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Effects of Outsourcing and FDI Spillovers on Productivity of East Asia-Pacific Countries

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Abstract

Outsourcing and foreign direct investment (FDI) have become widespread phenomena of globalization in recent decades. They not only bring in capital but also introduce advanced technology that can improve the factor productivity of the host country firms, thereby generating economic growth. More importantly, the technological benefit is not limited to locally affiliated firms but can also spread to non-affiliated ones.

This paper develops theoretical relationships between outsourcing, FDI spillovers and productivity, and then examines empirically whether international outsourcing contributes to technological spillovers through which total factor productivity increases in a sample of East Asia-Pacific countries. A panel-based model is specified to allow for the link between FDI, outsourcing and productivity of the region's countries during 1990-2004. The estimation results show that international outsourcing and FDI spillovers have had significant and expected effects on total factor productivity (TFP) of the Asia-Pacific countries. This can be a good lesson for Iran to promote its economic relations with the world, particularly with those countries investigated here, as they have adequate potentials in case.

Keywords: International Outsourcing, FDI Spillovers, Total Factor Productivity (TFP), East Asia-Pacific Countries

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1- Introduction

In the age of outsourcing[1], firms seem to be subcontracting a set of activities, ranging from product design to assembly, from research and development to marketing, distribution and after-sale service. Some firms have become 'virtual' manufacturers, owning design for many products, but making almost nothing themselves. The World Trade Organization (WTO) reported that in 1998 30% of an American car's value went to Korea for assembly, 17.5% to Japan for components and advanced technology, 7.5% to Germany for design, 4% to Taiwan and Singapore for minor parts, 2.5% to United Kingdom for advertising and marketing services and 1.5% to Ireland and Barbados for data processing. This meant that only 37% of the production value was generated in the United States (Head and Ries 2002).

Over the past three decades, Japanese multinational enterprises (MNEs) have steadily increased their offshore manufacturing presence. They now possess substantial production capabilities abroad. There is also considerable evidence for the kind of international outsourcing. For example, Taiwanese personal computer (PC) producers (e.g., Acer) supply mother boards and other inputs to other foreign PC producers. Similar practices are often observed in automotive industries. Traditionally, the production of engines has been kept in-house and engines are only used in the manufacturer's own vehicles. This practice is not difficult to understand given that engines are the most important component in automobiles. Honda is famous for its unique DCR (direction of crankshaft rotation) engines and their superior quality but the company has decided to abandon DCR and will incorporate its technology to produce more conventional GDI (gasoline direct injection) engines that are suitable for installation in other carmakers' models (Hyun and Koo 2006).

As the work by Grossman and Helpman (2005) demonstrates, a high-wage country may continue to attract outsourcing firms if it offers better infrastructure, partners who are skilled in adapting their capabilities to the needs of the outsourcing firms, or highly effective legal protections that

1- Outsourcing means imports of intermediate inputs by domestic firms. This refers to the fragmentation of production into discrete activities, which are then allocated across countries.

secure outsourcing relationships. Nonetheless, while it is well understood that the location of outsourcing production should reflect differences in country costs, there is little known about actual outsourcing effects. Foreign direct investment (FDI) has been also recognized widely as a growth factor in investment. FDI not only brings in capital but also introduces advanced technology that can improve the factor productivity of the host country firms, thereby generating economic growth. More importantly, the technological benefit is not limited to locally affiliated firms but can also spread to non-affiliated ones. The latter benefit is usually referred to as technology spillover.

This paper examines whether international outsourcing can affect the total productivity in a sample of Asia-Pacific countries. We also investigate empirically how a measurement of FDI spillovers on these countries over 1990-2004 yields significant evidence productivity growth. Thus, Section 2 reviews briefly the relevant literature and Section 3 specifies a panel model in order to we may be able to find empirically relationships between total productivity factor (TPF) and its significant determinant such as outsourcing and FDI spillovers. Section 4 provides concluding remarks.

2- Relevant Literature

It is an important channel through which trade affects the demand for labor of different skill types. Head and Ries (2002) contribute to the literature investigating the influence of globalization on the demand for skilled labor. Slaughter (2000) demonstrates that the US industry data provide no support for a positive relationship between MNE activities and skill upgrading. Feenstra and Hanson (1999), however, discuss that if firms respond to import competition from low-wage countries by moving non-skill-intensive activities abroad, then trade will shift employment toward skilled workers with more productivity within industries. In the following we discuss the relationship between international trade, outsourcing and total factor productivity

2-1- International Trade, Outsourcing and Productivity

Hummels et al. (2001) have used trade in parts and components to proxy for what they have termed ‘vertical specialization’, ‘intra-sector

specialization', and 'global product sharing'. These authors show that there has been rapid expansion in specialization for various industries including textiles, apparel, footwear, machinery, electrical equipment, transportation equipment, chemicals and allied products. It seems that outsourcing of intermediate goods and business services is one of the most rapidly growing components of international trade.

International outsourcing is common in many industries, such as computer and automobile industries. Chena et al. (2004) argue that the usual cost-saving motivation for outsourcing could be accompanied by a strategic reason, and that the strategic outsourcing in response to trade liberalization in intermediate goods can result in higher prices for both intermediate and final goods. Studies in the literature explore the incentives of international outsourcing and its potential effects associated with trade liberalization. Using the 'transaction cost' and 'incomplete contract' approach, McLaren (2000) focuses on trade liberalization and vertical structure under imperfect competition. According to him, trade liberalization lowers transaction cost and makes it easier for an input supplier to find an attractive buyer abroad.

Cross-country factor cost differences may create an incentive to engage in outsourcing, as firms decide where to complete the different production stages—design, materials extraction, parts production, and assembly—that are required for the creation of a final product. As with trade in final products, comparative advantage determines the ideal country placement for each production stage. However, while one expects outsourcing decisions to respond to country cost conditions, it is not obvious that outsourcing production will respond quickly or substantially to all cost changes. Information appears to play a large role in determining trade volumes, especially for differentiated products. As a result, even when country costs change, firms may not be sufficiently well informed about other markets to quickly change the location of their international sourcing. Grossman and Helpman's (2004) work on international outsourcing includes just such an informational feature; when Northern firms seek partners, they must expend resources on information gathering as they search for potential partners who match their production requirements. In this context, Northern firms may be dissuaded from seeking outsourcing partners in the low-wage south if the fixed costs of information gathering are high in those locations. Similarly, if

a firm is hit by a cost shock in one country where it operates, it may only seek information on alternative outsourcing partners if the shock is sufficiently large to warrant the expenditures involved in finding a new partner.

If outsourcing in a developing country is typified by low-skill assembly activities performed by low-wage workers, it may not be difficult for firms to compare their options across developing country locations. If this is true, then outsourcing decisions in the developing country should respond more vigorously to cost changes, since the fixed costs of search are proportionately smaller than they are in cases where highly skilled and highly specialized assembly facilities are required.

The same argument may distinguish the difficulty of relocating a highly detailed production processes versus those that are less differentiated and complex. Search costs and the costs of relationship-specific investments described by Grossman and Helpman (2004) are likely to be higher for more complicated assembly tasks. If capital intense projects have higher search costs and entail more tailoring of production to meet the outsourcing firm's production requirements, capital intense industries are likely to exhibit a smaller responsiveness to cost changes. To explore this possibility, one may test whether less capital intense industries are more cost sensitive than those that have highly capital- intensive production processes.

2-2- FDI, Technology Spillovers, and Productivity

Globalization relies deeply on the modern manufacturing processes in many industries. Rather than specializing in the production of different goods from start to end, countries increasingly contribute to produce goods that end up being quite multinational in their origin. The process of vertical specialization lies behind the rapid growth in international trade of intermediate inputs, components, and specialized producer services, which has far outpaced in recent years the growth of world trade in final goods. Vertical specialization takes two primary forms. Firms may procure specialized components or services from arms-length providers under contractual arrangements, or they may undertake the various production and assembly activities within the boundaries of a single firm by engaging in foreign direct investment (Grossman and Helpman, 2004).

Takii (2005) examines productivity spillovers derived from the existence of foreign direct investment (FDI) and explores the conditions that influence the magnitude of spillovers. The empirical evidence suggests the existence of positive spillovers. In general, when affiliates are established by foreign multinational corporations (MNCs), they should be distinguished from local firms in the host country. This is because MNCs transfer technology to their affiliates, giving those affiliates a competitive advantage relative to local firms. Thus, the entry of the MNC affiliates disturbs the existing equilibrium in the market and forces local firms to modify their behavior in order to protect market shares and profits. Correspondingly, it is important to measure the effects that the entry of MNCs' affiliates calls on productivity of local firms. The effects are generally called productivity spillovers (Blomström et al., 2000).

Krugler (2006) investigates empirically whether foreign direct investment (FDI) in a developing country generates positive externalities on local producers. Measurements of spillovers have yielded evidence of improvements in domestic productivity arising from FDI. Furthermore, evidence about spillovers from industrial R&D, as well as urban economic organization studies, reveals important technology diffusion between industries. In their study, Bloom et al. (2005) incorporate in the analysis of technology diffusion between firms, associated with R&D, both the positive spillover and the negative rivalry effect.

If the MNC has domestic vertical linkages in the host-country, subsidiaries will benefit from knowledge sharing with both clients and suppliers. On the one hand, local market penetration generates forward linkages and information flows between the subsidiary and the users of its output are beneficial to the MNC. On the other hand, outsourcing yields backward linkages leading to knowledge transfer to upstream sectors. Hence, the vertical propagation of know-how that creates new technological opportunities for host-country producers induces inter-industry spillovers. Moreover, the impact of FDI goes beyond the change in utilization of the host-country factor endowment. As the entry of the MNC induces the supply of new intermediate inputs, the productivity of local firms can be enhanced due to a feasible increase in specialization.

The finding of significant R&D spillovers across countries is consistent with the growth literature. The endogenous-growth literature, in particular, posits endogenous innovations as key propagators of long-run economic growth. Productivity transmissions of this kind are not only important for developed countries; they are also crucial for promoting economic growth in developing countries (Luinlel and Khan, 2004). More specifically, in the literature, the role of trade is significantly evident in providing spillover effects in the process of growth.

Coe and Helpman (1995) provide empirical evidence on trade-related international R&D spillovers by using panel data for the selected OECD countries over the period 1971-1990. Their empirical findings are that the domestic and foreign R&D capital stocks affect domestic total factor productivity (TFP) positively and that domestic R&D capital stock has a bigger effect than the foreign R&D capital stock on large countries, whereas the opposite holds for smaller countries. The more open the smaller countries are, the more likely they are to benefit from foreign R&D capital stock. However, Keller (1998) focuses on the actual import and shows that the role of trade patterns may not be that important in determining the extent of R&D spillovers. But, Coe and Hoffmaister (1999) provide evidence, which reconfirms the importance of trade patterns in knowledge diffusion. Van Pottelsberghe and Lichtenberg (2000) have also extended Coe and Helpman analysis by treating foreign direct investment (FDI) as a channel of technology diffusion. They find evidence of significant R&D spillover effects TFP.

To sum up, the general picture emerging from this strand of literature supports the argument for positive and significant relationship between international R&D spillovers and productivity across countries.

3- The Model

The emergence of endogenous growth theory in the 1980s has led to a resurgence of interest in the sources of economic growth. Coe and Helpman (1995) state that innovation is a major engine of technological progress and productivity growth. They argue that, in a global economy, a country's productivity depends on its own R&D efforts as well as the R&D efforts of its trading partners. Coe and Helpman's model is built on theories of

innovation-driven growth (e.g., Grossman and Helpman, 1991). Contrary to the most cross-country studies of economic growth that focus on explaining output growth as determined by the accumulation of labor, capital, and some additional economic and political variables, Coe and Helpman choose to focus on the growth of TFP, which is the component of output growth (Kao, et al. 1999). In their account, in an economy with two factors of production, the log of TFP is measured as,

$$\log TFP = \log Y - \theta \log K - (1- \theta) \log L, \quad (1)$$

where Y is final output, L is the available labor force, K is the capital accumulation, and θ is the share of capital in GDP.

In a simple closed economy, the production function of final output is assumed to be a linearly homogeneous function in the employed inputs. Because a country's R&D investment either expands the measure of available inputs or improves the qualities of inputs, one can establish a linkage between the TFP and the domestic R&D capital stock. In addition, international trade in intermediate goods enables a country to gain access to all inputs available in the rest of the world. As previously discussed, such inputs can be provided through process of trade liberalization, FDI and outsourcing. From this aspect, according to Coe and Helpman (1995) and Kao, et al. (1999), the foreign R&D capital stocks of a country's trading partners become relevant to this country's TFP,

$$\log TFP_i = \alpha_{0i} + \alpha_d \log S_{di} + \alpha_f \log S_{fi}, \quad (2)$$

where i is the country index, S_{di} represents the domestic R&D capital stock, and S_{fi} represents the foreign R&D capital stocks defined as the import-share-weighted average of the domestic R&D capital stocks of trade partners. Note that this specification allows the constant α_{0i} to differ across countries to account for country-specific effects. However, the specification may not capture the role of international trade. Although the foreign R&D capital stocks S_{fi} have been weighted by import shares, these weights are fractions that add up to one and, therefore, do not properly reflect the level of imports. Kao, et al. assume that whenever two countries have the same

composition of imports and face the same composition of R&D capital stocks among trade partners, the country that imports more relative to its GDP may benefit more from foreign R&D. Therefore, they modify Equation (2) that accounts for the interaction between the foreign R&D capital stocks and the level of international trade,

$$\log TFP_i = \alpha_{0i} + \alpha_d \log S_{di} + \alpha_f (m_i \log S_{fi}), \quad (3)$$

where m_i stands for the fraction of imports relative to GDP for country i. It means that domestic and foreign R&D capital stocks are somehow components of capital patterns which influence total productivity in the country. Trade in the form of capital and intermediate imports is also involved in the model to improve productivity.

Hence, the role of international trade is stressed in both the cross-country growth literature and work on international R&D knowledge spillovers. The theoretical literature suggests a variety of mechanisms by which trade may affect productivity growth (for example, spillovers of technology from the reverse engineering of imported goods and international outsourcing), and there are a number of ways to introduce international trade into the productivity model. Griffith, et al. (2004) take a simple and intuitive approach that, at the same time, is sufficiently general to allow trade to affect both innovation and technology transfer. Their empirical findings on the industries of the OECD countries show that R&D stimulates growth directly through innovation and also indirectly through technology transfer. Thus R&D plays a role in the convergence of TFP levels within industries across OECD countries. They also identify a role for human capital in stimulating innovation and absorptive capacity.

In addition, one of the most significant effects of trade liberalization on patterns of production growth and trade during the last decade is the phenomenon of international outsourcing. International outsourcing and fragmentation have been well documented, and their effects on production and input productivity are the subject of many recent empirical studies. They are often viewed as a way for firms to look for cheaper suppliers to cope with increasing international competition (see, for example, Chena et al. 2004).

Outsourcing firms sometimes purchase a key intermediate input from more efficient suppliers that are also their rivals in the final goods market. International outsourcing of this nature is common in many industries, such as computer and automobile industries. Chena et al. (2004) argue that in these situations the usual cost-saving motive for outsourcing could be accompanied by a strategic motive, and that the strategic outsourcing in response to trade liberalization in intermediate goods can result in higher prices for both intermediate and final goods.

Feenstra and Hanson (1997) develop an empirical framework to assess the importance of trade and technical change on the wages of production and non-production workers. Trade is measured by international outsourcing of intermediate inputs, while technical change is measured by the shift towards high technology capital such as computers. They find that both international outsourcing and R&D expenditures can explain a substantial amount of the increase in wages of non-production (high-skilled) relative to production (low-skilled) workers. To utilize the price regression for predictive purposes, ultimately, Feenstra and Hanson show how international outsourcing and purchases on high-tech capital affect total factor productivity.

Foreign direct investment (FDI) also contributes to economic growth in host economies directly and indirectly. FDI adds directly to employment, capital, exports, and new technology in the host country. In addition, local firms may benefit from indirect effects of improved productivity through demonstration effects and labor mobility, while these externalities are commonly known as FDI spillovers. By encouraging multinational corporations (MNCs) to invest, developing countries hope to generate technology spillovers because FDI transfers to the affiliate intangible assets that may diffuse to local firms (Blomström and Kokko, 1996). Technology is transferred across countries in several ways. International trade transfers technologies embodied in goods, e.g., new varieties of differentiated products or capital goods and equipment. Contractual agreements, such as licensing, may transfer technology by trade in intellectual property. FDI transfers knowledge within the boundaries of an MNC or between a foreign firm and a local joint-venture partner. These changes are spillovers arising from FDI that can affect productivity in host countries. Of these possibilities, therefore, FDI is often considered to be the most attractive because it permits

transfers of technologies that are otherwise difficult to obtain (Sinani and Meyer, 2004).

Thus, the variable $m_i \log S_{fi}$ in Equation (3), which accounts for the interaction between the foreign R&D capital stocks and the level of international trade, can be proxied by variables of international outsourcing and FDI spillovers. Specifically speaking, the domestic R&D capital stocks (S_{di}), international outsourcing (OS_i) and FDI spillovers ($FDIS_i$) are the effective determinants of the total productivity in a country. They are expected to affect positively the total factor productivity. Accordingly, a new econometric specification of the Equation (3) that is set up by a panel base is developed here as follows:

$$log\ TFP_{it} = \alpha_{0i} + \alpha_d\ log\ S_{dit} + \alpha_{os}\ OS_{it} + \alpha_{FDI}\ FDIS_{it} + U_{it}, \quad (4)$$

where OS_{it} denotes outsourcing in country i in time t. This variable is measured by the ratio of imported intermediate inputs with respect to non-energy intermediates (replaced by non-oil GDP due to the lack of data) in the country (Feenstra and Hanson, 1997). $FDIS_{it}$ denotes FDI spillovers, and is measured by the share of FDI to the total capital accumulation for country i in time t. It is expected that the effect of the variable on productivity is positive, because a link between capital formation and productivity could reflect a selection effect whereby capital intensive technologies exhibit the TFP growth (Krugler, 2006). Finally, U_{it} stands for disturbance terms in the equation.

3.1 Data Resources

We apply panel data to estimate the specified TFP model [Equation (4)], using data for 18 East Asia-Pacific countries[1] over 1990-2004. First, the data on TFP for each country is arising from estimating the production

1- Selected countries consist of 10 ASEAN members plus China, Hong Kong, Japan, South Korea, Australia, New Zealand, Fiji and Solomon Islands. The main reason for the selection of these countries is that they are mostly leading countries in trade patterns regarding liberalization, outsourcing and FDI attraction. Also, the availability of data allowed us to choose these countries of the East Asia-Pacific region.

function in Cobb-Dauglas form (Lopez and Serano, 2002). Thus, a general form of the equation is defined as,

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} \quad (5)$$

where *Y* stands for GDP, *K* denotes capital stock, *L* is labor force and *A* indicates the productivity level. Again, we re-define Equation (5) as,

$$A_{it} : TFP_{it} = \frac{Y_{it}}{K_{it}^{\alpha} . L_{it}^{\beta}} \quad (6)$$

A logarithm form of the above equation can be specified as below, which enables us to estimate TFP for country *i* in time *t*,

$$\ln TFP_{it} = \ln Y_{it} - \alpha .\ln K_{it} - \beta .\ln L_{it} \quad (7)$$

where α , β are capital and labor elasticities, respectively.

Required data have obtained from the 'World Economic Indicators, CD-ROM 2006, 'Country Statistical Information Database of the World Bank (http://www.worldbank.org/data/countrydata/), International Monetary Fund http://dsbb.imf.org/Applications/web/gdds/gddscountrylist/IMF/), UNCTAD PC-TAS, CD-ROM 2006.

4- Data Analysis

Estimating Equation (4) by panel procedure, Table 1 summarizes the estimation results for indicating the impacts of the domestic R&D capital stocks, outsourcing and FDI spillovers on the TFP of the sampling countries. According to the results obtained, Hausman test rejects random effects, while panel results are obtained on the reliability of the fixed effects. Additionally, diagnostic tests, shown in the table, have been applied to check for AR (1) of the unbalanced panel and heteroscedasticity. The results report no regarding problems.

The results are classified into three cases, indicating the role of outsourcing in different countries' productivity growth. Accordingly, ***Case***

A measures the effect of outsourcing on the productivity growth of all sampling countries, while ***Case B*** specifies a gross effect of a dummy variable for developed-emerged countries in the region combined with the outsourcing variable (DUM_1*OS_{it}). In ***Case C***, DUM_2*OS_{it} is defined to show a combination effect between a dummy variable for the developing countries in the region and the outsourcing variable.

Table 1: Panel estimation results (fixed effects) for the *log TFP* regression (Eq. 4)ǂ

Variables	Case A	Case B	Case C
$log\ S_{dit}$	0.073 (4.941)**	0.069 (4.211)**	0.048 (2.387)*
OS_{it}	0.076 (3.127)**	0.053 (2.411)*	0.058 (2.819)**
$DUM_1 * OS_{it}$	-	0.258 (4.634)**	-
$DUM_2 * OS_{it}$	-	-	0.039 (2.127)*
$FDIS_{it-1}$	0.138 (3.861)**	0.135 (3.801)**	0.132 (3.714)**
No. of observations	270	270	270
Hausman test	19.61**	19.73**	19.38**
LM test of AR(1) for unbalanced panels	67.43**	71.56**	76.81**
Wald-test for panel group-wise heteroscedasticity	132.46**	168.73**	145.92**

ǂ The results have been obtained by using Stata9.2.

Notes: (a) The dependent variable is *log TFP*.

(b) The bias-corrected *t-statistics* are reported in parentheses. * (**) denotes significance at the 5% (1%) level.

(c) Hausman test rejects random effects, while panel results are obtained on the basis of fixed effects. Based on the Hausman test process, the vector of consistent coefficients (b) obtained by random effects is tested against a vector of inconsistent coefficients obtained by fixed effects (B). So the null hypothesis, H_0, is: difference in coefficients not systematic. The *Hausman statistic* is defined by

$\chi^2(1) = (b-B)'[(\Sigma_b - \Sigma_B)^{-1}](b-B)$, where Σ_b and Σ_B are variances of b and B, respectively (Stata9, 2005).

(d) Diagnostic tests, LM and Wald tests, have been applied to check for AR(1) of the unbalanced panel and heteroscedasticity. The results report no regarding problems.

In Table 1, the estimator gives us a significant elasticity of *TFP* with respect to the domestic R&D capital stocks for all cases. Overall, the values of the coefficients remain within the range of 0.05-0.7, indicating that a 1% increase in the domestic R&D capital stock results in a 0.05%-0.07%

increase on average in total productivity factor of countries under consideration.

The estimation results reported in the table also show that the coefficient of outsourcing variable is statistically significant and has expected effect on total productivity of all the countries available in the sample. It reveals the fact that global outsourcing, including expenditure on imported intermediate goods, design and assembly, can result in higher productivity for countries around the world. According to the results, the outsourcing effect on productivity is within a range of 0.05%-0.08% for three cases, respectively. More specifically, the results indicate that the interacted effect of outsourcing with dummy variable of developed-emerged countries (appeared in the coefficient value of $DUM_1 * OS_{it}$) in ***Case B*** is stronger than that of ***Case C***, that the later case highlights the role of the developing countries in the region in explaining the countries' TFP. Thus, we find international outsourcing leading to TPF promotion, while this is more pronounced in developed-emerged countries that have had more contribution to the global trade and globalization process.

The effect of FDI spillovers on TPF is positive and significant for all countries. This result is obtained by the estimated coefficient of the FDI spillovers with one lag period ($FDIS_{it-1}$). The coefficient estimated for three cases is in the rage of 0.13-0.14, which is totally consistent with Sinai and Meyer (2004). Hence, in addition to the international outsourcing and domestic R&D impacts, domestic firms can benefit from direct contact with foreign firms, so that an increase in the share of FDI to the total capital accumulation in time t increases the total productivity of countries under consideration by 0.13%-0.14% in time $t+1$.

4- Conclusions

In this paper, we have discussed that the theoretical literature suggests a variety of mechanisms by which trade may affect productivity growth (for example, spillovers of FDI and international outsourcing), and there are a number of ways to introduce international trade into the productivity model. In fact, international trade in intermediate goods enables a country to gain access to all inputs available in the rest of the world. Hence, we have examined the impacts of domestic R&D capital stocks and FDI spillovers as

well as international outsourcing on total productivity of the selected East Asia-Pacific countries by applying the estimation method regression in the panel data procedure. All estimations confirm the existence of the significant linkage between TPF and these variables.

The results reported in Table 1 represent a significant elasticity of TFP with respect to the domestic R&D capital stocks, in which total productivity responds positively to a change in the sampling countries' domestic R&D capital stocks. This result confirms findings of Kao, et al. (1999). The paper has also measured the effect of FDI spillovers, and found that all countries in the sample benefit from international FDI spillovers to improve productivity on resource production. It implies that domestic firms can benefit from direct contact with foreign firms, so that an increase in the share of FDI to the total capital accumulation in a proper time. The attraction of the FDI through liberalization and deregulation, and the enhancement R&D expenditures by governments in developing countries like Iran are recommended for the productivity growth.

The estimation results also show that the coefficient of outsourcing variable is statistically significant and has expected effect on total productivity of all countries available in the sample. A proxy of outsourcing in Equation 4 develops the role of international economics in production process, representing a set of effects of trade patterns and international spillovers on growth. It reveals the fact that global outsourcing, including expenditure on imported intermediate goods, design and assembly, can result in higher productivity for all countries in the sample. Thus, we conclude that international outsourcing can lead to TPF promotion, while this is more pronounced in developed and emerging countries in the East Asia-Pacific countries that have more contribution to the global trade and globalization. This can be a good lesson for Iran to promote its economic relations with the world, particularly with those countries investigated here, as they have adequate potentials in case.

Consequently, this study has characterized the relationship between the fraction of inputs outsourced and total productivity in a way which might offer explanations for why the importance of outsourcing has increased. The implication is that the more contribution to the global outsourcing the higher productivity growth countries can achieve.

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