Global Journal of Business Research
Vol. 10, No. 2, 2016, pp. 1-11
ISSN: 1931-0277 (print)
ISSN: 2157-0191 (online)

IBFR
www.theIBFR.com

APPROPRIATION OF INVESTMENTS AND INNOVATION BENEFITS IN THE U.S. - CHINA TRADE RELATIONSHIP

Tony Mutsune, Luther College

ABSTRACT

It is widely understood that the 1978 market-oriented economic reforms set the stage for China's phenomenal growth and swift accession to the world's second-largest economy. A part of the reforms involved relaxing restrictions on foreign investment inflows, privatization and contracting of state-owned industries, and the lifting of protectionist policies. These initiatives are thought to have assisted the flow of knowledge and skills into China. Such flows are known to help deepen human capital which results in productivity increases when combined with improvements in physical capital and other resources. It is reasonable that these advantages are primarily channeled through international commerce linkages. This context provides for investment and innovation choices to influencing productivity outcomes among trading partners. This study presents an empirical framework for testing data from the U.S.-China trade experience for the period 1996-2014, with the aim of identifying how research and development (R&D) expenditures in the U.S. and China combine to influence productivity outcomes in the Chinese economy. The results indicate that R&D stock accumulation in the U.S. plays an important role in prompting productivity increases in China's economy when combined with China's own R&D efforts. The implications of the results can be applied in making strategic R&D choices that improve the advantages in the U.S.-China trade relationship..

JEL: F14, F20, F23

KEY WORDS: Trade, Technology Spillovers, Productivity, Foreign Direct Investment

INTRODUCTION

China's swift ascension to an economic powerhouse is unprecedented. It is the subject of much discussion and inquiry across a broad dispersion that extends from the more absorbed academic and media spheres to the occasionally interested observer. The 1978 re-orientation of China's economy towards free-market principles is widely credited for the transformations that propelled the previously lowly ranked economy to a major global player. Some unmistakable outcomes following the reforms includes the opening up of the China to foreign investment, privatization and contracting out of state-owned industries, and the lifting of protectionist policies, all of which have helped create channels that facilitate the flow of meaningful knowledge and skills from abroad. Several studies have demonstrated that these flows are instrumental in the deepening of human capital and consequently productivity increases when combined with improvements in the stock of physical capital and other resources used in production.

According to the new growth theory, increasing returns associated with new knowledge, ideas, and technology spillovers offer important insights in understanding how gains in productivity occur (Romer 1986, Lucas 1988, Rebelo 1991). This study is premised on the view that China's market-oriented reforms paved the way for dissemination of knowledge, ideas and technology spillovers through trade and foreign direct investments (FDIs). Therefore, it can be taken that China's accelerated growth is partly explained by these factors. Correspondingly, a 1997 IMF study report by Zuliu and Moshin examined the sources of China's growth and concluded that although important, the accumulation of physical capital and labor stock alone does not offer a sufficient explanation. According to the study, during 1979-94 productivity gains accounted for more than 42 percent of China's growth and by the early 1990s had overtaken capital as the most significant source of that growth. In the decades that followed the economic reforms of 1978, China has seen its FDI annual inflows increase from 109 million dollars in 1979 to more than 13 billion in 2007. This amount constituted about half of all FDI inflows to all developing countries in the 1990s (Dmitrios K., Kostas V. *et al*,). Notably, the productivity advantages of multi-national enterprises (MNEs) over their domestic counterparts is well documented (Blomstr¨om and Sj¨oholm, 1999; Markusen, 2002). An important argument presented by Helpman *et al* (2004) suggests that the high costs associated with FDIs in effect makes them a preserve of the most efficient firms. Therefore, there is potential for diffusion of knowledge from MNE affiliates to relatively backward local firms (Smeets and de Vaal, 2011). This study sets to examine the extent to which productivity increases in China can be explained by its trade with the U.S., by virtue of spillovers of technology and knowledge disseminated through R&D efforts by U.S. companies. The rest of the paper is organized as follows; a review of literature, explanation of data and methodology, discussion of results, and the concluding remarks.

LITERATURE REVIEW

This section comprises a review of content from select studies related to the concept of trade-driven growth. Particular areas that feature prominently include connections between trade and growth, sources of productivity, technology and knowledge transfers. Important ideas that emerge from the review influence the data and methodology approach in the section that follows. Early attempts at making connections between international trade and economic growth date back to 1776 when Adam Smith's published his inquiry into the nature and causes of the wealth of nations. Several others have since pursued this line of inquiry and helped improve our understanding of the role of international trade in spurring economic growth among nations using both classical approaches and more current adaptations. In any case, there is a consensus that international trade and economic growth are two concepts that are paired together. It is not uncommon to find that entire economies are primarily sustained by their exports. The oil rich Middle Eastern countries offer some appropriate examples. Clearly, economic growth has always been a central pre-occupation of governments, enterprises, and people in all nations. An argument can be made that international trade is the framework upon which economic wellbeing rests globally. The logical consequence is a universal movement towards more openness in trade.

As previously stated, the 1978 economic reforms in China amounted to more openness in trading internationally. Yao and Zhang (2003) cite the absorption of foreign capital as a respectable indicator of openness following the reforms. They point out that by 1995, only the U.S. surpassed China as the largest recipient of FDIs. As global FDIs continue to grow in excess of both world output and world trade, China is by far the largest recipient having surpassed the U.S as host destination in 2004 (Shaukat and Wei, 2005). China is also trading more than it has in past years. Before the 1978 economic reforms, China's total imports ranked 32nd globally, accounting for a measly 1% of global trade compared to its present status as the world's largest commodity exporter and importer since 2013 (Xiaojun).

According to an IMF study on how trading partnerships impact economic growth among partners, Arora and Vamvakidis (2004) found that United States is the most important trading partner for other countries. This indeed is the case for China at this point in time. It is therefore conceivable that a significant level of China's economic endowments from trade is likely from its trade with the United States and FDIs from U.S. firms. A large body of literature documents that trade and investment flows into less-advanced economies could bring about important technological spillovers that boost firm-level productivity and bolster long-term economic prospects. Undoubtedly, there are cases when spillovers are confined among other multinationals, and in some cases end up crowding out domestic firms (Caves, 1996; De Backer and

Sleuwaegen, 2003). In China's case, overall, the existing literature shows mixed conclusions on the effects of FDI on domestic firms in particular. While increases in productivity among Chinese firms since the economic reforms are undisputed, the mixed outcomes from previous studies suggest caution in attributing such increases solely to FDI inflows. For example, a study by Hale and Long (2007) failed to find any significant FDI spillover effects on productivity for domestic firms in the same upstream or downstream industries. They suggest that domestic firms may be assuming a more passive role in innovation, and focusing providing inputs and intermediate goods for multinational firms instead.

With respect to international trade, previous studies concur that it is a major channel of international technology spillovers. Coe and Helpman (1995) lend support to the idea of trade-related spillovers when they show that countries exhibit higher productivity levels as a result of importing goods from countries that are more technologically advanced. Acharya and Keller's (2009) study offers other insights; they show that non-trade channels play a larger role for the U.S., Japan and Canada. Past limitations in appropriate comparative measures of openness (to trading internationally) have limited the conclusions about the relationship between openness and productivity. However, there is a broad consensus on the productivity increases that are familiar to economies which trade more internationally. In China's case, the combination of privatization and trade liberalization had strong effects on productivity growth in both the state and none-state sectors, averaging 5.50 percent and 3.67 percent respectively from 1998 to 2007 (Zhu, 2012). It is well recognized that capital intensity is one of the main determinants of productivity as measured by total factor productivity (TFP) estimation. Both government and industry are known to device policies that encourage investments in capital because of the positive impact on TFP. Meanwhile, while any list of measurements of productivity can cover a substantial number of factors, it is important to recognize that no list can be exhaustive. Even so, the suitability of TFP measurement resides in its usefulness as a residual measure of changes in total output not accounted for by total factor input changes after the output of the weighted sum of all inputs have been determined. In addition (assuming combination with a fixed factor), TFP measurement is not subject to diminishing returns, unlike increments of capital and labor. The implication is that any residual increases in output that are not accounted for by total factor input changes after the weighted sum of all inputs has been determined can be thought of as an outcome of innovativeness and technological advancements.

In effect, the connections between TFP and innovativeness reiterate the conclusions by Zuliu and Moshin (1997); the accumulation of physical capital and labor stock alone do not fully account for growth increases in China. Several studies have concluded that most differences in output among countries are attributed to TFP (Porter, 1990; Ezeala-Harrison, 1995; Krugman, 1996; Aiyar and Dalgaard, 2004). According to a United Nations Industrial Development Organization (UNIDO) study by Anders Isaksson (2007), stock of knowledge has a direct effect on TFP. Even with factor inputs, one still needs to possess knowledge on how best to organize factor input combinations for optimum production. Superior knowledge allows for optimum organization of inputs. It is also understood that knowledge tends to be regenerative; it combines in new and dynamic ways that can amount to innovation. However, several studies have also pointed out that, the link between TFP and knowledge is considerably weakened by factors such as institutional quality, degree of openness and flexibility of the economy, government policy actions, and financial infrastructure among several others.

A 2010 *China Business Review* article by Jarret and Wenthold on technology transfers to Chinese firms discloses that technology transfer has been a focus of China's growth plans for decades. This focus became prominent when former leader Deng Xiaoping, inspired by the advanced technology he witnessed during trips abroad, enacted policies in the 1980s that allowed foreign firms to access China's market in exchange for advanced technology. They add that Chinese companies have benefited from advanced technologies with relatively little capital expenditure, which expedites the process of achieving organic growth. However, a 2015 Congressional Research Report by Wayne Morrison, expressed concerns about the policies arguing that they constitute pressure by government entities to transfer technology to a local partner as a part of the cost of doing business in China, and also that such practice is in contradiction to China's obligations to the WTO. Other channels for knowledge transfers into China are less contentious. For example, in a move aimed at promoting technical improvements in local companies, especially innovation of small and medium-sized enterprises, Chinese authorities have outlined policies that use tax breaks to encourage local enterprises to upgrade their equipment and increase research and R&D efforts to improve the manufacturing industry. The arrangement particularly favors an array of high-tech equipment and product imports that are intermediate in the manufacture of IT products and software. According to a 2014 OECD Science, Technology and Industry Outlook Report, China already spends a lot more on R&D than Japan, and is poised to overtake the EU and also surpass the United States by 2019. Griliches (1988) and Coe and Moghadam (1993) show that there is sufficient empirical evidence to support the idea that cumulative domestic R&D is important for productivity. Coe and Helpman (1993) go even further by proposing that in the context of the entire international trade construct, which encompasses trade in goods and services, FDI, the exchange of information, and dissemination of knowledge, a country's productivity depends on its own R&D as well as the R&D efforts of its trade partners. They argue that own R&D enhances a country's benefits from overseas technical advances which lead to productivity increases.

DATA AND METHODOLOGY

This paper's attempt to examine the extent to which productivity increases in China are linked to its trade with the U.S. embodies the ideas presented by Coe and Helpman (1993, 1995) in their study of international R&D spillovers among OECD countries and Israel. In this case, we adapt them to a bi-lateral trade scenario. Coe and Helpman predicated their approach on new theories of growth which emphasize links between investments in R&D and TFP increases. In it, they develop a framework for examining how a country's investment in R&D affects TFP of its trade partners. The empirical framework follows the Coe and Helpman equations set up that is based on theoretical models of innovation-driven growth. However, there are few modifications appropriate for the objective of this study. A more elaborate description of the full model can be found in Coe and Helpman (1995). We assuming an economy manufactures final output Y from an assortment of intermediate inputs. Our simplest equation has the following specification:

$$Log\ F_i = \alpha_i^0 + \alpha_i^d log\ s_i^d + \alpha_i^f\ log\ s_i^f \quad (1)$$

Where i specifies a country, $1og\ F$ is the log of TFP.

$$\text{TFP} = \log Y - [\beta 1og\ K + (1 - \beta) \log L] \quad (2)$$

Where L stands for labor inputs, K for capital inputs and β is the share of capital inputs. S^d in (1) represents the domestic R&D capital stock, and S^f represents the foreign R&D capital stock defined as the import-share-weighted average of the domestic R&D capital stocks of trade partners. The specification (1) allows the coefficients α to vary across respective countries; in our case China and the U.S. Some reasons offered in Coe and Helpman (1995) for varying the constant α^0 are: there may be country-specific effects on productivity that are not captured by the variables used in the equations; and, variables in the TFP estimate is measured in country specific currencies whereas both R&D capital stocks are in US dollars. In our case, for TFP estimates, an index approach is used instead of currencies. More details are given under empirical testing.

The specification of (1) can be thought of as an extension of models relating TFP to (only) the domestic R&D capital stock, to include foreign R&D efforts ($\alpha^f \neq 0$). Coe and Helpman (1995) acknowledge that the specification may not capture fully the role of international trade. They explain that although the foreign stock of knowledge S^f consists of import-weighted foreign R&D capital stock, these weights are fractions that add up to one and therefore do not properly reflect the level of imports. For this reason a modified specification of (1) that accounts for the interaction between foreign R&D capital stock and the level of international trade is applicable for our purposes, along with other plausible arguments presented by Coe and Helpman. A modified version of (1) follows:

$$\text{Log}\, F_i = \alpha_i^0 + \alpha_i^d \log s_i^d + \alpha_i^f m_i \log s_i^f \quad (3)$$

Where m represents the fraction of imports as a share of the GDP. In this equation the elasticity of TFP with respect to the domestic R&D capital stock equals α^d while the elasticity of TFP with respect to the foreign R&D capital stock equals $\alpha^f m$. It follows that whenever α^f is the same for both China and the U.S., the latter elasticity will vary in both countries in proportion to their import shares. The empirical analysis is conducted using data for the period 1996-2014. Sources used include the U.S. Census Bureau, the Conference Board and World Bank statistical databases. The frequency of the data sample is on an annual basis. The dependent variable is represented by the logarithmic transformation of changes in China's TFP index over the study period, and is taken as a proxy for productivity changes. The explanatory variables are represented by logarithmic transformations of China's domestic R&D spending and import-weighted foreign (U.S.) R&D spending. To obtain import weights for China's imports from the U.S., we use data for U.S. exports of physical goods to China as a proxy. Data in services tends to present challenges in both measurement and tracking, thus requiring appropriate adaptations not included in this study. The trade interactions that can lead to inflows of knowledge stock and ideas are assumed to be estimated by the proportion of imports in relation to the GDP as a multiple of R&D spending by the trading partner (U.S.).

DISCUSSION OF RESULTS

Displayed in Table are summary statistics for the variable groups in our sample. They reveal that both the mean and median of the domestic R&D data are higher than in the import-weighted foreign R&D group. Thus what has been widely reported about China's push for innovation-driven growth is supported. However, the standard errors of the two groups have a significant difference. Higher errors are consistent with higher standard deviations as observed in the domestic R&D group. The kurtosis indicates flatness in the data distribution in both groups, with a greater degree of flatness for domestic R&D data. Both data groups assume a tailed distribution, with the longer tail evident in the import-weighted foreign R&D group. Generally, the skewness and kurtosis statistics are dependent on the sample size. Summary statistics for the TFP variable set indicated a low mean standard error and standard deviation. The kurtosis value is indicative of peak periods, which is indicative of periods when average productivity rises to peak levels. The negative tailed distribution of the TFP group is a fair reflection of economic growth trends in China in recent decades.

Table 1: Summary Statistics of Data Sample

	Log TFP (CHN)	Log Domestic R&D	Import-Weighted Log Foreign R&D
Mean	6.931	3.475	0.0862
Std. error	0.0084	0.2861	0.0031
Median	6.936	3.399	0.0825
Std. dev.	0.0367	1.247	0.0136
Kurtosis	0.0545	-1.387	-0.4584
Skewness	-0.5643	0.0549	0.6687
Count	19	19	19

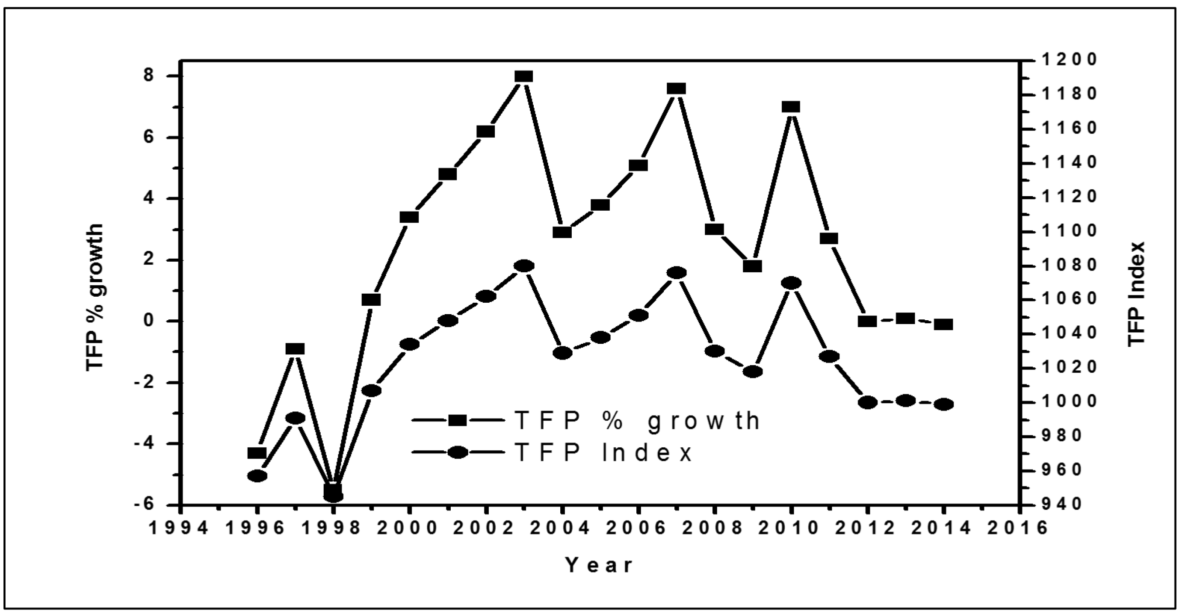
This table shows summary descriptive statistics for each variable from our data sample, which comprises of annual observations over the period 1996-2014. The groupings consist of logarithmic transformations of TFP growth index for China as the dependent variable, and similar transformations for domestic R&D spending and import-weighted R&D spending in the U.S. as the explanatory variables. We use data on U.S. exports of physical goods to China for computing a proxy for China's import share weight.

Table 2: Regression Results of Equation (3)

Dependent Variable: Log of TFP Growth Index					
Sample (adjusted): 1996-2014 Included observations sets: 18 Cross sections: 3 Total panel observations: 54					
Variable	**Coef.**	**SE**	**t-Stat.**	**Prob.**	
Intercept	6.774***	0.0452	149.84	0.0000	
Log of domestic R&D	0.0029	0.0057	0.5150	0.6135	
Import share-weighted Log of foreign R&D	1.703***	0.5194	3.278	0.0047	
R-squared	0.4361		Squared resid.		0.0243
Adjusted R-squared	0.3657		F-stat.		6.187
SE of regression	0.0292		Prob. (F-statistic)		0.0102

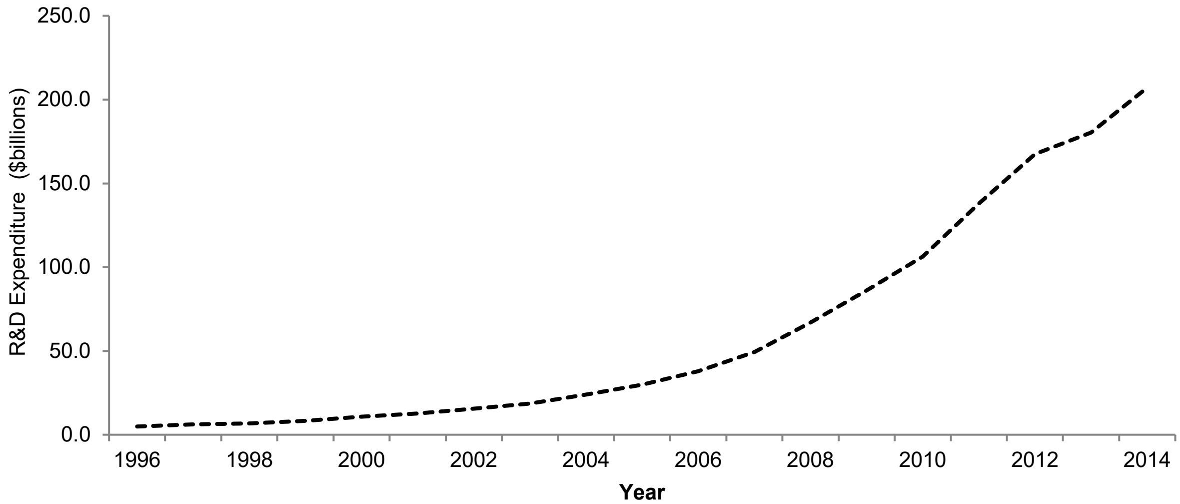
*This table shows the regression results from equation (3). In the upper level is a brief description of the sample data which covers 18 years across of three sets of variable observations in logarithmic transformation. The mid-section shows the statistical outcomes for variables. The lower section reports statistical outcomes for the regression. Significance levels at 1, 5, and 10 percent levels are indicated by the notations *, **, and *** respectively.*

Figure 1: Changes in China's TFP Growth Index, 1996-2014



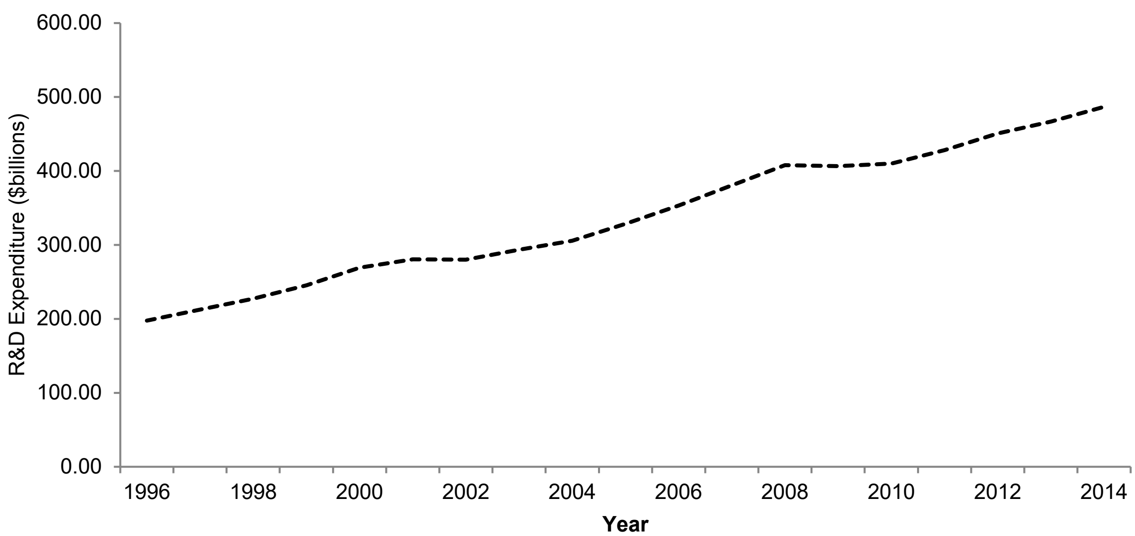
This figure displays changes in TFP growth in percentage and index form for China over the period 1996-2014 obtained from The Conference Board statistical database: www.conference-board.org. The figure shows that TFP grew at a rapid pace before 2005, at a time when foreign stock of R&D from the U.S. grew more rapidly than China's own R&D stock.

Figure 2: Domestic R&D Spending in China, 1996-2014



This figure displays R&D spending in China for the period 1996-2014. Initial data is obtained as a percentage of GDP from the World Bank Statistical database: www.worldbank.org. It appears that domestic R&D spending grew exponentially after 2005 when China was admitted to the WTO.

Figure 3: Foreign R&D Expenditure by the U.S., 1996-2014



This figure displays R&D spending in the U.S. for the period 1996-2014. Initial data is obtained as a percentage of GDP from the World Bank Statistical database: www.worldbank.org. This data is used to compute the log of import-weighted share of foreign R&D spending in the regression analysis.

The empirical analysis involves a regression fitted to equation (3). The output is presented in Table 2. The results from our data sample indicate that the model equation's ability in explaining the link between changes in China's productivity, domestic R&D stock and R&D stock in the U.S. is moderate. Results for the intercept and import share-weighted log of foreign R&D show significance at the one, five and ten percent levels. However, it is remarkable that the log of domestic R&D variable did not show significance at any of the significance levels tested. We cannot therefore make strong conclusions from our data sample on the domestic R&D spending by China. While there is no real supporting evidence for rejecting a supposition of significance in productivity changes in China as a result of domestic R&D efforts, it is helpful to inspect other probable causes of the unexpected p value. We suspect that the small sample size may have constrained ability to fully detect the significance of changes in productivity levels resulting from changes in domestic R&D efforts. The variable signs are indicative of a promoting role played by both domestic and foreign R&D. Based on the data sample, foreign R&D spending seems to have a relatively greater influence of domestic productivity in China. However, it is advisable to be cautious in taking the result as evidence of a fact and instead treat it with an awareness of the unstable combination of sample size, data type, and model assumptions which can sometimes lead to overemphasized outcomes. A more sober approach is to treat the results as an endorsement of the role played by foreign (U.S.) R&D efforts in China's productivity.

CONCLUDING COMMENTS

The aim of this study is to examine the extent to which productivity increases in China may be linked to trade with the U.S., by means of technology spillovers and knowledge dissemination that result from R&D stock in the U.S. The empirical approach is based on a framework that combines annual trade, TFP, and R&D spending data appropriately for China and the U.S. over the period 1996- 2014. The regression equation expresses productivity increases in China as dependent on China's own R&D stock and that of import-weighted R&D stock from the U.S. The results offer some insights and also raise new questions. It appears that the role of R&D stock accumulated by the U.S. in fostering productivity increases in China's economy is corroborated by the results. However, as previously mentioned, it is not clear why the results for domestic expenditure on R&D in China were inconclusive. R&D expenditure at the domestic level is undoubtedly known to impact productivity. Figure 2 shows an upward trend in China's domestic R&D expenditure over the period studied. However, data sources do not distinguish between R&D expenditures by foreign firms in China (which often are in some level of partnership with domestic firms), and locally sourced R&D funding. In addition, there are known challenges with obtaining concrete data on the Chinese economy. Most of the literature reviewed in this study expresses a positive connection between productivity increases and domestic R&D spending.

The results also seem to indicate that expenditures on R&D in the U.S. may have significant effects on China's productivity. Figure 3 shows that R&D expenditure by the U.S. was significantly higher than China's own spending between 1996 and 2014. Prior to 2005 China's productivity rose rapidly at a time when its own stock of R&D was growing at a slower rate compared to the U.S. (see Figure 1). During this period, China's productivity continued to grow, as did its trade with the U.S. particularly following accession to the WTO in 2005. The results are consistent with evidence of transfers of knowledge and technical know-how from earlier studies discussed in the literature review. China's productivity increases are not fully explained by its trade relations with the U.S. alone. Other technologically advanced countries trade and invested directly in China since the economic reforms of 1978. Overall, it appears that R&D efforts in the U.S. help in spurring productivity advances in the Chinese economy. When combined with China's own domestic R&D stock, the resulting change in productivity is boosted. Such outcomes can potentially benefit U.S. businesses. A more advanced Chinese economy can also mean a strong market for technology based products from the U.S. Also, higher productivity in China can lead to increases in wages and expansion of a middle class with a stronger demand for imports. Based on the results from this study, it is clear that U.S.-China trade relationship presents important opportunities for U.S. business that can lead to expanded markets and domestic job creation.

Whilst the findings of the study give us some insights into the allowance of productivity benefits in the US- China trade relationships, there are some exceptions. The limitations of the study design affected the outcomes. The variable estimates we used do not fully represent sectors in which technology-based products and innovative ideation is a strong feature. The study may also suffer some degree of impact limitation because of a strong country focus that assigns productivity from foreign R&D efforts solely to a single trading partner. China's trading interactions with other technologically advance partners likely contributed to movements in productivity measures. Lastly, the limited size of the data is occasioned by incompleteness and disparity in measurement criteria from sources. Excluding the limitations, the study moves us closer to understanding a far-reaching dimension of one of the most important trade relationship in the world, which also serves as an important gauge for global trade dynamics and thus merits our attention. Future research efforts will focus on exploring improvements on the impact limitations and constraints imposed by the study design, with an ultimate goal of expanding the framework to accommodate for application to a multilateral trading system which more closely reflects the realities of a global trading system.

REFERENCES

Acharya, Ram C., Wolfgang Keller (2009) "Technology Transfer Through Imports," *Canadian Journal of Economics*, vol. 42(4).

Aiyar, Shekar and Dalgaard, Carl-Johan (2004), "Total Factor Productivity Revisited: A Dual Approach To Development Accounting, EPRU Working Paper Series, ISSN 0908-7745 Website: http://www.econ.ku.dk/epru/files/wp/wp-04-07.pdf

Arora, Vivek and Vamvakidis, Athanasios, "How Much Do Trading Partners Matter for Economic Growth?" IMF working paper WP/04/26, 2004.

Blomstr¨om, Magnus and Sj¨oholm, Frederik (1999) 'Technology Transfer and Spillovers: Does Local Participation with Multinationals Matter?' *European Economic Review* 43(4-6), 915– 923.

Caves, R., (1974) "Multinational Firms, Competition, and Productivity in Host-Country Industries," *Econometrica* 41: 176-193

Coe, David, Elhanan Helpman (1995) "International R&D Spillovers." *European Economic Review*, vol. 39(5).

Coe, David, Elhanan Helpman, "International R&D Spillovers." NBER Working Paper Series, No. 4444, 1993.

Coe, David and Moghadan, Reza. "Capital and Trade as Engines of Growth in France: An Application of Johansen's Cointegration Methodology," IMF Working Paper 93/11, February 1993.

De Backer, Koen and Sleuwaegen, Leo (2003) "Does Foreign Direct Investment Crowd Out Entrepreneurship?" *Review of Industrial Organization*, vol. 22 (1).

Dmitrios K., Kostas V. *et al*, "What Causes Inflows of Foreign Direct Investment to China: Some Empirical Evidence," Website: www.eefs.eu/conf/Warsaw/Papers/569a.doc

Ezeala-Harrison, F (1995) "Canada's Global Competitiveness Challenge: Trade Performance Versus Total Factor Productivity Measures," *American Journal of Economics and Sociology*, *54*(1).

Griliches, Zvi (1998) "Productivity Puzzles and R&D: Another Nonexplanation, *"Journal of Economic Perspectives,* 2.

Hale, Galina and Long, Cheryl, "Is There Evidence of FDI Spillover on Chinese Firms' Productivity and Innovation?" Website: http://www.econ.yale.edu/growth_pdf/cdp934revised.pdf

Helpman, Elhanan, Melitz, Marc and Yeaple, Stephen (2004) "Exports versus FDI with Heterogeneous Firms," *American Economic Review* 94(1).

Isaksson, Anders. "Determinants of Total Factor Productivity: A Literature Review," A UNIDO Staff Working Paper 02/2007.

Jarett, K. and Wendholt A. (2010) "Transferring Technology to Transform China- Is It Worth It?" *China Business Review*, March 1.

Krugman, P. (1996) *Pop Internationalism,* Cambridge, MA: MIT Press.

Lucas, R. E. (1988) "On The Mechanics of Economic Development," *Journal of Monetary Economics* 22.

Markusen, James R (2002) *Multinational Firms and the Theory of International Trade*. MIT Press, Cambridge MA.

Morrison, Wayne "China-U.S. Trade Issues," Congressional Research Service Report, March 17, 2015. Website: https://www.fas.Gtx org/sgp/crs/row/RL33536.pdf

OECD, Science, Technology and Industry Outlook Report, 2014.

Porter, M, E. (1990) *The Competitive Advantage of Nations*, London: Macmillan
Rebelo, Sergio (1991) "Long-Run Policy Analysis and Long-Run Growth," *Journal of Political Economy* 99(3).

Romer, P. M. (1994) "The Origins of Endogenous Growth," *The Journal of Economic Perspectives* 8(1): 3–22

Shaukat, A., Wei G. (2005) "Determinants of FDI in China," *Journal of Global Business and Technology,* Vol. 1, No. 2.

Shujie Y., Zongyi Z. (2003) "Openness and Economic Performance: A Comparative Study of China and the Asian NIEs," *Journal of Chinese Economic and Business Studies,* Vol. 1(1).

Smeets R., deVaal A (2011) "Knowledge Diffusion from FDI and Intellectual Property Rights," CPB Netherlands Bureau for Economic Policy Analysis Discussion Paper No. 168.

Xiaojun, Li, "China as a Trading Superpower," Website: http://www.lse.ac.uk/IDEAS/publications/reports/pdf/SR012/li.pdf

Zhu, Xiaodong (2012) "Understanding China's Growth: Past, Present, and Future," *Journal of Economic Perspectives,*vol. 26(4).

Zuliu H., Mohsin K. (1997) "Why is China Growing So Fast?" *IMF Economics Issues* (8), June.

ACKNOWLEDGEMENT

The author wishes to thank the anonymous reviewers who offered helpful advice. Appreciation also to Professor Wei Xu of Wuyi University's School of Applied Physics & Materials Engineering, Jiangmen, China, for valuable contribution and resources shared.

BIOGRAPHY

Tony Mutsune is an Associate Professor of Management and Economics at Luther College. His research appears in journals such as *Advances in Competitiveness Research, International Journal of Management and Marketing Research, and Review of Business and Finance Studies.* He can be reached at Luther College, 700 College Drive, Decorah, Iowa 52101, USA, mutsto01@luther.edu.