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Competitiveness, Technology Licensing, and Ease of Paying Taxes: A 30-Country Study

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ABSTRACT

Objective: The objective of this article is to explore the impact of a regulatory constraint: the ease of paying taxes, on the likelihood of technology licensing and the subsequent impact on the sales of firms acquiring such licences across 30 countries.

Research Design & Methods: In a comparative, longitudinal study design we apply random effects panel logit, and random-effects GLS regression models. The World Bank Enterprise Surveys panel data for Central Europe for 2008 to 2013 is the source data for the analysis. Surveys of firms from 30 countries in Central and Eastern Europe and Central Asia constitute the panel.

Findings: Increasing regulatory burden in the form of tax compliance reduces the likelihood of technology licensing. Technology licensing has only modest effects on sales. Foreign ownership of firms increases both the likelihood of technology licensing and revenues.

Implications & Recommendations: All manner of political entities, from towns to entire nations, revise their tax policies to woo investment. Our current analysis of the marginal effects suggests that the impact of these improvements is underwhelming. Attracting foreign ownership is recommended to increase technology licensing, sales and competitiveness.

Contribution & Value Added: While tax holidays are a common device to woo investment, the interaction of tax regimes with technology licensing, specifically the regulatory burden of preparing and paying taxes, is scarcely studied. It is a gap we strive to fill in this manuscript.

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INTRODUCTION

Competitiveness at the national level is understood to be a phenomenon involving both firms that are world-class performers in their specific industry as well as a business environment that rewards innovation (Porter, 1990). Part of that environment is the regulatory regime which includes taxation. While tax holidays are a common device to woo investment, the interaction of tax regimes with technology licensing, specifically the burden of preparing and paying taxes, is scarcely studied. To our knowledge, there is no precise study of the effects of ease of paying taxes on technology transfer. It is a gap we strive to fill in this manuscript.

The motivation for our work is the increased focus of policymakers and firms on competitiveness, particularly in emerging and emergent markets, and how institutional constraints affect decisions to adopt competitive measures. As we elucidate in our discussion below, nations develop by obtaining more advanced technology from other nations, hence enhancing their competitiveness by lowering production costs/increasing output, improving quality, or both. While policymakers sketch the broad strokes of technology transfer, firms are the entities acquiring the technology from foreign companies, with a view to improving their own competitiveness and hence their financial and operational performance. The "rules of the game" (North, 1990) that policymakers design and enforce, such as tax codes, will naturally have bearing on the attractiveness of sourcing technology from abroad.

Acquiring technology can occur when a firm purchases it from another firm, when a firm buys the entire company owning the technology, or when the firm licenses the technology. While all of these ways are important, we concentrate upon the latter in this article. Using a panel of nearly 5 500 firms across 30 countries for the period 2009-2013, we examine the impact of tax compliance (an instance of regulatory burden) on technology licensing. The sample of firms from World Bank survey which we use for this study is composed in 70% of small, entrepreneurial firms. We use measures of the number of tax payments required, the hours of tax preparation required, and the tax rate itself on the likelihood of a firm licensing technology from a foreign company. We then analyse the effect such licensing has on annual sales, grouping the firms initially by national stage of development (Innovation, High Efficiency, Low Efficiency, and Factor), and then by country. In a comparative, longitudinal study design we apply quantitative research methods including random effects panel logit, and random-effects general least squares regression models.

Although there is scant prior research on the influence of ease of tax compliance on technology licensing per se, there is abundant work on institutional constraints/voids (see Khanna & Palepu, 2010) and regulatory burden. Costs and risks tend to increase when institutions are weak, which is typical in emerging economies (Meyer, Estrin, Bhaumik, & Peng, 2009). Understanding that rules of the competitive game do differ among developing and developed countries has raised appreciation that institutional burden influences strategies of both domestic and international firms (Peng, Wang, & Yiang, 2008). Based on this literature, we expected to find an inverse relationship between the three separate measures of compliance (tax payments, tax hours, and tax rate) and the likelihood of technology licensing. Overall, this is the case, though tax rates correlate positively with the likelihood of technology licensing for firms in Innovation economies. We theorise that this may indicate that taxes are spent more effectively in such economies on infrastructure

and social services. These benefits may outweigh the costs of higher rates, so the expected negative effect on obtaining technology licensing is not observed in this environment

We anticipate that technology licensing will be a boon for annual sales. This is the case for firms in Innovation economies, but the overall results are not impressive. On the other hand, foreign ownership of a firm bodes well for both technology licensing and for sales. There are robust, positive correlations across the overall sample and subsamples for foreign ownership and both the likelihood of licensing technology as well as annual revenues. At the national level, both technology licensing and foreign ownership tend to be significant for firm sales in countries at the Low Efficiency stage of development. Ten of the fourteen nations in the Low Efficiency category show significant results for technology licensing, foreign ownership, or both.

The remainder of the article is organised as follows. Our literature review encompasses separate sections on the germane topics of competitiveness, technology transfer, and regulatory burden. We then describe the data and methods in detail prior to sharing our results. A discussion of those results, limitations, and future research avenues conclude the article.

LITERATURE REVIEW

International Competitiveness and Firm-level Performance

International competitiveness is subject to policy discussions, public debate and governmental actions based on rankings and comparative statistic (Fagerberg, 1988), yet the theoretical grounding of this concept is not well established (Krugman, 1996). Czako (2003) proposes that competitiveness research should offer a paradigm stimulating the modification and reinterpretation of traditional boundaries between economics and management. Based upon a critical review of classic competitiveness studies, she mentions a common multi-level approach linking firm level and macroeconomic observations, as well as the use of comparative international data to formulate conclusions.

These studies suggest that national competitiveness begins at the level of the firm; for a country to be competitive, its enterprises need to be competitive and productive (Czakó, 2003). This multilevel nature of competitiveness closely relates to that of the World Economic Forum (Porter, 2005). The multilevel approach linking competitiveness of an economy with firm level decisions of individual entrepreneurs and managers is rather rare in management and economics literature. Wood, Bylund and Bradley (2016) suggest there is a gap in studying behavioural aspects of decision making by entrepreneurs related to public policy initiatives, such as taxes which influence the competitiveness of an economy. Mottner and Johnson (2000, p. 186) claim that the majority of earlier research into international licensing has focused on large firms, while smaller firms may be more inclined to license technology due to financial constraints in choosing an alternative of own technology development. We address this gap by examining technology licensing in the unique sample of firms from the World Bank survey. More than 70% of the sample are small, entrepreneurial firms.

The international competitiveness of a country can be defined as “country’s ability to create, distribute and/or service products in international trade, while earning raising returns on its resources” (Scott, 1985, p. 3). Corporate decisions and policies are largely influenced by the formal institutional environment in which firms operate (Fan, Gillan, & Yu, 2013). For a successful increase in national competitiveness, firms located in a country

should upgrade from competing on low-cost labour and/or natural resources to more sophisticated, technology-driven competitive advantages (Puślecki, 2010). Technology adaptation via licensing or other means is critical for upgrading the abilities of employees, productivity, and efficiency (Damijan, Jaklič, & Rojec, 2006).

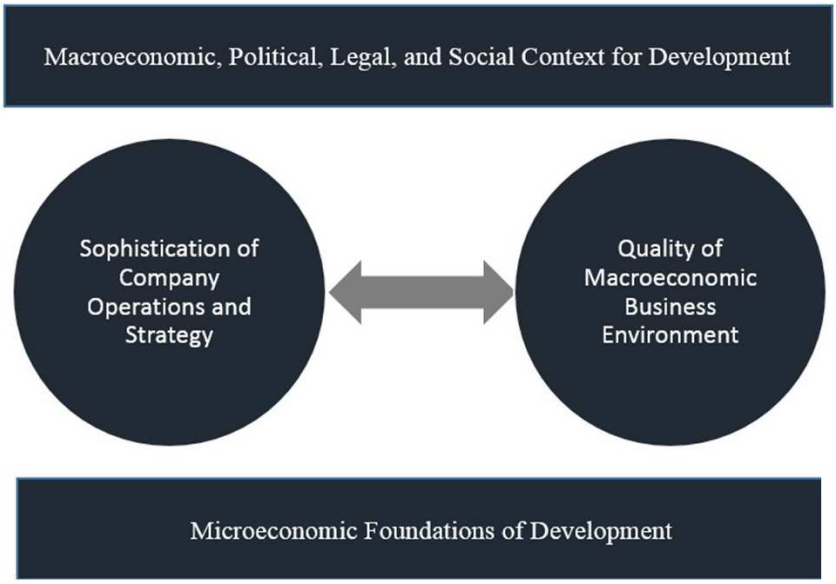

Figure 1. Determinants of productivity growth
Source: authors' depiction based on Porter (2005, p. 3).

A variety of global, regional, country, industry and cluster level benchmarking studies serve as th basis for competitiveness research (Lall, 2001). Out of these studies, two have had the greatest impact so far: The Global Competitiveness Report of the World Economic Forum from Geneva, and The World Competitiveness Report published by IMD Business School from Lausanne. We describe both studies briefly, before describing selected aspects of competitiveness which we are planning to examine in depth in this article.

The World Economic Forum (WEF) defines competitiveness as: "the set of institutions, policies, and factors that determine the level of productivity of a country" (Browne, Corrigan, Crotti, Di Battista, Drzeniek, Hanouz, Galvan, & Sala-i-Martín, 2016). The WEF's approach maintains that the level of total factor productivity determines the level of prosperity that can be reached by an economy, and their report has been published from 2005. There are 12 pillars of competitiveness, or broad categories that the WEF uses to compare across countries. They include: institutions, infrastructure, macroeconomic environment, market size, innovation, business sophistication, technological readiness, financial market development, labour market efficiency, goods market efficiency, higher education and training, health & primary education. These categories are aggregated into three sub-indices: basic requirements, efficiency enhancers, and innovation and sophistication factors, with simple average scores from the measurements yielding the country score on each of the 12 pillars.

The WEF uses a weighted approach adjusted for countries at different stages of development, from factor-driven to innovation-driven economies, approximated by their GDP per

capita in USD. For example, innovation and sophistication factors account for 5% weight in the total score for factor-driven economies (per-capita GDP < 2 000 USD), 10% for efficiency-driven countries (between 2 000 USD – 16 999 USD), and 30% for innovation-driven economies (17 000 USD and above) (Browne *et al.,* 2016). Implicit in this approach is a comparative advantage perspective, and an assumption that for emerging and recently developed economies the ability to increase productivity in a competitive world relies on different factors. The effect the factors have on the score vary among categories of countries, but is standard for countries in the same category. In consequence, the potential for an emerging country to ascend to the next level depends primarily on its ability to adapt technologies from other economies. Economic development literature (see Lall, 2001) supports this trajectory. In summary, the approach of the WEF takes into account that effective shifts in competitiveness at the country level depend on its current stage of development (Collins & Troilo, 2015).

The World Competitiveness Report (WCR), published by IMD Business School from Lausanne (IMD), also acknowledges the multilevel nature of international competitiveness, and ranks countries based on the ability to create and to maintain an environment in which companies can compete. As such, the report pays particular attention to the quality of national institutions and national economic factors, upon which the firms in that country can build global competitive advantage. The WCR divides the national environment into four categories: economic performance, government efficiency, business efficiency, and infrastructure. Each of these is further divided into five subcategories, operationalised further by 340 measures. IMD uses equal weights for each of the 20 sub-categories that have 5% individual weights in the overall competitiveness index (IMD World Competitiveness Center, 2016). The model assumes the impact of these sub-categories across countries at different levels of economic development is equal, unlike the WEF index. On the contrary, the approach taken by IMD implies that each sub-category measured in its report equally impacts competitiveness of any country in the global economy. While the WEF index is easily accessible, the assumption of sub-category assumption has been criticised as lacking rigour (Lall, 2001). The practical consequence is that policymakers have little guidance on which factor, or a group of factors, merit their attention, even though the index is easy to use.

Technology Transfer

The issue of technology transfer is of critical importance in the world, in which speed of technology development in developed countries increases, while inequalities and poverty are persistent phenomena of concern across many emerging economies (Mottner & Johnson, 2000; Seven & Coskun, 2016). Total factor productivity increases over time mainly due to technology change. For example, Solow (1957) shows that gross output per employee almost doubled in the US from 1909 to 1949, and he attributes over 87% of this increase to technical change (Eggertson, 2009). Technology which enables productivity enhancement is the key driver influencing most factors measured in the WEF and IMD rankings. A country's capacity to adapt and to improve technologies developed in other nations is a core issue debated in many policy documents on national innovation and competitiveness (Lall, 2001; Ajitabh & Momaya, 2004).

While continuous innovation, research, and development are the key for sustaining the competitiveness of developed economies, emerging countries rely mostly on technology licensing and transfer from developed economies, in efforts to improve productivity

of their industries. Developing proprietary technology is costly and time-consuming, therefore, efficient technology transfer from other countries is critical for industrialisation of emerging economies (Lall, 2001; Lopez, 2008). Technology transfer has been identified as almost synonymous with international licensing (Mottner & Johnson, 2000).

The monetary value of technology licensing has increased quite substantially over time. In the thirty years from 1975 to 2005, the global value of royalties and licence fees increased 25 times from 4 to 100 USD billion (Lopez, 2008). Further growth in technology licensing is expected due to globalisation, shortening technology life cycles, and the increasing cost of research and development (Aulakh, Jiang, & Pan, 2010). In addition, there have been major institutional improvements in the whole regions of transition and emerging economies, e.g. Central and Eastern Europe (Collins & Troilo, 2015). As a result, the internalisation of technological advantage and direct investment in these economies becomes less efficient relative to the more flexible alternative of technology licensing to local firms (Aulakh, Jiang, & Pan, 2010). The trade-off between setting up a subsidiary and internalising technological advantage versus licensing with an indigenous firm is well established in international business theory (Chen, 2005). Firms will have incentives to internalise if they can achieve relative advantage from hierarchy, where transaction costs are high and market mechanisms are not efficient (Dunning, 1981).

Ease of Paying Taxes and Regulatory Burden

Technology transfer requires two parties, the proprietor of the technology and the technology customer who applies the technology. National regulations and the application of the rule of law affect both parties in the same way. The literature is robust with respect to the effects that regulatory characteristics have on the cost of international transfers from the perspective of the technology proprietors; however, most of this work concerns the technology proprietors, not the recipients.

A related body of research concerns regulatory burden and entrepreneurship. Moreno (2015) reviews many recent empirical studies and concludes that "most empirical analysis finds a negative relationship between regulatory restrictions and entrepreneurship." This stream starts from at least the beginning of the millennium and includes the results of Djankov, LaPorta, Lopes-de-Silanes and Shleifer (2002), Demirguc-Kunt, Love and Maksimovic (2006), Klapper, Laeven and Rajan (2006), Troilo (2011). On the other hand, Bowen and DeClercq (2008) find no effect of regulatory burden on entrepreneurial firms, while Gentry and Hubbard (2005) claim that the effect of taxation on entrepreneurs in innovative industries is indeterminate. In contrast to the majority, Levie and Autio (2011) demonstrate a statistically positive relationship between higher strategic and non-strategic entrepreneurial entry and lighter regulatory burden. They find these effects are somewhat mitigated if the country enforces the rule of law. Some of these differences are a function of how the various researchers define and measure entrepreneurship.

The literature seems lacking in studies as to the determinants of the purchase of technology. Still, it is clear based on standard microeconomic theory that regulation is a pecuniary cost and as such higher regulation should result in a lower demand for technology transfer. Prior research finds that taxation and related externalities can produce distortions in incentives (Baumol, 1972; McGrattan, 1994). Regulation, in as much as it limits the autonomy of decision makers, may also be considered a non-pecuniary cost, an additional factor which would reduce the demand. (Wood *et al*., 2016). Taxes can be considered a direct cost,

and the tax preparation and payment burdens indirect costs similar to other regulatory burdens. Therefore, the amount of tax, the amount of time spent in tax preparation, and the number of times a year taxes must be paid all constitute regulatory expenses.

Although there is a lack of scholarship on the impact of ease of paying taxes on technology transfer per se, it seems likely that regulatory burden in the form of greater demands for paying taxes would have a deleterious effect on technology transfer. Additionally, the expectation of greater reward in the form of higher revenues is the impetus for acquiring technology (see Dess, Covin, & Lumpkin, 1997; Guo, 2008; Troilo, 2014), whereas higher tax rates would have a dampening effect. We propose the following hypotheses for testing:

H1: The number of tax payments will correlate negatively with obtaining a technology licence.

H2: The number of hours of tax preparation will correlate negatively with obtaining a technology licence.

H3: Higher tax rates will correlate negatively with obtaining a technology licence.

H4: Obtaining a technology licence will correlate positively with sales revenue.

The points of interest in these hypothesis are the magnitudes of the effects, as well as the variation across nations and stages of development (Figure 1). We summarise the hypotheses and citations of relevant literature (Table 1).

Table 1. Summary of hypotheses and relevant literature

Hypotheses	Relevant literature
H1, H2, H3 – higher regulatory burden in the form of tax compliance will reduce the likelihood of obtaining a technology licence.	- Existence of distortionary effects of taxation and related externalities (Baumol, 1972; McGrattan, 1994). - Deleterious effects of such distortions on entrepreneurship and innovation (Djankov *et al.,* 2002; Moreno, 2015; Wood *et al.,* 2016).
H4 – Acquiring technology has a positive effect on firm outcomes such as sales revenue	Empirical evidence corroborating the positive effect of technology acquisition on firm performance (Dess *et al*., 1997; Guo, 2008; Troilo, 2014)

Source: own study.

MATERIAL AND METHODS

The World Bank Enterprise Surveys panel data for Central Europe for 2008 to 2013 is the source data for the analysis. Surveys of firms from 30 countries in Central and Eastern Europe and Central Asia constitute the panel. The World Bank surveyed firms in several countries in 2008 and revisited them in 2012, but most firms were queried in 2009 and again in 2013. In terms of time, the sample is balanced; each firm appears twice. There is a total of 5 458 observations (2 729 firms x 2) in our analysis.

The World Bank did undertake the same sampling methodology and use the same basic questionnaire across time, so the data are consistent. The sampling incorporates a cross-section of firms by size and industry to mirror the national population. Employment figures define firm size, with firms having less than 20 employees labelled as small in the World Bank data. Firms with headcount between 20 and 99 are medium-sized, and firms with 100 or more employees are large. By these standards, approximately 71% of the sample are small firms, 18% are medium-sized enterprises, and 11% are large companies.

Using per-capita GDP for 2013, we sort the 30 countries into categories of development roughly based upon the WEF criteria. We differentiate between "High Efficiency" and "Low Efficiency" economies because the data seems to merit it (Table 2).

Table 2. Distribution of observations by country and stage of development

Country	Obs.	2013 Per Capita GDP in USD
Innovation (8)		
Slovenia	190	23.100
Czech Republic	36	19.800
Estonia	146	19.200
Slovakia	24	18.100
Total	396	20.050
High Efficiency (8)		
Lithuania	90	15.700
Russia	256	15.500
Latvia	184	15.000
Kazakhstan	166	14.300
Poland	34	13.800
Croatia	74	13.600
Hungary	126	13.600
Turkey	276	10.800
Total	1.206	14.038
Low Efficiency (14)		
Romania	194	9.590
Azerbaijan	138	7.810
Belarus	242	7.720
Bulgaria	140	7.660
Montenegro	108	7.190
Serbia	240	6.350
Macedonia	356	5.220
Bosnia & Herzegovina	230	4.750
Albania	240	4.410
Mongolia	262	4.400
Georgia	162	4.270
Ukraine	384	3.990
Kosovo	22	3.890
Armenia	336	3.720
Total	3.054	5.784
Factor (4)		
Moldova	366	2.240
Uzbekistan	278	1.880
Kyrgyzstan	88	1.280
Tajikistan	70	1.050
Total	802	1.613

Source: own calculations based on World Bank Enterprise Survey (2013).

Table 3. Tax metrics by country and stage of development

Country	Tax Rate (%)		Tax Hours		Tax Payments	
	2009	2013	2009	2013	2009	2013
Innovation						
Slovenia	34.9	32.9	246	245	21	10
Czech Republic	53.1	50.0	930	413	12	8
Estonia	48.1	68.6	81	81	7	9
Slovakia	48.5	49.7	325	207	32	21
Avg.	46.2	50.3	396	237	18	12
High Efficiency						
Lithuania	45.6	43.0	166	175	15	11
Russia	48.3	54.1	448	177	8	7
Latvia	36.6	35.8	239	224	7	7
Kazakhstan	42.0	29.0	271	188	7	6
Poland	45.1	40.3	420	288	41	19
Croatia	20.8	21.2	196	196	29	30
Hungary	56.6	49.8	330	277	14	12
Turkey	44.3	40.0	223	226	11	11
Avg.	42.4	39.2	287	219	17	13
Low Efficiency						
Romania	45.4	43.3	202	216	113	41
Azerbaijan	40.9	40.0	376	214	22	18
Belarus	117.4	58.5	986	338	112	10
Bulgaria	33.9	27.8	586	424	15	14
Montenegro	33.6	21.6	372	320	89	28
Serbia	31.2	33.3	279	279	67	67
Macedonia	15.4	7.4	150	119	40	29
Bosnia & Herzegovina	42.8%	23.6	428	407	55	44
Albania	49.6	38.5	368	357	44	44
Mongolia	33.6	24.6	204	192	41	41
Georgia	38.6	16.5	387	280	30	5
Ukraine	57.2	55.4	860	491	147	28
Kosovo	28.3	15.6	163	164	33	33
Armenia	38.6	38.8	578	372	50	13
Avg.	43.3	31.8	424	298	61	30
Factor						
Moldova	42.4	30.8	234	220	53	49
Uzbekistan	89.8	98.7	206	205	45	45
Kyrgyzstan	40.3	33.4	222	226	76	52
Tajikistan	83.4	84.5	296	296	69	69
Avg.	64.0	61.9	240	237	61	54

Source: own calculations based on World Bank Enterprise Survey (2013).

Table 3 displays the distribution of observations by country and stage of development. There are 4 countries in the Innovation category with an average per-capita GDP of 20 050 USD, 8 economies qualifying as High Efficiency with an average of 14 038 USD, 14 nations in Low Efficiency with an average of 5 784 USD, and 4 Factor countries averaging 1 613 USD. The

number of observations by stage of development are: 396 observations and 198 firms in Innovation, 1 206 observations and 603 firms in High Efficiency, 3 054 observations and 1 527 firms in Low Efficiency and 802 observations and 401 firms in Factor, respectively.

Table 3 offers details for the tax regimes of the countries in the sample, along with averages by stage of development, which is compiled from the World Bank *Doing Business* Indicators. As explained more completely below, Tax Rate is the overall rate of taxation for corporations, Tax Hours is the number of labour hours needed to comply with the tax code, and Tax Payments is the number of payments necessary to fulfil all tax obligations.

According to Table 3, the tax rate for Innovation economies actually climbed from 46.2% in 2009 to 50.3% in 2013 for an increase of 9.0%.[1] The number of tax hours for the Innovation category fell by a whopping 40%, though it is interesting to note that in absolute terms the average number of tax hours in 2013 is equal to that for Factor economies (237) and greater than for High Efficiency countries (219). The Czech Republic shaved 56% of its tax compliance hours, yet remains the highest at 413. The number of tax payments declined by one-third from 18 to 12.

The High Efficiency grouping made strides in all three measurements from 2009 to 2013. Tax rates fell by 7.7%, tax hours declined 23.6%, and tax payments were reduced by 22.0%. At the country level, Poland made notable improvement in tax payments, going from 41 to 19 for a decrease of nearly 54%. Russia's tax hours dropped 60.5% from 448 to 177.

Of the development categories, the Low Efficiency bucket showed the greatest improvement in both tax rates and tax payments. They dropped by 26.6% in the former and 51.6% in the latter. The number of tax hours also decreased by 29.7%, second only to the Innovation category. The most improved country across the board is Belarus, with declines in rates, hours, and payments of 50.2%, 65.7%, and 91.1%. Georgia, Armenia, Montenegro, and Ukraine also registered dramatic success, particularly in the realm of the number of payments.

The Factor grouping also improved over time, but its gains were modest at best. Tax rates fell 3.3%, hours dropped 1.1%, and payments decreased 11.5%. Kyrgyzstan had the most impressive overall gains, with rates falling 17% and number of payments declining 32%. Moldova's tax rate fell 27.4% during the period.

Variable definitions appear in Table 4, and descriptive statistics are in Table 5. There are two dependent variables, each of which is estimated separately as described below. Sales is a continuous variable capturing annual sales in millions of local currency units. TechLicense is a dichotomous variable; firms were asked if they have technology licensed from a foreign company. The "Yes" answer is coded as 1 and the "No" is a 0. The average annual sales amount is 1.4 billion LCUs, and 14% of firms licensed technology from a foreign enterprise during the period. In terms of industry, Retail represents the largest sector at 26.1%, followed by Food (9.7%), Wholesale (9.5%), and Construction (8.9%).

As indicated, there are three variables of interest regarding taxation, and these were collected from the World Bank Doing Business Indicators.[2] TaxRate is the total tax rate the firm bears as a share of its commercial profit after accounting for any

[1] Calculations relating to Table 2 generally use this equation: (Begin-End)/Begin, though for this calculation it is actually (End-Begin)/Begin so (50.3-46.2)/46.2 = 0.0899 = 9%. The numbers are percentage changes from the beginning base, including the changes in tax rates.

[2] The complete World Bank Paying Taxes methodology, which this paragraph summarises, may be found at: http://www.doingbusiness.org/Methodology/paying-taxes#total.

allowable deductions and exemptions (World Bank, 2016). It includes income, sales, labour, and infrastructure taxes. TaxHours is the amount of time in hours per year needed to prepare, file, and pay income taxes, sales and/or value-added taxes (VAT), and labour taxes including social contributions (World Bank, 2016). TaxPayments is the number of payments needed to satisfy all tax obligations. It reflects the total number of taxes paid, the method of payment, the frequency of payment, the frequency of filing, and the number of government agencies involved (World Bank, 2016). An additional variable of interest is the percentage of foreign ownership, which ForeignOwner represents. On average, 7.1% of the firm's equity is in the hands of a foreign enterprise.

Table 4. Variable definitions

Variable	Definition
Dependent variables	
Sales	Annual sales in millions of local currency units (LCUs)
TechLicense	"Does the firm have technology licensed from a foreign company?" (Yes=1, No=0)
Explanatory variables	
TaxPayments	The number of annual tax payments
TaxHours	The number of hours spent annually to comply with tax codes.
TaxRate	The total tax rate, expressed as a share of commercial profits.
ForeignOwner	The percentage of the firm owned by a foreign enterprise.
Control variables	
Employees	The number of full-time employees of the firm, in thousands
FirmAge	The age of the firm in years
Public	Legal status: Firm is publicly listed. (Yes=1)
Private	Legal status: Firm is a private limited liability corporation. (Yes=1)
Sole	Legal status: Firm is a sole proprietorship. (Yes=1)
Partner	Legal status: Firm is a partnership. (Yes=1)
PerCapGNI	Per-capita Gross National Income in nominal US dollars.

Source: own study.

Firm-level controls include the number of employees, firm age, and the legal status of the firm. The Employees variable is in thousands of full-time workers, and on average firms employed 59 labourers. The average age of firms in the sample is 19.5 years, with a standard deviation of 16.5 years. Nearly three quarters of firms register as privately held concerns, whereas 10% are sole proprietorships and 8% are publicly traded. In terms of industry, Retail represents the largest sector at 26.1%, followed by Food (9.7%), Wholesale (9.5%), and Construction (8.9%). These five segments, plus Hotel & Restaurant and Transport Services, have categorical variables as industry controls.

The further empirical analysis unfolds in two steps. In the first step, a random-effects panel logistics model is used to estimate the likelihood that the respondent firm has licensed technology from a foreign company. We specify random effects because fixed effects would negate the differences among countries, which is precisely what interests us.

Table 5. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Dependent variables				
Sales	1.392	14.036	0	572.000
TechLicense	0.14	0.35	0	1
Explanatory variables				
TaxPayments	38.43	32.55	5	147
TaxHours	320.32	188.74	81	986
TaxRate	43.52	21.12	7.40	117.40
ForeignOwner	7.09	23.67	0	100
Control variables				
Employees	0.059	0.29	0.001	12
FirmAge	19.52	16.48	1	188
Public	0.08	0.27	0	1
Private	0.74	0.44	0	1
Sole	0.10	0.30	0	1
Partner	0.04	0.19	0	1
Other	0.04	0.18	0	1
PerCapGNI	7.057	5.317	570	24.400
Distribution of observations by industry				
Industry	**Obs**		**%**	
Food	531		9.7	
Textiles	148		2.7	
Garments	346		6.3	
Wood & Furniture	110		2.0	
Chemicals	157		2.9	
Media & Telecom	74		1.4	
Plastics	77		1.4	
Minerals	162		3.0	
Metals	233		4.3	
Machinery	201		3.7	
Electronics	76		1.4	
Auto manufacturing	14		0.3	
Construction	486		8.9	
Auto services	124		2.3	
Wholesale	520		9.5	
Retail	1 424		26.1	
Hotel & Restaurant	229		4.2	
Transport services	244		4.5	
Information Technology (IT)	41		0.8	
Other manufacturing	261		4.8	
Total	**5 458**		**100**	

Source: own calculations based on World Bank Enterprise Survey (2013).

These estimates are performed using one of the variables of interest, e.g. TaxRate along with the controls. The regression equation has the following form:

$$\Pr(TechLicense) = \alpha_1 ExplanatoryVariable + \alpha_2 ForeignOwner + \\ + \sum_{j=1}^{7} \gamma_j FirmControls_j + \sum_{k=1}^{7} \tau_k IndustryControls_k + Intercept + \varepsilon \quad (1)$$

where:

$ExplanatoryVariable$ - is TaxPayments, TaxHours, and TaxRate in turn.

These estimates are performed for the total sample and for each development category for each of the three tax variables. For purposes of comparison, "Other" is the omitted category for legal status. After estimation, marginal effects of the key explanatory variables are calculated for those variables that are statistically significant.

In the second step, a random-effects panel generalised least squares (GLS) regression estimates the impact of having a technology license on annual sales. The equation is similar to (1) above:

$$Sales = \alpha_1 TechLicense + \alpha_2 ForeignOwner + \\ + \sum_{j=1}^{7} \gamma_j FirmControls_j + \sum_{k=1}^{7} \tau_k IndustryControls_k + Intercept + \varepsilon \quad (2)$$

Because this is a linear regression, the value of the coefficients are the marginal effects. Note that there are no country-level fixed effects because the tax burden is a country-level phenomenon that the regression analyses are trying to capture.

Table 6. Correlation matrix

Category	Sales	TechLicense	TaxPayments	TaxHours	TaxRate	ForeignOwner
Sales	1.000	–	–	–	–	–
TechLicense	0.034	1.000	–	–	–	–
TaxPayments	0.003	-0.033*	1.000	–	–	–
TaxHours	-0.008	-0.027*	0.554**	1.000	–	–
TaxRate	0.031**	-0.057**	0.291**	0.398**	1.000	–
ForeignOwner	0.060**	0.108**	-0.004	-0.010	0.005	1.000

* - significant at 5%. ** - significant at 1%

Source: own calculations based on World Bank Enterprise Survey (2013).

Table 6 contains the correlation matrix of the main variables. As a check for collinearity, the matrix is reviewed for correlations with an absolute value greater than 0.700. No such value is found, so collinearity does not appear to be a concern. The highest correlation exists between TaxHours and TaxPayments at 0.55. The use of a Baltagi-Wu test (Levie & Autio, 2011; Baltagi & Wu, 1999) revealed no serial autocorrelation in the data.

RESULTS AND DISCUSSION

The findings for TaxPayments appear in Table 7. TaxPayments is negative and significant at 10% for TechLicense for the overall sample and at 5% for both Innovation economies and Low Efficiency economies. Support for H1 is relatively robust. Also noteworthy is the effect of foreign ownership; ForeignOwner is positive and significant at 1% for four of the five estimates and is positive and significant at 5% for the remaining one (Innovation). The Wald Chi-squared statistic is positive and significant at 1% for four of the five specifications, indicating that the model fits the data well.

The next step is to analyse marginal effects for TaxPayments for the overall sample as well as the Innovation and Low Efficiency categories. According to Woolridge (2013), the assumption of serial independence of observations in a correlated random-effects panel data model is a strong one, and can be problematic for calculating average partial (marginal) effects. An alternative is to pool the data and estimate the dependent variable using a probability unit (probit) model, then calculate the marginal effects of the variables from this equation. The marginal effects from a pooled probit estimate will be nearly identical to that of correlated random-effects panel model, are easier to calculate, and are as statistically robust (Woolridge, 2013; Arulampalam, 1996). This is the method employed for all marginal effects reported in this article, but we do not show the pooled results for brevity. These effects cannot be discerned from the coefficients displayed in the tables.

Table 7. Logistic estimates of Tech Licenses for number of tax payments

Number of tax payments	(1)	(2)	(3)	(4)	(5)
VARIABLES	Total	Innovation	High Eff	Low Eff	Factor
TaxPayments	-0.002*	-0.076**	0.020	-0.004**	0.007
	(0.001)	(0.036)	(0.017)	(0.002)	(0.015)
ForeignOwner	0.010***	0.011**	0.013***	0.009***	0.017***
	(0.002)	(0.005)	(0.004)	(0.002)	(0.005)
Employees	0.205*	-0.322	0.422	0.165	0.465
	(0.120)	(1.028)	(0.343)	(0.140)	(0.306)
FirmAge	0.003	-0.001	0.009*	0.002	-0.004
	(0.002)	(0.009)	(0.005)	(0.003)	(0.017)
Public	0.345	16.657	17.949	0.065	0.292
	(0.310)	(3,997)	(3,357)	(0.360)	(0.709)
Private	0.568**	16.152	17.864	0.253	1.031
	(0.278)	(3.997)	(3.357)	(0.312)	(0.637)
Sole	-0.243	16.005	16.933	-0.499	-0.689
	(0.322)	(3,997)	(3,357)	(0.359)	(0.950)
Partner	0.107	16.472	17.508	-0.128	0.403
	(0.368)	(3.997)	(3.357)	(0.457)	(0.822)
Constant	-1.972***	-17.045	-19.873	-1.442***	-3.080***
	(0.298)	(3.997.557)	(3.357.227)	(0.338)	(1.023)
Observations	5446	343	1.206	3.043	706
Wald Chi-squared	299.150***	15.99	69.64***	159.050***	46.970***

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. Industry controls not shown for brevity.
Source: own calculations based on World Bank Enterprise Survey (2013).

These marginal effects are computed holding the other variables at their mean values, and the interpretation is the effect on the likelihood of the dependent variable occurring when the value of the continuous variable increases by one unit. For TaxPayments, it is therefore the effect of each additional payment on the probability that the firm will obtain a technology license from a foreign company. For the overall sample, this effect is miniscule at only -0.02%; if the number of payments increases by 10, the likelihood of the firm acquiring a technology license from abroad declines by a mere 0.2%. On the other hand, the marginal effect of a one-unit increase in TaxPayments in Innovation nations is to decrease the likelihood of license acquisition by 0.8%; a 10-unit increase would therefore decrease the

likelihood by 8%. For Low Efficiency countries, the effects are -0.4% and -4%, respectively. ForeignOwner has a positive marginal effect of 0.1%, so a 10% increase in the foreign ownership of a firm increases the likelihood of that firm licensing technology by just 1%.

Table 8. Logistic estimates of Tech Licenses for hours of tax preparation

VARIABLES	Total	Innovation	High Eff	Low Eff	Factor
TaxHours	-0.001***	-0.001	-0.002*	-0.001***	0.005
	(0.000)	(0.001)	(0.001)	(0.000)	(0.005)
ForeignOwner	0.010***	0.011**	0.012***	0.009***	0.017***
	(0.002)	(0.005)	(0.004)	(0.002)	(0.005)
Employees	0.213*	-0.200	0.413	0.185	0.471
	(0.119)	(1.014)	(0.343)	(0.138)	(0.306)
FirmAge	0.003	-0.001	0.009*	0.001	-0.005
	(0.002)	(0.009)	(0.005)	(0.003)	(0.017)
Public	0.348	17.829	17.450	0.046	0.310
	(0.310)	(6.870)	(2.675)	(0.361)	(0.701)
Private	0.559**	17.320	17.231	0.209	1.012
	(0.277)	(6.870)	(2.675)	(0.312)	(0.633)
Sole	-0.232	17.472	16.396	-0.512	-0.672
	(0.322)	(6.870)	(2.675)	(0.360)	(0.948)
Partner	0.036	16.855	16.945	-0.318	0.355
	(0.369)	(6,870)	(2,675)	(0.461)	(0.821)
Constant	-1.807***	-18.890	-18.432	-1.173***	-3.875***
	(0.302)	(6.870)	(2.675)	(0.348)	(1.308)
Observations	5.446	343	1.206	3.043	706
Wald Chi-squared	304.410***	14.280	71.550***	166.730***	47.230***

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. Industry controls not shown for brevity.
Source: own calculations based on World Bank Enterprise Survey (2013).

Table 8 displays the results for TaxHours. Here TaxHours has the expected effect for both the overall sample as well as for High Efficiency and Low Efficiency nations. TaxHours is negative and significant at 1% for both the overall sample and for Low Efficiency economies, and is negative and significant at 10% for High Efficiency countries. These results support H2. As may be expected, the marginal effect of a single hour is infinitesimal. An additional 100 hours of tax preparation would only reduce the likelihood of obtaining a technology license by a scant 0.08% for the sample as a whole. For the subsamples, the effects are more pronounced. An additional 100 hours reduces the likelihood of technology licensing in High Efficiency economies by 3% and in Low Efficiency economies by 1%.

The findings for TaxRate are in Table 9. TaxRate is negative and significant at 1% for three of the five specifications but it is positive and significant at 10% for Innovation nations. The results are mixed concerning H3. Tax rates did increase for the Innovation category for the period 2009-2013 per Table 2. It may also be that taxes are spent more effectively in Innovation countries, yielding better infrastructure and social services which more than offset the expected negative effect on technology licensing and hence sales and profits. For the overall sample, each increase of 1% in the tax rate reduces the likelihood of licensing technology from a foreign company by 0.1%. An increase of 10% in the tax rate

therefore lowers the probability of licensing by 1.0%. Such an increase reduces the likelihood of licensing by 4% in High Efficiency countries and by 1% in Low Efficiency countries, but increases the likelihood in Innovation economies by 2%.

Table 9. Logistic estimates of Tech Licenses for tax rate

VARIABLES	Total	Innovation	High Eff	Low Eff	Factor
TaxRate	-0.012***	0.023*	-0.045***	-0.013***	-0.001
	(0.003)	(0.014)	(0.014)	(0.003)	(0.006)
ForeignOwner	0.010***	0.011**	0.013***	0.009***	0.017***
	(0.002)	(0.005)	(0.004)	(0.002)	(0.005)
Employees	0.267**	-0.350	0.456	0.212	0.471
	(0.121)	(0.989)	(0.352)	(0.138)	(0.309)
FirmAge	0.003	0.001	0.008	0.002	-0.004
	(0.002)	(0.009)	(0.005)	(0.003)	(0.017)
Public	0.215	16.379	17.043	-0.045	0.311
	(0.313)	(2.908)	(2.047)	(0.363)	(0.712)
Private	0.370	15.938	16.786	0.113	1.023
	(0.281)	(2.908)	(2.047)	(0.315)	(0.652)
Sole	-0.396	15.656	15.926	-0.562	-0.722
	(0.325)	(2.908)	(2.047)	(0.361)	(0.959)
Partner	0.027	15.454	16.580	-0.274	0.421
	(0.371)	(2.908)	(2.047)	(0.460)	(0.824)
Constant	-1.328***	-18.758	-16.687	-0.978***	-2.627***
	(0.321)	(2.908)	(2.047)	(0.358)	(0.855)
Observations	5,446	343	1,206	3,043	706
Wald Chi-squared	308.040***	16.550	70.260***	169.080***	46.700***

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. Industry controls not shown for brevity.
Source: own calculations based on World Bank Enterprise Survey (2013).

Because of the strong assumptions underlying the random-effects panel model mentioned earlier, we perform some robustness checks. Woolridge (2013) describes Generalised Estimating Equations (GEE) as "essentially multivariate, nonlinear least squares" (p. 43). We check the reported results in Tables 7 through 9 with this method and find the same outcomes with regard to statistical significance, direction, and relative magnitude for the key explanatory variables. Moreover, marginal effects can be readily calculated from GEE without losing the time element inherent to the pooled probit approach. The marginal effects are materially identical to those calculated above with the pooled probit.

The last two tables present the findings from the second stage of the analysis. The effect of having technology licensed from a foreign company on annual sales appears in Table 10.

Surprisingly, TechLicense is only significant for Innovation countries at 5%, but not for the other estimates. Foreign ownership, on the other hand, is significant to varying degrees across all five specifications. The control variable Employees is positive and significant at 1% for every specification except Low Efficiency. It appears that both the level of foreign ownership and the number of employees plays a larger role for sales than holding licensed technology.

Table 10. Generalised least squares estimates of sales and technology license

Category	Total	Innovation	High Eff	Low Eff	Factor
TechLicense	-28.591	93.978**	-432.322	224.178	-737.502
	(567.684)	(42.051)	(1,352.435)	(785.654)	(1,174.372)
ForeignOwner	33.573***	1.247**	78.934***	29.044**	26.533*
	(8.071)	(0.512)	(22.253)	(11.552)	(15.298)
Employees	2.719.798***	460.781***	4.956.848***	1.778.780*	3.414.709***
	(666.156)	(91.320)	(1.847.113)	(914.426)	(994.995)
FirmAge	65.300***	0.897	11.835	126.452***	-42.496
	(11.731)	(0.694)	(28.118)	(16.758)	(38.086)
Public	-484.801	-347.674***	-328.446	-1.248.249	1.276.952
	(1.245.789)	(116.569)	(4.789.244)	(1.733.497)	(1.591.020)
Private	-224.671	-363.973***	95.824	-155.419	822.888
	(1.073.848)	(108.266)	(4.382.019)	(1.470.728)	(1.384.437)
Sole	280.017	-574.984***	-1.051.215	646.376	-343.672
	(1.203.518)	(126.721)	(4.897.688)	(1.613.588)	(1.599.092)
Partner	-122.238	-304.887**	-649.086	673.506	-549.264
	(1.430.453)	(128.126)	(5.188.812)	(2.097.502)	(1.706.077)
Constant	-856.471	354.927***	-583.854	-1.914.733	1.347.959
	(1.135.882)	(116.549)	(4.455.265)	(1.558.390)	(1.573.240)
Observations	5.457	396	1.206	3.054	801
Wald Chi-squared	89.620***	81.030***	25.200**	96.380***	28.230**
Average Sales	1.392.95	62.21	855.53	1.805.65	1.286.47

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. Industry controls not shown for brevity.
Source: own calculations based on World Bank Enterprise Survey (2013).

Since these are linear estimates, the variable coefficients are the marginal effects. The marginal effects of categorical variables demonstrate the impact of whether that variable takes a 1 or a 0 as its value. For firms in Innovation countries, having licensed technology (TechLicense=1) correlates to an increase in sales of nearly 94 million LCUs v. a company that does not (TechLicense=0). As a basis of comparison, the average sales of enterprises in Innovation economies are 62 million LCUs.

The other variables are continuous, so for ForeignOwner each 1% increase in foreign ownership correlates to an increase of 33.6 million LCUs in sales for the overall sample. The figure is only 1.2 million LCUs for firms in Innovation economies and nearly 79 million LCUs for firms in High Efficiency countries. The table includes a line for Average Sales to give a sense of magnitude. For example, the 79 million LCUs for High Efficiency represents 9.2% of the average sales of 855 million LCUs. Note that Employees are in units of one thousand, so an increase in headcount of 1.000 corresponds with an increase of around 2.7 billion LCUs for the overall sample.

Table 11 extends the analysis to each country. First, the linear regression of TechLicense and ForeignOwner on Sales (Equation 2) is estimated for each country, with the caveat that the industry categorical variables are omitted due to the fact that they consume too many degrees of freedom at the country level. The resulting coefficient values appear

in the "TechLicense" and "ForeignOwner" columns, respectively. The "Average Sales" column displays the average annual sales by country as a basis of comparison.

Table 11. Effects by country for tech licenses on annual sales

Country (Obs.)	Tech License	ForeignOwner	Average Sales
Innovation			
Czech Republic (36)	317*	11***	390
High Efficiency			
Russia (256)	388**	9**	255
Latvia (184)	.	0.06**	4
Hungary (126)	.	402**	7.114
Turkey (276)	.	0.25*	11
Low Efficiency			
Romania (194)	7*	0.12***	8
Azerbaijan (138)	2*	0.04*	1
Belarus (242)	22.831*	.	14.443
Bulgaria (140)	9***	.	5
Serbia (240)	814*	59***	1.238
Macedonia (356)	.	7***	197
Bosnia & Herzegovina (230)	5**	0.12***	5
Albania (240)	1.141**	.	380
Mongolia (262)	.	190*	4.635
Kosovo (22)	2***	.	1
Factor			
Moldova (366)	.	1***	31
Uzbekistan (278)	.	103**	3.670

Source: own calculations based on World Bank Enterprise Survey (2013).

The Czech Republic is the only significant result in the Innovation category. TechLicense is positive and significant at 10% while ForeignOwner is positive and significant at 1%. Each additional percentage of foreign ownership yields 11 million LCUs more in sales, while having licensed technology correlates with 317 million LCUs in additional sales. This compares to an average of 390 million LCUs for Czech enterprises.

For High Efficiency, ForeignOwner is positive and significant at varying levels for firms in four nations while TechLicense is positive and significant at 5% for Russia. The marginal effect of technology licensing in Russia is 388 million LCUs compared to average sales of 255 million LCUs. Hungary registers the biggest marginal effect of foreign ownership, where each additional percentage of foreign ownership corresponds to an additional 402 million LCUs in sales. This is 5.6% of the average sales of 7.1 billion LCUs.

The Low Efficiency category contains ten countries registering positive, significant effects from technology licensing, foreign ownership, or both. In terms of magnitude, technology licensing correlates with nearly four times average sales in Albania and nearly twice average sales in Belarus. Each additional percentage of foreign ownership correlates with increases of 3% to 5% in sales revenue for Serbia, Macedonia, and Mongolia.

There are only two significant results for the Factor economies. Foreign ownership is positive and significant at 1% for Moldova and the marginal effect is approximately 3% of average sales. Foreign ownership is positive and significant at 5% for

Uzbekistan and again the marginal effect is nearly 3%. For our initial analysis, we only find support for H4 for the Innovation category, but at the country level we have 10 nations where TechLicense is positive and significant.

For convenience, we summarise the results for the hypotheses in the table below:

Table 12. Summary of findings

Hypothesis	Result
H1: The number of tax payments will correlate negatively with obtaining a technology licence.	H1 is supported.
H2: The number of hours of tax preparation will correlate negatively with obtaining a technology licence.	H2 is supported.
H3: Higher tax rates will correlate negatively with obtaining a technology licence.	H3 is partially supported. Innovation economies have a positive correlation.
H4: Obtaining a technology licence will correlate positively with sales revenue.	H4 is partially supported. Positive correlation is observed for innovation economies and various countries.

Source: own study.

CONCLUSIONS

In this article, we study the impact of the ease of paying taxes on technology transfer. We categorise paying taxes as a type of regulatory burden, anticipating that the greater the burden, the lower the likelihood of tech transfer occurring. Such transfer makes firms more competitive in the short term, and nations more competitive in the long term. The immediate benefit of tech transfer should register in increased revenues for the recipient firm.

With these concepts in mind, we structure our analysis in two stages. In the first, we measure the effects of the number of tax payments, the number of hours of tax preparation, and tax rates on the likelihood of obtaining a technology license from a foreign company. The results for all three of these tax metrics are as expected, but the economic impact as captured by the marginal effects is scant. It does not seem that reducing the number of tax payment, the hours of tax preparation or the tax rate itself will do much to increase the likelihood of tech licensing. An argument may be offered, based on signalling theory, that reducing any of these measures advertises the locale as business-friendly environment. While this is certainly plausible and indeed all manner of political entities, from towns to entire nations, take such steps to woo investment, our current analysis of the marginal effects suggests that the impact of these improvements is underwhelming.

Concerning sales, the big story is the influence of foreign ownership. While technology licensing does have the expected effect in Innovation economies, it does not register for the other subsamples or the overall sample. Foreign ownership, however, has both positive, statistically significant correlations, as well as impressive marginal effects based upon the average sales figures in Table 9. These results recommend that both firms and policymakers pursue more foreign shareholding as a general course, but with the caveat that foreign ownership can involve particular trade-offs and hindrances across the thirty different nations in this study.

Our analysis is not nuanced enough to specify the catalyst or the process linking foreign ownership to improvement. For example, foreign ownership may improve sales because of the passing of tacit knowledge which increases the efficiency of operations, but we cannot verify this is true. Even if it is, we cannot say even in general terms what kind of knowledge this may

be, e.g. technical, managerial, etc., or how it interacts with the firm's existing base of knowledge such that sales increase. Our data does not allow analysis at this level of refinement.

We anticipate that tech transfer will improve sales; naturally, firms seek better technology in order to make profits. While the effect does not register at the level of stage of development outside of Innovation, we do observe it at the national level, particularly for countries in the Low Efficiency category. Eight out of the fourteen countries in this category exhibit varying degrees of significance for the effect of technology licensing on sales. On the other hand, only the Czech Republic in Innovation and Russia in High Efficiency have the expected result; there are no nations in the Factor stage of development with significant outcomes for tech licensing on sales. Perhaps not as surprising, given the aforementioned observations about foreign ownership, thirteen countries across all stages of development show positive, significant correlations between foreign ownership and sales.

The question then becomes why does this disparity in number of countries across regions exist for technology licensing and sales? Here we turn to the discussion of competitiveness that began our literature review. It may be that in Innovation economies, it is necessary to have technology just to exist in the market. Conditions here approximate perfect competition more than in other regions, so there is no special effect on sales from tech transfer at the national level. All that firms gain from such transfer is perhaps an increased likelihood of survival.

On the other hand, firms in Factor economies may have potential for tech transfer to drive sales, but the current impact is minimal because markets are less developed. Not only markets, but also other institutions. It may be that firms in this region cannot leverage technology into increased sales (and profits) because they are coping with a number of institutional voids (see Khanna & Palepu, 2010).

The Low Efficiency economies seem to occupy the happy "middle ground" where institutions are robust enough to allow firms to glean benefits from technology licensing, yet markets are not so fierce that the financial advantages of such transfer are competed away. The differences among the stages of development as measured by per-capita GDP in Table 2 are substantial, as are the relative quality of their institutions. It is expected that higher institutional quality generally correlates with economic development (see North, 1990), but the optimal stage of such development for firms to add value from technology licensing is not known. Our analysis suggests Low Efficiency as a start.

Our work is not without limitations. We are measuring correlations; we have not established causality. Although we employ a number of control variables, we may have omitted one that could impact our results. This is particularly true with regard to foreign ownership, per the above discussion. As is the case with survey data, we are gauging perceptions, which may or may not correspond with reality. Establishing the stages of economic development as we have is plausible but there can be legitimate disagreements about the countries contained therein. Our work is also exploratory in nature. And thus our contributions to the literature are more empirical than theoretical in nature.

One item that could be a promising avenue for future research is to examine tech licensing on an industry basis, instead of just using industries as control variables. It would also be useful to continue data collection for a longer time series, to see when the benefits of licensing might attenuate. Another approach would be to measure the impact of licens-

ing on other outcomes, such as firm survival. A systematic review of literature on relationship among institutional and regulatory rules of the game in emerging economies, and strategic decision of game players will enable to develop theoretical model that will guide competitiveness literature. Future work will grapple with some of these issues.

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