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets. ... [This process] incessantly revolutionizes the economic structure *from within,* incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism

(1942, p. 83, quoted in Aghion and Howitt 1992, p. 324; emphasis in original).

The primary economic disruptions caused by the process of technological change are unemployment among workers whose jobs have been automated, decreased wages for those whose skills have become less demanded, and increased inequality among high-skilled employees on the one hand and middle- and low-skilled workers on the other (Manyika 2017). Other negative effects include decreased productivity in the initial period since ICT adoption, as individuals and firms adapt and reorganize their operations (Holt and Jamison 2009) and increased inequality of opportunity between those who possess and use information technology and those who do not (*"the digital divide"*) (Selwyn 2004). The former two are the primary reasons why certain groups and individuals (starting, most famously, from the Luddites in the 19th-century England) have opposed technological change (Akst 2013), while the latter effect was the primary reason why a number of studies in the early 1990s found no or negative contribution from ICTs to growth and is known as the "Solow Paradox" (see Oliner and Sichel 1994 for a review and evidence).[2]

The negative effects of technological change, as research and experience show, hold only for the short run. In the long run, technological change leads to productivity growth, which translates into a higher standard of living for all. Productivity effects of technology outweigh its displacement effects (Akst 2013; Acemoglu and Restrepo 2018; Autor 2015).

[2] In a *New York Times* article (12th July 1987), Robert Solow had remarked that 'one could see the computer age everywhere but in the productivity statistics.'

1.2 Technological Progress and Public Policy

Technological progress is a result of "*the application of new scientific knowledge in the form of inventions and innovations to both physical and human capital"* (Todaro and Smith 2015, p. 151). It can be promoted through the creation and maintenance of a favorable environment for economic agents that either invest in ICT, or, more importantly, are engaged in research and development (R&D), i.e., *"the conception or creation of new knowledge, products, processes, methods, and systems"* (Weil 2013, p. 202). As government revenue and expenditure account for at least one-fourth of GDP in a typical economy (Hyman 2011, p. 8), *fiscal policy* (the use of taxes and subsidies to affect supply and demand) is a means by which that goal can be achieved.

Taxes are the primary means by which governments finance their operations. Other things being equal, taxation reduces the incentives of individuals, households, and firms to work, invest, and consume (Hyman 2011; Mirrlees 2011). Neoliberal economists hold that high taxes and non-productive government spending (e.g., on old-age pensions) reduce domestic saving and investment rates, thus hampering economic growth (Barro 1990; Feldstein 1982; King and Rebelo 1990).

Taxes on corporate profits, which will be the focus of this study,[3] affect a range of business decisions. Among those are *whether to engage* in an activity and *in what form* (sole proprietorship, partnership, company/corporation), *how to finance operations* (debt vs. equity), *how much to produce,* and *where to locate.* High statutory, average effective, and marginal effective tax rates increase the cost of capital by reducing the return to

[3] The emphasis on corporate income, rather than personal income or sales taxes, is justified by the fact that much of the investment in R&D and ICTs is carried out by private firms (Weil 2013, pp. 204-205).

investment, discourage incorporation, favor debt versus equity finance, discourage additional investment and expansion, and make companies shift profits from high-tax jurisdictions to low-tax ones (Auerbach 1983; Devereux and Griffith 1998, 2003; Hall and Jorgenson 1967; Jorgenson 1963; King 1974; King and Fullerton 1984; Kotlikoff and Miao 2010; Mirrlees 2011). The burden of taxation is borne by the entrepreneurs, shareholders (owners of capital), as well as workers (Auerbach 2006; Harberger 1962; Kotlikoff and Miao 2010).

The trend in statutory corporate tax rates since the mid-1980s, driven partly by the efforts to attract foreign investment, has been one of steady decrease and has led to a cross-country convergence in corporate tax rates (Auerbach, Devereux, and Simpson 2010; Devereux, Griffith, and Klemm 2002). Reforms in developed countries have been rate-cutting *and* base-broadening, which explains why the share of corporate tax revenue in total tax revenue and as a share of GDP has remained stable over time or has slightly increased (OECD 2020a).

Subsidies encourage private provision of goods and services in markets where there are *positive externalities* (the marginal social benefit exceeds the marginal private benefit) or *public goods* characterized by nonrivalry and nonexcludability (consumption by one individual does not affect consumption by others, and non-payment/ non-contribution is not a determinant of use). Left to themselves, profit-maximizing firms will not provide or will substantially underprovide such goods and services. Thus, governments either provide those themselves (e.g., national defense and roads) or subsidize private production (e.g., R&D) (Hyman 2011, pp. 150-155). Government support to corporate R&D, both direct (through subsidies) and indirect (through provision of tax incentives,

as discussed below), has substantially increased over time, though recently, there has been a relative decline in direct government funding as compared with indirect support via tax incentives (OECD 2020b).

Much of the reduction in corporate tax burdens in developed and developing countries alike, especially for knowledge-intensive (IT and high-tech) industries, has been achieved through *tax incentives*, rather than decreases in average and marginal tax rates (Auerbach 2006; Klemm 2010; Hulten and Robertson 1984; Shah 1995; Zee, Stotsky, and Ley 2002). Those are *"provisions in the tax code that afford preferential treatment to some activities, assets, forms of organization or forms of financing over others"* (Shah 1995, p. 2), and include, among others, tax holidays and exemptions, reduced (preferential) tax rates, tax credits and allowances, accelerated depreciation allowances, and investment subsidies. The primary intent of tax incentives is to encourage domestic and foreign investment and capital accumulation. Table 1.1 provides an overview of the main types of tax incentives, with notes on the rationale for provision.

Table 1.1 Main Types of Tax Incentives

Tax incentive	Definition/description	Rationale for provision
Tax holiday	Temporary exemption of a new firm or investment from taxes, typically at least from the corporate income tax. Sometimes administrative requirements, such as the need to file tax returns, are also waived.	Most firms are in a loss position in the initial years of operation, and most capital investments do not yield a profit until several years after being made.
Investment tax credit (plant and equipment)	Deduction of a certain fraction of an investment from the tax liability. Rules differ regarding excess credits (credits in excess of tax liability) and include the possibility that they may be lost, carried forward or refunded.	Capital is a source of growth, and investment in equipment (*capital deepening*) generates growth when accompanied with population growth (increase in the labor force).
Investment allowance (plant and equipment)	Deduction of a certain fraction of an investment from taxable profits (in addition to depreciation). The value of an allowance is the product of the allowance and the tax rate, which means that, unless there is a single tax rate, the value of allowance (unlike a tax credit) varies across firms.	
Investment allowance and tax credit (R&D)	Deduction from gross taxable income/tax liability of a certain amount of investment on research and development	A special feature of R&D capital is the imperfect appropriability of returns as a result of intra- and interindustry spillovers. Such spillovers are large and significant, and as a result, the social rate of return on R&D projects exceeds the private returns. Because private returns from R&D understate the true social returns from such investments, R&D will be

		underprovided.
Accelerated depreciation allowance	Deduction of the value of an asset for tax purposes at a faster rate than available for the rest of the economy. Can be implemented in different ways, including higher first-year write-offs and increased depreciation rates.	Capital used in the production process depreciates (loses its productive value) at a certain rate in time (≈ 10% a year) and needs to be replaced to maintain the same level of output. By allowing depreciation at a higher rate than the standard (*"economic depreciation"*), tax payments in nominal terms are unaffected, but their net present value is reduced, and the liquidity of firms is improved.

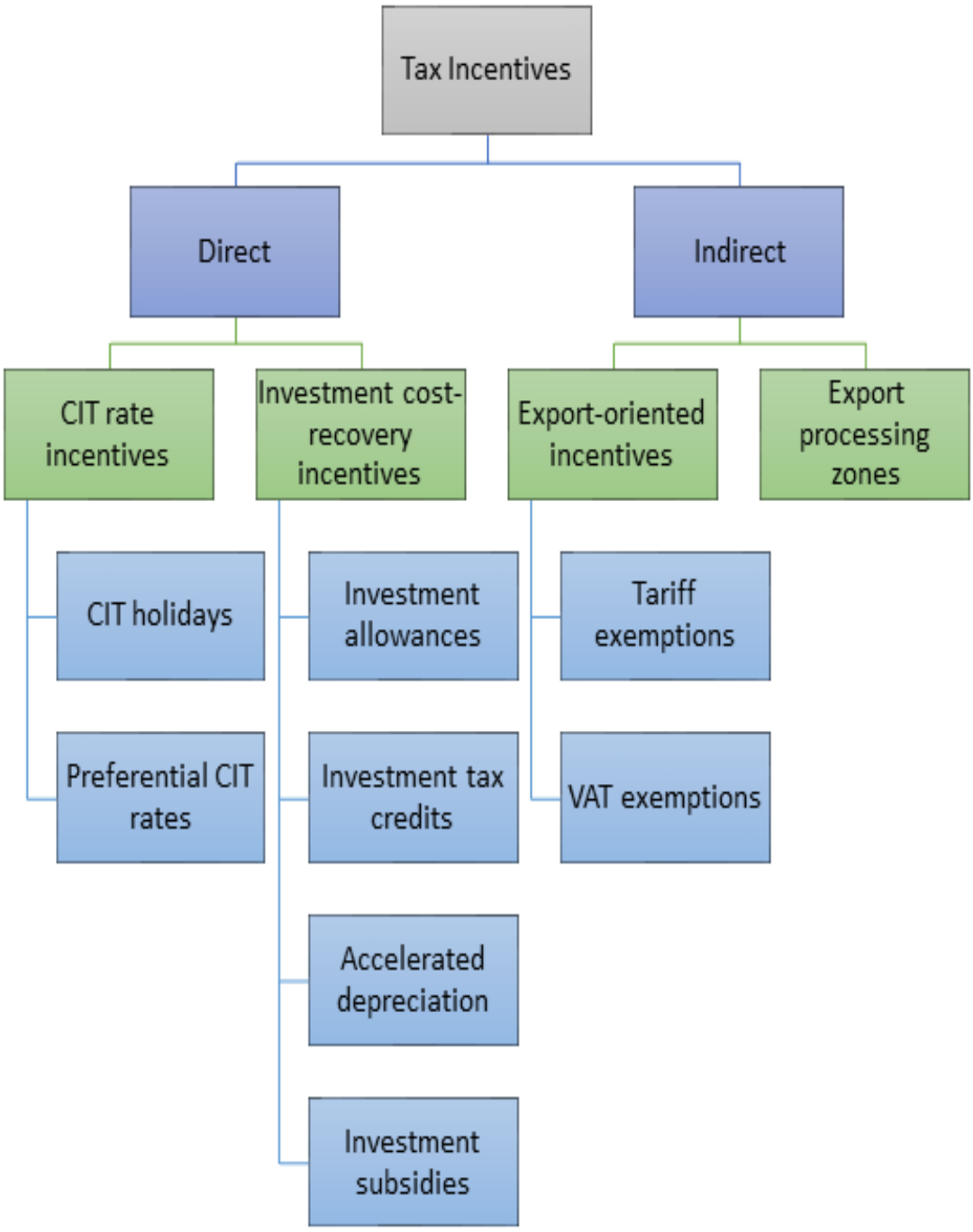
Sources: Klemm (2010); Shah (1995); Zee, Stotsky and Ley (2002)

In addition to those listed above, governments provide such incentives as *tax reliefs* (reduced tax rates for a class of taxpayers and activities, e.g. small businesses), *exemptions* from import tariffs and taxes on inputs (VAT, excises), and promote *geographically defined enterprise zones,* such as special economic zones (SEZ) and export processing zones (EPZ) where firms can locate, thereby benefiting from various tax incentives (Klemm 2010; Zee, Stotsky and Ley 2002, Figure 1.2 below).

Arguments for the provision of tax incentives, as can be gauged from the table, include *market failures* (presence of positive externalities and public goods, for which the social rate of return from investment is higher than the private rate of return, and which, therefore, if left to the private sector, will be underinvested in), *risk and uncertainty* (the potential loss to any one private enterprise exceeds the benefit), and *allocative efficiency* (directing capital to its most productive use) (Shah 1995). Major counterarguments are

that the provision of tax incentives runs counter to an important rule of thumb in designing an optimal tax system, that of *neutrality,* and violates the two core principles of equitable taxation, those of *horizontal equity* (equal treatment of equals) and *vertical equity* (consistency of tax burdens with the ability to pay), as capital income is treated more favorably than labor income (Mirrlees 2011, pp. 39-44; Shah 1995, p. 6). Because of increased information requirements for administration, tax incentives have the potential to increase the complexity of the tax system and thus, the administrative and compliance costs of taxation (Zee, Stotsky, and Ley 2002; Klemm 2010). Tax incentives may also lead to inefficiencies, as clientele emerge that lobby the government for extensions in preferential treatment (Shah 1995).

Figure 1.2 Main Types of Tax Incentives



Source: Based on Zee, Stotsky, and Ley (2002)

Empirical evidence on the effects of tax incentives is not vast, but unambiguously reveals that with the exception of incentives for R&D, those are not cost-effective means to encourage investment. Tax incentives do not generate additional investment per unit of foregone revenue and are often redundant, i.e., offered to industries where investment would have taken place even if no incentives were provided, because of high returns (Goolsbee 1998; Hulten and Robertson 1984; James 2013; Klemm and Van Parys 2012; Shah 1995; Van Parys and James 2010). Most studies conclude that a neutral tax policy that does not discriminate between industries and activities and ensures a level playing field to all businesses through *'a broadly based, low, and uniform tax rate'* (James 2013, p. 46) can better serve the ends that policymakers pursue by providing tax incentives. More importantly, those studies show that non-tax factors of the investment climate, such as the regulatory framework, macroeconomic and political stability, and the quality of governance (rule of law, absence of corruption, transparency, and accountability), are much more decisive in stimulating investment, and also determine the effectiveness of incentives (Van Parys and James 2010).

CHAPTER 2. RESEARCH DESIGN AND METHODOLOGY

2.1 Research Design

This is a mixed-method study that uses qualitative and quantitative approaches to data collection and analysis to reveal the impact of tax incentives on investment and innovation. Previous research suggests that with the exception of incentives for R&D, tax incentives do not meet their objective as policy tools, i.e., stimulating capital accumulation by private firms, and if they do, are not cost-effective, i.e., do not generate an additional unit of investment per unit of foregone revenue (Hulten and Robertson 1984; Klemm and Van Parys 2012; Shah 1995; Van Parys and James 2010). The study aims to make a contribution to the empirical literature by comparatively analyzing the tax incentives provided to information technology (IT) and high-tech industries in Armenia and 15 Central and Eastern European (CEE) countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Serbia, the Slovak Republic, and Slovenia.

Countries in the sample share a similar history, as are post-communist and transitioned to a market economy after the collapse of the Soviet Union. Armenia differs from other countries in the sample in two important respects: geography, specifically proximity to developed countries of the Western Europe, and economic and political integration. The listed CEE countries are either members of the European Union (EU-

11 countries: Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, and Slovenia) or have signed the Stabilization and Association Agreement (Albania, Bosnia and Herzegovina, Macedonia, and Serbia). Armenia is a member of the Eurasian Economic Union but has signed a partnership agreement, known as the Comprehensive and Enhanced Partnership Agreement (CEPA) with the EU.

Research Questions and Hypotheses: The study aims to answer the following research question:

RQ: What role does fiscal policy play in fostering investment in information technology and high-tech industries?

Three sub-questions are specified:

1. *Do fiscal incentives, such as subsidies, corporate tax holidays, investment tax credits and allowances, and tax exemptions, affect investment?* (Effectiveness)
2. *How much more investment do firms undertake in the presence of fiscal incentives?* (Efficiency)
3. *Do non-tax factors, such as regulation of business activity, protection of property rights, labor market conditions, and macroeconomic and political stability, affect investment incentives more than fiscal policy?* (Relevance)

The following hypotheses are advanced:

H_1: Fiscal incentives do affect investment decisions in information technology and high-tech industries.

H_2. Except for R&D subsidies and investment allowances, fiscal incentives are not cost-effective tools to promote investment in IT and high-tech industries.

H_3. Non-tax factors, such as regulation of business activity, protection of property rights, labor market conditions, and macroeconomic and political stability, affect investment decisions more than fiscal incentives.

2.2 Methodology

Data: The analyzed data included statistics and documents on the provision of tax incentives in Armenia and the countries of Central and Eastern Europe. Data sources include, but are not limited to the Armenian Legal Information System (ARLIS) (national legislation in the field, including the Tax Code), the Enterprise Incubator Foundation (EIF) (annual *"State of the Industry"* reports for the IT sector in Armenia), the Eurostat (science and technology indicators of the EU member countries), the International Monetary Fund (IMF) (macroeconomic indicators), the Organisation for Economic Co-operation and Development (OECD) (science, technology, and tax data), the PricewaterhouseCoopers (tax summaries), and the World Bank (development, governance, and doing business indicators).

Analysis: Quantitative data were analyzed using MS Excel and STATA software. Qualitative data were analyzed by manual pattern coding.

CHAPTER 3. DATA ANALYSIS

3.1 Descriptive Statistics

3.1.1 Fiscal Policy and Incentives

The main aggregates and balances of government finance of the CEE countries, as summarized in Table 3.1 below, show that the average government revenue in the region is 38% of GDP. Revenue is raised mostly from taxes (see Table 3.2), among which the largest shares are accounted for by taxes on goods and services (nearly 40%) and social security contributions (34%). Taxes on income, profits and capital gains account for 15% of total revenue on average.

As of February 2020, the average statutory corporate income tax (CIT) rate in the region is 16%, the lowest being in Hungary (9%), Bosnia and Herzegovina, Bulgaria, and Macedonia (10%), and the highest in Croatia (25%). The average standard indirect tax (value added tax, VAT) rate is 21%, the lowest being in Bosnia and Herzegovina (17%) and the highest in Hungary (27%). The average annual taxable turnover serving as a VAT threshold in the countries is USD 44,000, the lowest being in Albania (USD 18,000) and the highest in Serbia (USD 74,000). The employer's share of social security contributions accounts for 21% of gross wages on average (see Table 3.3).

Table 3.1 Government Finance Statistics in CEE Countries and Armenia, 2019

	General government revenue, % of GDP	General government total expenditure, % of GDP	Net lending (+) / net borrowing (-), % of GDP	General government gross debt, % of GDP
Albania	27.1	29.7	-2.6	66.7
Armenia	23.5	25.0	-1.5	50.1
Bosnia and Herzegovina	41.9	40.6	1.3	33.3
Bulgaria	36.3	38.3	-2.0	19.2
Croatia	46.6	46.6	0	71.1
Czech Republic	41.6	41.4	0.2	31.6
Estonia	39.6	39.8	-0.2	8.2
Hungary	44.6	46.4	-1.8	67.5
Latvia	35.7	36.5	-0.8	36.3
Lithuania	35.0	34.5	0.5	31.8
Macedonia	30.0	32.0	-2.0	40.7
Poland	41.3	42.8	-1.5	47.8
Romania	29.8	33.5	-3.7	37.4
Serbia	40.8	41.2	-0.4	52.7
Slovak Republic	39.5	40.4	-0.9	47.8
Slovenia	40.0	39.8	0.2	67.1
CEE average	*38*	*39*	*-0.9*	*44*

Source: IMF (2019)

Table 3.2 Tax Revenue in CEE Countries and Armenia, Total and by Sources, 2017-2018

	Tax revenue, % of GDP	Taxes on income, profits, and capital gains, % of revenue	Taxes on goods and services, % of revenue	Taxes on goods and services, % of value added of industry and services	Social security contributions, % of revenue
Albania	18.6	16.7	53.1	20.0	21.4
Armenia	21.4	42.5	44.4	11.7	0.3
Bosnia and Herzegovina	20.5	8.4	43.6	21.4	38.6
Bulgaria	20.1	16.9	42.4	17.5	25.5
Croatia	21.6	7.3	47.3	23.4	29.8
Czech Republic	14.9	15.2	30.5	11.3	46.3
Estonia	21.0	19.9	38.2	16.3	31.3
Hungary	22.9	17.4	36.7	18.5	30.9
Latvia	23.6	10.3	44.4	22.8	28.8
Lithuania	16.6	16.6	35.1	13.1	39.0
Macedonia	17.6	18.1	43.1	14.9	27.6
Poland	16.8	12.5	36.9	14.6	40.7
Romania	15.4	19.9	33.9	11.3	32.6
Serbia	18.6	7.6	45.9	19.4	35.5
Slovak Republic	17.8	18.7	28.5	12.3	39.2
Slovenia	18.4	11.5	36.6	16.4	38.5
CEE average	*19*	*14.5*	*39.8*	*16.9*	*33.7*

Sources: European Commission (2020) and World Bank (2020a)

Table 3.3 Statutory CIT, Standard VAT, and Social Security Contribution Rates in CEE Countries and Armenia, 2020

	Statutory CIT*		Standard indirect tax (VAT)		Social security contributions** (% of gross wages)	Other taxes (real estate tax), % of market value or local currency units
	Basis (source of income)	Rate (%)	Rate (%)	Threshold (annual taxable turnover)		
Albania	worldwide	15	20	ALL 2 million (USD 18,000)	16.7	0.20%
Armenia	worldwide	18	20	AMD 115 million (USD 241,000)	2.5	0.3%
Bosnia and Herzegovina***	worldwide	10	17	BAM 50,000 (USD 28,000)	10.5	BAM 0.5 - 3 per sq metre
Bulgaria	worldwide	10	20	BGN 50,000 (USD 28,000)	18.92 - 19.62	0.01-0.45%
Croatia	worldwide	18	25	HRK 300,000 (USD 44,000)	16.5	No property tax
Czech Republic	worldwide	19	21	CZK 1 million (USD 43,770)	34	Varies (location and usage)
Estonia	worldwide	20	20	EUR 40,000 (USD 44,000)	34	No property tax
Hungary	worldwide	9	27	HUF 12 million (USD 38,700)	21	Max. 3.6%
Latvia	worldwide	20	21	EUR 40,000 (USD 44,000)	24	0.2-0.6% (reduced)
Lithuania	worldwide	15	21	EUR 45,000 (USD 49,000)	1.45 - 2.71	0.5-3%

Macedonia	worldwide	10	18	MKD 2 million (USD 35,000)	28	0.10-0.20&
Poland	worldwide	19	23	PLN 200 000 (USD 51,000)	5.77 - 8.43	Max. PLN 23.10 per sq metre
Romania	worldwide	16	19	RON 220,000 (USD 50,000)	2.25	0.2-1.3%
Serbia	worldwide	15	20	RSD 8 million (USD 74,000)	16.65	Max. 0.40
Slovak Republic	worldwide	21	20	EUR 50,000 (USD 55,000)	35.2	8.30 EUR per sq metre
Slovenia	worldwide	19	22	EUR 50,000 (USD 55,000)	16.10	2%
CEE average		*16*	*21*	*USD 44,000*	*21.24*	

Source: PwC (2020)

Notes: * Applies to resident companies and permanent establishments for all countries except Estonia and Latvia. For withholding tax rates and double taxation treaties, see below.

** Includes only the employer's share and in most cases, refers to pension, health, and unemployment insurance.

*** In case those differed, only the rates applicable in the Federation of Bosnia and Herzegovina (FBiH) (not in Republika Srpska or the Brčko District) are reported.

CEE countries withhold taxes on dividends, interest, and royalties earned by foreign companies at rates of 14, 13, 13 percent on average, unless the terms of an effective double taxation treaty specify lower rates. The countries have signed 64 DTTs on average, and all have transfer pricing legislation based on the arm's length principle, as well as rules for thin capitalization and controlled foreign companies (CFCs) (see Table 3.4 below).

Table 3.4 Withholding Tax Rates, Double Taxation Treaties, and Group Taxation Rules in CEE Countries and Armenia, 2020

	Withholding Taxes (Dividends, Interest, and Royalties), %		Group Taxation		
	Non-treaty	Treaty (varies), the number of DTTs	Transfer Pricing Rules (Arm's Length Principle)	Thin Capitalisation Rules	Controlled Foreign Companies
Albania	8, 15, 15	43	✓	✓	X
Armenia	5, 10, 10	46	✓	X	X
Bosnia and Herzegovina	5, 10, 10	38	✓	✓	X
Bulgaria	5, 10, 10	68	✓	✓	✓
Croatia	12, 15, 15	63	✓	✓	✓
Czech Republic	15, 15, 15	89	✓	✓	✓
Estonia	7, 0, 10	60	✓	✓	✓
Hungary	0, 0, 0	81	✓	✓	✓
Latvia	0, 0, 0	61	✓	✓	✓
Lithuania	15, 10, 10	55	✓	✓	✓
Macedonia	10, 10, 10	49	✓	✓	X
Poland	19, 20, 20	81	✓	✓	✓
Romania	5, 16, 16	88	✓	✓	✓

Serbia	20, 20, 20	65	✓	✓	X
Slovak Republic	35, 35, 35	68	✓	✓	✓
Slovenia	15, 15, 15	58	✓	✓	✓
CEE average	*14, 13, 13*	*64*			

Source: PwC (2020)

The single largest component of government expenditure in the CEE countries are subsidies and other transfers (51%), followed by compensation of employees (18%) (see Table 3.5 below). Average expenditure on research and development (R&D) is 0.17% of GDP in the region, the highest being in the Czech Republic (0.32%), and the lowest in Poland (0.02%) and Macedonia (0.04%). R&D expenditure as a share of government expenditure is the highest in Estonia (1.79%), followed by Croatia (1.66%) and the Czech Republic (1.54%). The shares of government-funded R&D performed by businesses are the highest in Poland (16.32% of total), Hungary (13.57%), and Romania (12.17%) (see Table 3.6).

R&D expenditure data by the four main sectors of performance *(business enterprise, government, higher education, and private non-profit)* (Table 3.7) show that the governments' average share in total R&D expenditures in CEE countries is quite small, 19.5% of total (0.17% of GDP) as compared with the average shares of business enterprises (68% of total, 0.61% of GDP) and higher education institutions (31% of total, 0.28% of GDP).

Table 3.5 Government Expenditure in CEE Countries and Armenia, 2017-2018

	Compensation of employees	Subsidies and other transfers	Goods and services expense	Interest payments	Other
Albania	23.5	53.4	9.0	9.6	4.5
Armenia	20.7	40.2	13.9	10.5	14.7
Bosnia and Herzegovina	25.5	46.6	18.1	1.9	6.7
Bulgaria	18.9	45.5	8.6	2.4	4.6
Croatia	15.7	42.1	11.7	6.9	3.3
Czech Republic	13.3	50.1	8.1	2.3	6.8
Estonia	18.2	61.6	10.3	0.2	9.6
Hungary	19.5	45.6	13.8	6.6	14.5
Latvia	18.1	55.5	10.3	3.3	13.1
Lithuania	16.5	64.1	8.0	4.2	7.1
Macedonia	14.5	72.6	6.4	4.2	2.4
Poland	14.1	44.1	6.7	4.3	3.9
Romania	17.8	35.5	9.4	4.2	3.9
Serbia	25.4	56.0	12.5	4.6	1.6
Slovak Republic	14.7	48.0	9.7	3.5	7.3
Slovenia	19.3	44.9	11.7	6.5	4.7
Average	*18.3*	*51*	*10.3*	*4.3*	*6.3*

Source: World Bank (2020a)

Note: The numbers stand for % of expenditure.

Table 3.6 R&D Tax Expenditure and Direct Government Funding of R&D in CEE Countries and Armenia, 2017-2018

	Government expenditure on R&D, % of GDP	Expenditure on R&D, % of government expenditure	Government - financed BERD, % of BERD	Implied tax subsidy rate on BERD*
Albania	-	-	-	-
Armenia	0.22		-	-
Bosnia and Herzegovina	-	-		-
Bulgaria	0.17	0.56	1.58	0 (0)
Croatia	0.19	1.66	1.13	
Czech Republic	0.32	1.54	7.3	0.21 (0.15)
Estonia	0.16	1.79	4.41	0 (0)
Hungary	0.17	0.65	13.57	0.2 (0.18-0.19)
Latvia	0.15	0.57	6.13	0 (-0.01)
Lithuania	0.19	0.87	1.21	0.31 (0.25)
Macedonia	0.04	-		
Poland	0.02	0.69	16.32	0.22 (0.18)
Romania	0.15	0.49	12.17	0.08 (0.07)
Serbia	0.26	-	-	-
Slovak Republic	0.18	0.87	2.46	0.28 (0.22)
Slovenia	0.26	0.96	3.1	0.28 (0.17)
CEE average	*0.17*	*0.97*	*6.31*	*0.16*

Sources: European Commission (2020), OECD (2020b)

Note: The tax subsidy rate is defined as 1 minus the B-index, a measure of the before-tax income needed by a representative firm to break even on USD 1 of R&D outlays. For further details, see the source metadata.

Table 3.7 R&D Expenditure in CEE Countries and Armenia, Total and by Sectors of Performance, % of GDP, 2018

	All sectors	Business enterprise	Government	Higher education	Private non-profit
Albania	0.15	-	-	-	-
Armenia	0.23	-	-	-	-
Bosnia and Herzegovina	0.20	-	-	-	-
Bulgaria	0.75	0.54	0.17	0.04	0
Croatia	0.97	0.47	0.19	0.31	-
Czech Republic	1.93	1.19	0.32	0.41	0
Estonia	1.4	0.59	0.16	0.63	0.02
Hungary	1.53	1.16	0.17	0.19	-
Latvia	0.64	0.16	0.15	0.33	-
Lithuania	0.88	0.33	0.19	0.34	-
Macedonia	0.37	0.11	0.04	0.21	0.01
Poland	1.21	0.80	0.02	0.38	0
Romania	0.51	0.30	0.15	0.05	0
Serbia	0.92	0.36	0.26	0.30	0
Slovak Republic	0.84	0.45	0.18	0.20	0
Slovenia	1.95	1.45	0.26	0.23	0.01
CEE average	*0.89*	*0.61*	*0.17*	*0.28*	*0.00*

Source: European Commission (2020) and World Bank (2020a)

All countries in the sample except Estonia and Latvia provide specific tax incentives (as listed and defined in Chapter 1) for corporate investment in information and communication technologies (computer hardware, software, and equipment) and R&D. The most widely used incentives are investment allowances for R&D investment (up to 100% or more of expenses), credits for investments in high-tech plants and equipment (30-50%), and accelerated depreciation allowances for computer technology (30-50%). In almost all countries, startup expenses and a certain percentage of company debt (up to 30%, subject to thin capitalization rules) are deductible for tax purposes. Half of the countries provide employment tax credits and subsidies, and all countries allow for carry-forward of investment losses (PricewaterhouseCoopers 2020). As noted in the PwC tax summary for Estonia, although there are no special tax incentives, *"the entire Estonian corporate tax system, which provides for an indefinite deferral for taxing corporate profits, may be viewed as a tax incentive that promotes reinvestment of profits and thus stimulates economic growth."* The same applies for Latvia since the recent tax reform (January 2018).

Armenia provides a tax holiday for startup companies, effective for five years (EIF Armenia 2020; National Assembly of the Republic of Armenia 2014) and accelerated depreciation for computers and communication equipment (1 year or 100%) (National Assembly of the Republic of Armenia 2016).

Table 3.8 Tax Incentives for ICT and R&D Investment in CEE countries, February 2020

	CIT holiday and exemption	CIT rate reduction	Investment tax credits and allowances (plant and equipment)	Investment tax credits and allowances (R&D)	Investment tax credits and allowances (other than P&E and R&D), grants and subsidies	Accelerated depreciation allowance	Export VAT and import tariff exemption	Special economic zones
Albania	✓	✓				✓		
Bosnia			✓		✓	✓	✓	
Bulgaria					✓	✓		
Croatia		✓	✓	✓	✓	✓		
Czechia				✓	✓	✓		
Estonia	✓	✓					✓	
Hungary	✓	✓	✓	✓	✓	✓		✓
Latvia	✓	✓			✓			✓
Lithuania		✓	✓	✓	✓		✓	✓
Macedonia	✓	✓					✓	✓
Poland		✓		✓	✓	✓	✓	✓
Romania	✓	✓		✓	✓	✓		
Serbia	✓		✓	✓	✓		✓	
Slovakia		✓	✓	✓	✓	✓		
Slovenia			✓	✓	✓	✓		

Source: Author's compilation based on PwC (2020)
Note: For further details, see country summaries in the companion Excel spreadsheet.

3.1.2 Non-tax Factors Affecting Investment

Macroeconomic Performance and Stability: Main macroeconomic indicators of the CEE countries for years 2014-2018 reveal that the countries recorded an average growth rate of 3.2%, and inflation has been low (1.9%). The average real interest rate has been 3%, and the average unemployment rate has been 11%. The current account balance for most countries is negative, with an average of -0.57% of GDP (see Table 3.9).

Governance: The average governance score in the region in 2018, as measured by the World Bank's *Governance Indicators* (World Bank 2019), is 0.46. The highest scoring country is Estonia (1.22), and the lowest scoring is Bosnia and Herzegovina (-0.38). For details on country performances on each of the six dimensions of governance *(voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption),* see Table 3.10 below.

Table 3.9 Main Macroeconomic Indicators of the CEE Countries and Armenia, 2014-2018

	GDP growth rate, annual %	Inflation rate (GDP deflator), annual %	Real interest rate, %	PPP conversion rate, LCU per int. $	Unemployment rate, % of labor force	Current account balance, % of GDP
Albania	3.1	0.8	7.1	42.6	15.1	-8.3
Armenia	3.9	1.7	13.8	196.8	18.4	-4.8
Bosnia and Herzegovina	2.6	1.9	3.3	0.7	23.9	-5.2
Bulgaria	3.2	2.4	4.0	0.7	8.0	2.3
Croatia	2.3	0.6	8.4	3.5	14.7	3.0
Czech Republic	3.6	1.8	2.2	12.7	4.0	0.8
Estonia	3.6	2.8	1.4	0.5	6.2	1.9
Hungary	3.9	3.1	-0.5	134.6	5.5	2.0
Latvia	3.1	1.9	1.1	0.5	9.2	-0.2
Lithuania	3.2	2.0	1.1	0.4	8.1	0.4
Macedonia	2.6	2.9	4.0	19.3	24.1	-1.5
Poland	4.1	0.9	3.2	1.8	6.2	-0.7
Romania	4.6	3.5	3.1	1.7	5.7	-2.3
Serbia	2.0	2.2	3.7	40.9	16.2	-4.5
Slovak Republic	3.4	0.5	1.1	0.5	9.8	-1.4
Slovenia	3.4	1.2	1.6	0.6	7.7	5.1
CEE average	*3.2*	*1.9*	*3*	*17.4*	*11*	*-0.57*

Source: IMF (2019) and World Bank (2020a)

Table 3.10 Governance Indicators in the CEE Countries and Armenia, 2018

	VA	PS/AV	GE	RQ	RL	CC	*Average*
Albania	0.21	0.38	0.11	0.28	-0.39	-0.52	*0.01*
Armenia	-0.11	-0.42	-0.02	0.27	-0.15	-0.35	*-0.13*
Bosnia and Herzegovina	-0.24	-0.39	-0.62	-0.21	-0.23	-0.57	*-0.38*
Bulgaria	0.32	0.42	0.27	0.58	-0.03	-0.15	*0.24*
Croatia	0.50	0.77	0.46	0.45	0.32	0.13	*0.44*
Czech Republic	0.93	1.04	0.92	1.26	1.05	0.50	*0.95*
Estonia	1.21	0.60	1.19	1.56	1.24	1.51	*1.22*
Hungary	0.32	0.76	0.49	0.60	0.56	0.05	*0.46*
Latvia	0.81	0.42	1.04	1.19	0.96	0.33	*0.79*
Lithuania	0.92	0.75	1.07	1.11	0.96	0.50	*0.89*
Macedonia	-0.01	-0.20	0.09	0.52	-0.28	-0.36	*-0.04*
Poland	0.72	0.55	0.66	0.88	0.43	0.64	*0.65*
Romania	0.46	0.06	-0.25	0.45	0.33	-0.12	*0.16*
Serbia	0.00	0.08	0.11	0.01	-0.15	-0.37	*-0.05*
Slovak Republic	0.88	0.75	0.72	0.81	0.53	0.36	*0.68*
Slovenia	0.99	0.91	1.13	0.69	1.06	0.87	*0.94*
CEE average	*0.53*	*0.46*	*0.49*	*0.68*	*0.42*	*0.19*	*0.46*

Source: World Bank (2018)

The World Bank's *Doing Business 2020* report (World Bank 2020b) reveals that the average overall ease of doing business score in CEE countries is 75. The highest scoring and ranking country is Lithuania (81.6 out of 100, 11th among 190 countries), followed by Macedonia (17th), Estonia (18th), and Latvia (19th). Table 3.11 presents overall scores and ranks for each country, as well as scores of some of the DB index measures that are relevant to the IT industry *(starting business, getting electricity, getting credit, enforcing contracts, resolving insolvency).*

One of the DB index measures, *paying taxes,* is also a separate index released jointly by the PricewaterhouseCoopers and the World Bank (PwC and World Bank 2020). The data presented in Table 3.12 below reveal that businesses in CEE make 15 payments per year on average, spending 227 hours. The average total tax and contribution rate as a percent of profit is 34.2. The highest scoring country on this index is Estonia (89.9 out of 100, 12th among 190 countries), followed by Latvia and Lithuania. The worst performing countries are Bosnia and Herzegovina and Albania.

The 2019 edition of the *International Property Rights Index* released by the Property Rights Alliance (Property Rights Alliance 2019) reveals that intellectual property rights are the most protected in the Czech Republic and the least protected in Albania (see Table 3.13). Physical property rights are the most protected in Estonia. The overall best performing country on this index is Estonia, which ranks as the first in the analytical region used by the Index compiler (Central Eastern Europe and Central Asia region including 25 countries) and the 25th in the world (among 129 countries). Estonia is closely followed by the Czech Republic and Lithuania. The worst performing countries are Bosnia and Herzegovina (24th in the region) and Albania (22nd).

Table 3.11 Doing Business Scores and Ranks of CEE Countries and Armenia, 2020

	DB score	DB rank (/190)	Starting a business score	Getting electricity score	Getting credit score	Enforcing contracts score	Resolving insolvency score
Albania	67.7	82	91.8	71.0	70.0	53.5	67.7
Armenia	74.5	47	96.1	87.7	70.0	67.9	44.6
Bosnia and Herzegovina	65.4	90	60.0	79.0	65.0	57.8	68.2
Bulgaria	72.0	61	85.4	55.1	65.0	67.0	57.8
Croatia	73.6	51	85.3	86.8	50.0	70.6	56.5
Czech Republic	76.3	41	82.1	95.6	70.0	56.4	80.1
Estonia	80.6	18	95.4	83.3	70.0	76.1	60.1
Hungary	73.4	52	88.2	63.3	75.0	71.0	55.0
Latvia	80.3	19	94.1	82.3	85.0	73.5	59.8
Lithuania	81.6	11	93.3	92.9	70.0	78.8	46.7
Macedonia	80.7	17	88.6	81.5	80.0	66.0	72.7
Poland	76.4	40	82.9	82.3	75.0	64.4	76.5
Romania	73.3	55	87.7	53.7	80.0	72.2	59.1
Serbia	75.7	44	89.3	73.2	65.0	63.1	67.0
Slovak Republic	75.6	45	84.8	83.3	70.0	66.1	65.5
Slovenia	76.5	37	93.0	89.2	45.0	54.8	84.4
CEE average	*75*	*44*	*87*	*78*	*69*	*66*	*65*

Source: World Bank (2020b)

Table 3.12 Paying Taxes Index Scores and Ranks of CEE Countries and Armenia, 2020

	Paying Taxes Rank (/190)	Paying Taxes Score	Payments (number per year)	Time (hours per year)	Total tax and contribution rate (% of profit)	Postfiling index (0-100)
Albania	123	65.2	35	252	36.6	60.1
Armenia	52	81.5	15	264	22.6	79.4
Bosnia and Herzegovina	141	60.4	33	411	23.7	47.7
Bulgaria	97	72.3	14	441	28.3	71.2
Croatia	49	81.8	12	206	20.5	66.7
Czech Republic	53	81.4	8	230	46.1	90.5
Estonia	12	89.9	8	50	47.8	99.4
Hungary	56	80.6	11	277	37.9	87.5
Latvia	16	89.0	7	169	38.1	98.1
Lithuania	18	88.8	10	95	42.6	97.5
Macedonia	37	84.7	7	119	13.0	56.4
Poland	77	76.4	7	334	40.8	77.4
Romania	32	85.2	14	163	20.0	76.8
Serbia	85	75.3	33	226	36.6	93.2
Slovak Republic	55	80.6	8	192	49.7	87.2
Slovenia	45	83.3	10	233	31.0	80.0
CEE average	*59.7*	*79.7*	*14.5*	*227*	*34.2*	*79.3*

Source: PwC and World Bank (2020)

Table 3.13 Performance of CEE Countries and Armenia on International Property Rights Index, 2019

	Score (0-10)	Global Rank (/129)	Regional* Rank (/25)	Legal and Political Subindex	Physical Property Rights Subindex	Intellectual Property Rights Subindex
Albania	4.546	106	22	4.200	6.045	3.391
Armenia	4.812	93	19	4.223	6.855	3.357
Bosnia and Herzegovina	4.419	110	24	3.905	5.786	3.565
Bulgaria	5.569	61	11	4.836	6.184	5.687
Croatia	5.162	75	14	5.096	5.599	4.791
Czech Republic	7.029	26	2	6.650	7.036	7.401
Estonia	7.173	25	1	7.279	7.620	6.619
Hungary	6.218	43	6	5.397	6.532	6.726
Latvia	5.936	54	10	5.921	6.442	5.445
Lithuania	6.460	35	3	6.344	6.935	6.102
Macedonia	4.703	100	21	4.024	6.549	3.536
Poland	5.996	52	9	5.436	6.424	6.129
Romania	6.028	50	8	5.433	6.412	6.238
Serbia	4.785	95	20	4.441	6.023	3.890
Slovak Republic	6.386	38	5	5.388	7.096	6.676
Slovenia	6.102	47	7	6.250	5.990	6.066
CEE average	5.767	61	11	5.373	6.444	5.484

Source: Property Rights Alliance (2019)
Note: The region is Central Eastern Europe and Central Asia (25 countries).

Labor Market Conditions: Two proxy measures were used to assess labour market conditions in CEE countries: the Human Development Index (HDI) 2019 value (UNDP 2020) and the World Bank's Human Capital Index (World Bank 2020d) Among the CEE countries, Slovenia has the highest HDI rank (0.902, 24th in the world), followed by Estonia and Poland. The best quality of learning, as measured by harmonized test scores, is attained in Estonia, Poland, and Slovenia (see Table 3.14 below).

The average government expenditure on education (all levels) in the region is 4.3% of GDP and 11.3% of total government expenditure. STEM graduates in CEE countries account for 23 % of all graduates on average, and there are 28,000 full-time researchers (Table 3.15).

Table 3.14 Human Development and Capital in CEE Countries and Armenia, 2018-19

	Human Development Index		Human Capital Index		
	Value	Rank (/189)	Value	Rank (/157)	Harmonized test scores (300-625)
Albania	0.791	69	0.62	56	429
Armenia	0.760	81	0.57	78	443
Bosnia and Herzegovina	0.769	75	0.62	58	461
Bulgaria	0.816	52	0.68	44	498
Croatia	0.837	46	0.72	36	505
Czech Republic	0.891	26	0.78	14	522
Estonia	0.882	30	0.75	29	542
Hungary	0.845	43	0.70	38	516
Latvia	0.854	39	0.72	35	530
Lithuania	0.869	34	0.71	37	514
Macedonia	0.759	82	0.53	88	382
Poland	0.872	32	0.75	30	537
Romania	0.816	52	0.60	67	452
Serbia	0.799	63	0.76	27	521
Slovak Republic	0.857	36	0.69	40	500
Slovenia	0.902	24	0.79	13	532
CEE average	*0.84*	*47*	*0.69*	*41*	*496*

Sources: UNDP (2020) and World Bank (2020c)

Table 3.15 Education Spending and Labor Market Outcomes in CEE countries and Armenia, 2017-2018

	Government expenditure on education, all levels		Mean years of schooling	STEM graduates, tertiary	Researchers, full-time equivalent
	% GDP	% of TE	Years	% of all graduates	
Albania	4.0	13.6	10.1	19.2	7,998
Armenia	2.7	10.4	11.8	14.7	4,822
Bosnia and Herzegovina	-	-	9.7	20.3	-
Bulgaria	3.9	11.0	11.8	19.7	
Croatia	-	-	11.4	25.3	27,580
Czech Republic	5.6	14.2	12.7	23.5	21,150
Estonia	5.2	13.1	13	27.5	33,974
Hungary	4.7	10.1	11.9	22.8	31,103
Latvia	4.7	12.9	12.8	20.5	30,305
Lithuania	4.0	12.0	13	23.8	35,461
Macedonia	-	-	9.7	20.0	-
Poland	4.6	11.3	12.3	22.9	31,337
Romania	2.6	7.4	11.0	28.8	28,206
Serbia	4.0	9.3	11.2	26.6	22,291
Slovak Republic	3.9	9.4	12.6	21.1	33,738
Slovenia	4.8	11.7	12.3	25.0	38,049
CEE average	*4.3*	*11.3*	*11.7*	*23.1*	*28,433*

Sources: World Bank (2020d), European Commission (2020)

3.2 Inferential Statistics

3.2.1 The Model

Business enterprise expenditure on R&D (BERD, % of GDP) is defined as a function of the *total tax and contribution rate* (TTCR, % of profit), *government budget appropriations and outlays for R&D* (GBAORD, % of total expenditure), *regulatory quality of the government*, the levels of *protection of property rights* and *human development* (measured by IPRI and HDI), *GDP per capita* (PPP, current international dollars), the *inflation rate* (CPI, annual %), and the *lending interest rate* (%).[4] Data cover 11 CEE countries for which complete data are available (Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, and Slovenia) for a 12-year period (2007-2018). Table 3.16 presents descriptive statistics of the variables.

[4] Harmonized test scores, though those are believed to affect BERD, are not entered into the regression equation, as data are available with four-year intervals (2009, 2012, 2015, 2018). The dataset is available upon request.

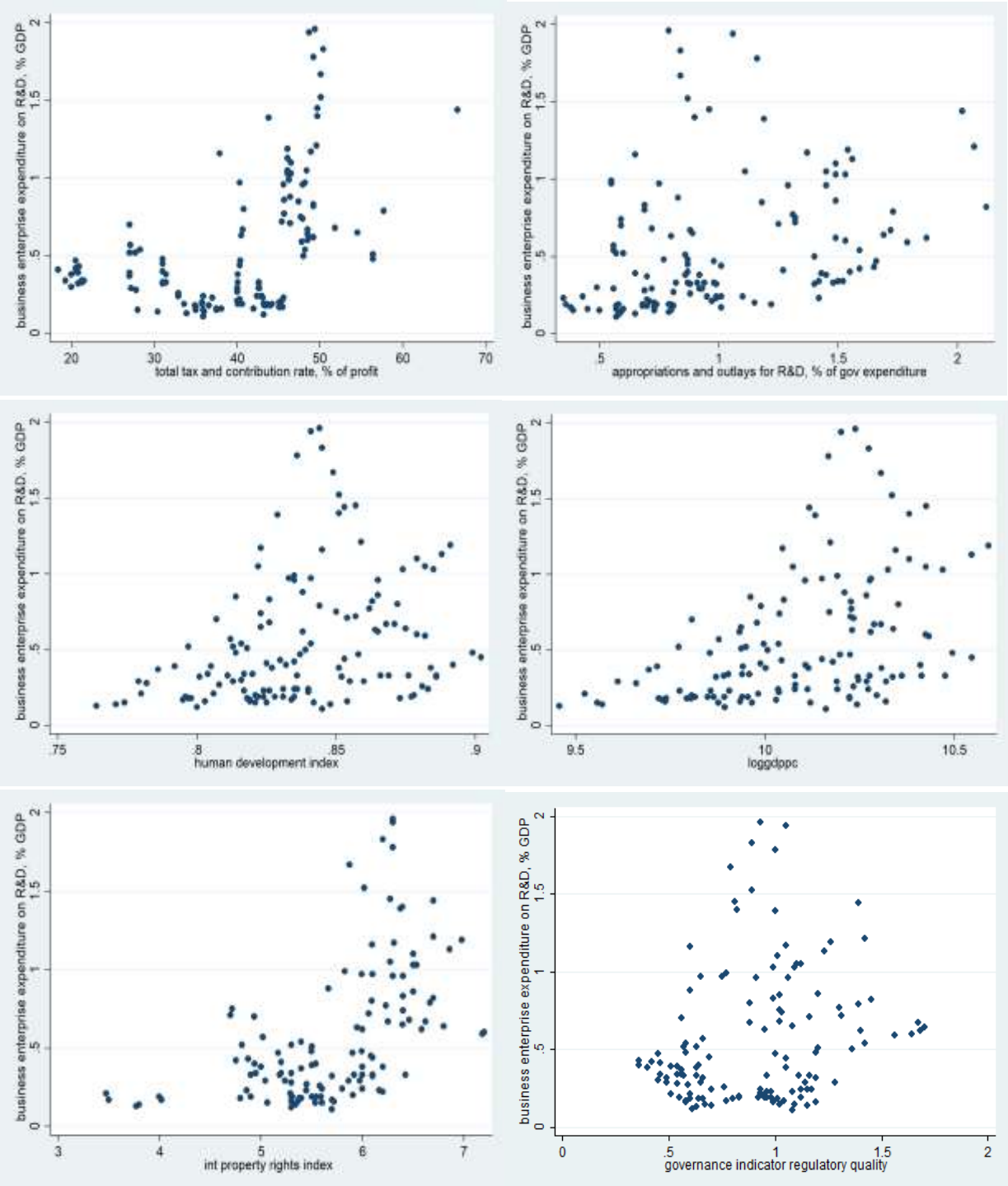
Table 3.16 Descriptive Statistics of the Panel Regression Variables

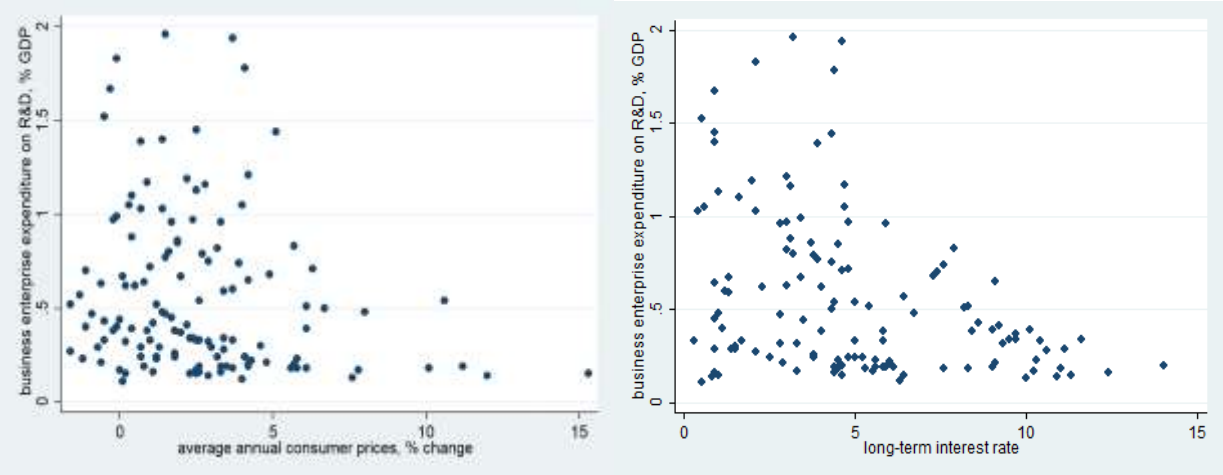
Variable		Mean	Std. Dev.	Min	Max	Observations
BERD	*overall*	.5560606	.4287417	.11	1.96	N = 132
	between		.4069536	.1691667	1.500833	n = 11
	within		.1792052	-.0947727	1.242727	T = 12
TTCR	*overall*	39.72576	9.707396	18.4	66.6	N = 132
	between		9.548813	20.48333	50.875	n = 11
	within		3.272618	18.88409	55.45076	T = 12
Inflation	*overall*	2.588636	2.819416	-1.6	15.3	N = 132
	between		.7717969	1.65	3.516667	n = 11
	within		2.720929	-2.52803	14.51364	T = 12
Regulatory quality	*overall*	.9037121	.308865	.36	1.7	N = 132
	between		.3026669	.465	1.506667	n = 11
	within		.1071565	.6045455	1.204545	T = 12
HDI	*overall*	.83775	.0299306	.764	.902	N = 132
	between		.0279275	.7910833	.88475	n = 11
	within		.013468	.8106667	.86425	T = 12
IPRI	*overall*	5.71243	.731898	3.472	7.199	N = 121
	between		.575684	4.929818	6.7154	n = 11

	within		.4887735	4.07343	6.504346	T-bar = 11
Interest	*overall*	4.931783	3.205878	.3	14	N = 129
	between		2.362559	2.65	9.644444	n = 11
	within		2.356591	.2734496	14.83178	T = 11.7273
GBAORD	*overall*	1.003182	.4054162	.35	2.12	N = 132
	between		.3944776	.5108333	1.751667	n = 11
	within		.1477038	.6515151	1.531515	T = 12
GDP per capita, PPP (log)	*overall*	10.08948	.2393737	9.4572	10.59019	N = 132
	between		.1846036	9.722387	10.34506	n = 11
	within		.1615018	9.72377	10.44686	T = 12

Correlation analyses show that BERD is positively correlated with *both* the tax rate and government appropriations and outlays for R&D, as well as the log of GDP per capita, the Human Development and International Property Rights Index scores, and the quality of governance. BERD is negatively correlated with the interest and inflation rates (see Figure 3.1 below).

Figure 3.1 Correlations between Business Expenditure on R&D and the Independent Variables





3.2.2 Results

The random-effects GLS regression with heteroskedasticity and autocorrelation-consistent (clustered robust) standard errors[5] revealed that the model explains 48% of the variance in business investment in R&D. Holding other factors constant, 1% increase in taxes is associated with a 2% increase, and 1% increase in inflation is associated with 0.7% decrease in BERD. The most significant factor affecting investment positively is the IPRI score, 1% increase in which is associated with 5.8% increase in BERD. Regulatory quality in the model is negatively and significantly correlated with BERD; 1% increase in regulatory quality score is associated with 67% decrease in BERD. Other factors all affect BERD positively at various degrees, but the coefficients are not significant at 1-5% levels. Table 3.17 summarizes the regression results.

[5] The random-effects regression, as the Hausman and the Breusch and Pagan Lagrangian test results showed, is the most suitable for the data.

Table 3.17 Summary of the Panel Regression Results

Dependent variable: BERD						
Independent variables	**Coefficient**	**Robust Standard Error**	**z**	**P>z**	**95% Confidence Interval**	
TTCR	.0204617	.0081678	2.51	0.012	.004453	.0364703
Inflation	-.0078586	.0046054	-1.71	0.088	-.0168851	.0011679
Regulatory quality	-.6720077	.1814878	-3.70	0.000	-1.027717	-.3162981
HDI	4.566137	3.356017	1.36	0.174	-2.011535	11.14381
IPRI	.0585544	.0223497	2.62	0.009	.0147499	.102359
Interest	.0144466	.0103085	1.40	0.161	-.0057577	.0346509
GBAORD	.1651939	.1230209	1.34	0.179	-.0759227	.4063104
LogGDPPC	.3359269	.2963567	1.13	0.257	-.2449216	.9167754
Constant	-7.412846	1.629761	-4.55	0.000	-10.60712	-4.218573
R^2	0.4788 (within)					
	0.3886 (between)					
	0.3983 (overall)					
Wald χ^2	1897.31					
Prob. > χ^2	0.0000					
	Number of observations: 118, Number of groups: 11					

CHAPTER 4. DISCUSSION OF FINDINGS

Findings in the preceding section show that the statutory corporate income tax rate in Armenia (18%, lowered from 20% by the recent tax reforms) is higher than in an average CEE country (16%). The standard VAT rate (20%) is lower and the VAT threshold (USD 241,000, increased from USD 122,000 by recent reforms) is higher than in CEE countries: the standard VAT rate in CEE countries is 21%, and the average annual turnover serving as VAT threshold is USD 44,000. Armenia withholds taxes on dividends, interest, and royalties earned by foreign residents at lower rates (5, 10, 10) than is the CEE average (14, 13, 13) and has concluded fewer DTTs (46) than an average CEE country (64). Armenia is the only country among the surveyed 16 that does not have thin capitalization rules for group taxation. As opposed to the eleven CEE countries that are EU members and like the four that are not (Albania, Bosnia and Herzegovina, Macedonia, and Serbia), Armenia does not have rules for controlled foreign companies.

As opposed to CEE countries which provide a wide range of tax incentives for companies investing in high technology and equipment - exemption of reinvested profits, tax credits and allowances for acquisition of high technology plant and equipment, corporate R&D, employment, representation, and interest expense, Armenia provides only a tax holiday for startup companies and an accelerated depreciation allowance. The depreciation rate for computer and communications equipment in Armenia (1 year or 100%) is significantly higher than the CEE average (33% or 3 years).

The regulatory environment for businesses in Armenia, as measured by the the World Bank's *Ease of Doing Business Index,* is only slightly worse than in an average CEE

country. The 2020 scores are 74.5 (CEE) and 75 (Armenia), respectively. By the ease of paying taxes, as measured by the PwC and World Bank's *Paying Taxes Index,* Armenia with a score of 82 performs better overall than an average CEE country (score of 80). However, it takes longer to file tax returns in Armenia (264 hours per year) than in an average CEE country (224 hours).

By the latest release of *Worldwide Governance Indicators*, Armenia substantially underperforms an average CEE country. The average value of the six governance indicators is -0.43 for Armenia, and except for regulatory quality, all indicators are negative. The average governance indicator is 0.46 in CEE countries, and all values are positive. With an overall score of 4.8, Armenia lags behind the CEE countries on the *International Property Rights Index 2019,* as well. The average CEE country scores 5.8 on the 1-10 scale. On the Intellectual Property Rights subindex, in particular, Armenia's score is 3.4, while the score of an average CEE country is 5.5.

On international standardized tests that measure knowledge in science, mathematics, and reading among schoolchildren, Armenian students perform worse than their peers in CEE countries. The harmonized test scores are 443 and 496, respectively. Fewer tertiary STEM graduates enter the Armenian labor market per year than in an average CEE country, and there are fewer full-time equivalent employed researchers.

The results of the panel regression analysis show that taxes are a significant factor affecting business investment in R&D. The positive coefficient of the tax variable indicates that higher tax rates are associated with *more, not less* R&D. The most significant factor affecting BERD, according to the results, is the IPRI score, 1% increase in which

is associated with 5.8% increase in business investment in R&D. Findings of the regression analysis are not taken as conclusive at this point, as the model explains less than half (40% overall) of the variation in BERD in the 11 countries for a 12-year period. (Adding more variables to the model may not only improve its overall fit but also affect the value and significance of the included variables.) Accordingly, none of the hypotheses is approved or rejected.

CHAPTER 5. CONCLUSION AND RECOMMENDATIONS

This study aimed to comparatively analyze the tax incentives and state support provided to ICT and high-tech industries in the countries of Central and Eastern Europe and Armenia. The analysis revealed that CEE countries provide a wide range of incentives to businesses investing in high-tech equipment and R&D, - from complete exemption of reinvested profits in Estonia and Latvia to superduduction of R&D in Hungary and employment tax credits and allowances in half of the surveyed countries. IT companies in Armenia benefit only from a tax holiday granted for five years. High technology equipment expenses are depreciated at a higher rate in Armenia than is the average in CEE countries. The quality of governance and the protection of intellectual property rights as non-tax factors affecting corporate investment are less favorable in Armenia than in CEE countries.

In its aim to facilitate investment in information and communication technologies via fiscal policy, the Government of Armenia should:

- *Provide performance-based tax incentives,* such as tax credits and allowances for investment in high-technology equipment (in the range of 40-50%), allow for deduction of R&D expenses (up to 100%), and subsidize employment expenses, especially in the regions where the unemployment rate is high. The rate of accelerated depreciation allowance for computers and communication equipment should be decreased from the current 100% to 33-50%.

- ❑ *Conclude additional tax treaties* to avoid double taxation.
- ❑ *Add to the recently adopted legislation* on group taxation (transfer pricing) laws or legislative provisions on thin capitalization and controlled foreign companies.

The improvement of the non-tax environment for investment in ICTs and R&D assumes that the Government:

- ❑ Spends more per pupil in secondary educational institutions and subsidizes tertiary enrollment in STEM programs.
- ❑ Ensures the protection of intellectual property rights.

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