E-commerce, Free Trade Zone and the Linkage Effect to Trade Upgrading

Li Quan*[1]

Peking University

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Abstract

In Sino-American trade conflict, protectionism has led to magnanimously missing traditional trade. Modern Leontief Paradox declared the rate of capital and labor between China and US is opposite to the forecast from the comparative advantage and factor proportion theory. The source of protectionism concentrates on scale of trade. This paper tends to explore institutional effect to trade upgrading which benefits trade facility.

Based on the strong evidence of the dramatical development of e-commerce, China's foreign trade has been facing dynamic energy conversion and become the first biggest with the highest level of globalization. According to data from ITU, China has more online shoppers than the US, United Kingdom, and Australia combined. Today China has 105 comprehensive pilot zones for cross-border e-commerce(CBEC) across the country, covering 30 provinces, autonomous regions and municipalities, which has brought great transition of trade patterns and related factor proportions.

At the same time, China has 18 nationwide free trade zones (FTZs). In this paper, we analyzes the heterogenous community effect of the linkage effect of China's double pilot project of CBEC and FTZs, which will creat more overlapping demands, effective price and labor market management, as well as ecological trade patterns through transition of value-added product space. This paper makes a systematic analysis on the network effect and linkage effect of double pilot projects to value-added product space, which lead to multipolar innovation leadership and promote transformation and upgrading of China's economy from the perspective of integration of domestic and foreign trade channels.

Keywords: linkage effect; heterogenous community effect; trade upgrading; value-added product space

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* liq@pku.edu.cn

1 Modern Leontief Paradox

In April 2018, U.S.A and China put forward successively lists of sanctions on commodities such as following:

Table 1—Lists of Sanctions on Commodities between U.S.A. and China

U.S.A.'S list of tariff increase on China's commodities	medical instrument, high speed railway, biomedical, new material, agricultural machinery, industrial robot, IT, new energy vehicles, air equipment, etc.
China's list of termination of tariff reduction on American commodities	fruit, dried fruit, nut, wine, denatured alcohol, ginseng, seamless steel pipe, pork, scrap, etc.

Based on traditional expectation, the United States would be an exporter of capital and technology-intensive goods and an importer of labor-intensive goods. While H-O model has been less successful at explaining the actual patterns of international trade than one might hope. Surprisingly again, however, this is not a case in the above lists.

Indeed, H-O model remains vital for understanding the effects of trade, especially its effects on the distribution of income. Some scholar pointed out that although comparative advantage benefited both countries, the gap between the partners has been deepened. Krugman and Obstfeld (2009)'s analysis of Mexico's Maquiladora reveal this phenomenon from the change of four magic numbers. Mexico's real wages can only stop at a quarter to U.S.A.. So the conclusion is that this low-end comparative advantage trap furtherly deepens Mexico's middle income trap.

Table 2—The Change of Real Wages According to Comparative Advantage

Real Wages		
(A) Before Trade		
	High-Tech Goods/Hour	**Low-Tech Goods/Hour**
U.S.A.	1	1
Mexico	1/8	1/2
(B) After Trade		
	High-Tech Goods/Hour	**Low-Tech Goods/Hour**
U.S.A.	1	2
Mexico	1/4	1/2

Source: Krugman & Obsfeld (2009), International Economics, P275

Today we can still observe established evidence against the factor-proportions theory. H-O model has long occupied a central place in trade theory, because it allows a simultaneous treatment of issues of income distribution and pattern of trade. The growth of North-South trade in manufactures has brought H-O model into the center of practical debates over trade policy. The explanation of Modern Leontief Paradox is in rougher accord with trade barriers, which were endogenous in traditional free trade theories. In recent years, regardless of protectionism in world trade environment, China persistently adopting open policies especially with cross-border e-commerce (CBEC) and Free Trade Zones (FTZs) in nearly whole national provinces, autonomous regions and municipalities, which created linkage effect to promote trade facility and upgrading to improve trade environment.

2 Literatures

Most trade literature views policy as infrequently changed, orthogonal to macroeconomic policy and/or the business cycle. Convensional Wisdom regards trade disputes as countercyclical phenomena. Envolving situation underscores importance of incorporating trade tensions into macroeconomic policy. To explore cyclicality of trade policy, need to integrate endogenous trade policy into an open economy model with macro factors. CBEC and FTZs are both practical institutions to raise importance of trade facility to alternative shocks.

Bowen, Leamer, and Sveikauskas attempted to use data for sample of 27 countries and 12 factors of production to test the probability of Modern Leontief Paradox. They calculated the ratio of each factor to the world supply. Then they compared these ratios with each country's share of world income. According to H-O model, a country would always export factors for which the factor share exceeded the income share, and import factors for which it was less. In fact, for 2/3 of the factors, trade ran in the predicted direction less than 70% of the time. Comparisons of the exports of labor-abundant, skill-scare nations in the third world with the exports of skill-abundant, labor-scarce nations do fit the theory quite well. If one thinks about trade in goods as an indirect way of trading factors of production, this predicts not only the direction but the volume of that trade. Factor trade in general turns out to be much smaller than H-O model. US has about 25% of world income but only about 5% of the world's workers; so a simple factor-proportions story would suggest that US imports of labor embodied in trade should be huge. China has less than 3% of world income but approximately 15% of the world's workers; it therefore "should" export most of its labor via trade.

Many trade economists believe that Leontief Paradox can be resolved only by

dropping the H-O assumption that technologies are the same across countries. If workers in US are much more efficient than those in China, then the "effective" labor supply in US is much larger compared with that of China than the raw data suggest-and hence the expected volume of trade between China and US is correspondingly less. But with the development of modern technology such as AI, China's second-mover advantage has made distinguished progress. Some Chinese fashion company is employing American workers to operate and maintain robots at Little Rock in Arkansas.

Ever since Stiglitz (2010, Atlanta)'s "Homoeconomicus: The Impact of the Economic Crisis on Economic Theory", a window of opportunity has been regarded as to construct new theories based on more plausible accounts of individual and firm behavior. Christopher Pissarides (2019, SEPKU)'s "The Future of Work in the Age of Robots and Artificial Intelligence" furtherly raised the importance of high technology and human capital. Ana Cecília Fieler, Marcela Eslava, and Daniel Yi Xu (2018) emphasized on trade upgrading and linkage effect based on micro data, which pointed out quantitative model to bring together theories linking international trade to quality, technology, and demand for skills. Rafael Dix-Carneiro and Brian K. Kovak (2017) investigated potential mechanisms, finding empirical support for a mechanism involving imperfect interregional factor mobility and dynamics in factor demand, which gradually amplifies the effects of liberalization, explaining the slow adjustment path of regional earnings and quantitatively accounting for the magnitude of the long-run effects.

3 Theoretical Model: Heterogenous Community Effect

Network brings us the Positive Feedback Effect[2] which means that as the installed base of users grows, more and more users find their adoption worthwhile. In this effect, users and consumers are homogenous. In the process of digital economy and internet trade, we can experience different types of seamless communities such as experience-sharing communities, epistemic communities, and file-sharing communities. Heterogenous Community Effect creats, promotes and extends the Positive Feedback Effect and leads to seamless lower costs and higher demands.

CBEC brings Iceberg Effect based on big data, which benefits demand management:

Demand 1.0: sell what we have Value to Consumer = Utility ÷ Price

Demand 2.0: sell what you want Value to Consumer = Utility ÷ Price × Timeliness

Demand 3.0：Tell you what you want

Value to Consumer = Utility ÷ Price × Timeliness + Self-realization in shopping process

[2] The Positive Feedback Effect is also named Metcalfe's Law, Network Effect, and Demand-Scale-Econoy. It states that the value of a telecommunications network is proportional to the square of the number of connected users of the system. Within the context of social networks, many, including Metcalfe himself, have proposed modified models using ($n \times \log n$) proportionality rather than n^2 proportionality.

Demand 4.0：You need what we supply

Value to Consumer = Utility ÷ Price ×Timeliness + Self-realization in shopping process + Potential Demand

FTZs also have heterogenous community effects based on ecosystems of modern international trade with integrated logistics, capital, technology and information, which will not only reduce labor costs, but also increase total demands. FTZs bring Inverted Tariffs Effect. The duty on a product manufactured abroad and imported is paid at the rate of the finished product rather than that of the individual parts, materials, or components of the product. An domestic-based company would thus find itself at a disadvantage relative to its foreign competitor if it had to pay a higher rate on parts, materials, or components imported for use in the manufacturing process. The FTZ program corrects this imbalance by treating a product manufactured in a FTZ, for purposes of tariff assessment, as if it were produced abroad.

The Linkage Effects bring out Vertical Integration when a company owns or controls its suppliers, distributors, or retail locations to control its value or supply chain. Vertical integration benefits companies by allowing them to control the process, reduce costs, and improve efficiencies. Backward integration is when a company expands backward on the production path into manufacturing, and forward integration is when companies control the direct distribution or supply of their products.

To simplify the analysis, we suppose a Two-Goods and Two-Country Model as the previous Krugman and Obsfield's analysis about US / UK and Mexico / ASEAN. One good is high-tech goods such as private jet, the other good is low-tech goods such as bicycle. One Country is more developed who has the advantage on high-tech goods, the other is less developed who has the advantage on low-tech goods. When China enters this market, according to Linder's overlapping demands theory, with the condition of homogenous demands analysis, China has more opportunities to trade with US/UK on high-tech goods compared to ASEAN, meanwhile more opportunities to trade with ASEAN on low-tech goods than US/UK. Guangxi FTZ is a intermediate linkage to connect ASEAN and more developed regions and countries, which improves world trade ecosystem and effidiency. Otherwise US/UK is more likely to trade with ASEAN only based on the low-tech goods and low-cost labor. The trade amount is very limited compared to that with China's participant.

When we introduce Internet trade, we can furtherly explore the above analysis from three perspectives: One is the information and trade facilitated to creat

heterogenous demands which means consumers with different income enter the same demand community; The second is the Positive Feedback Effect of Internet which means in this community, every consumer *n* will increase the information value by n^2 proportionality to increase demands; The third is a dynamic trade pattern to creat much more trade chances. We sum up the above characters as Heterogenous Community Effect.

Suppose the traditional Linder's overlapping demands are Q_L, the Heterogenous Demands are Q_H. As a normal rule, we standardize the total consumers to 1, which is divided into two parts: the proportion of demands determined by traditional Linder's overlapping demands is m; 1-m is the proportion of potential demands created by Internet trade. We have,

(1) $$Q_H = \frac{1-m}{m} Q_L$$

m

According to the above analysis, with the Positive Feedback Effect of Internet trade, $(1-m)/m$ will increase very rapidly to $(1-m)/m > 1$, then $Q_H \succ Q_L$.

Let's furtherly analyze the demand price effect. *X* denotes the trade amount based on traditional Linder's overlapping demands, which is called strong demand; and *Y* denotes the increased trade amount based on Heterogenous Demands Community, which is called potential demand. Community's consumption choice is Cobb-Douglas utility function:

(2) $$V = A\log X + B\log Y,$$

where *A* and *B* satisfy *A* + *B* = 1, separately denotes the individual constant demand rates of *X* and *Y*. As a standard manner, we assume the value and estimated price of *X* satisfies the Law of One Price, which means P_X =1. At the same time, the value and estimated price of *Y* is P_Y. Now we can analyze the whole economy from the perspective of demands because of two reasons: Firstly, the Positive Feedback Effect is a demand-sale-economy which increases the value of Internet through demand; Secondly, the supply and demand sides have very close relationship in Internet trade from design to production.

Suppose welfare is the only goal in the demand of *X* and *Y*, the welfare function

is linear, which means a constant returns to unit welfare. Suppose each consumer inelasticly supplies one unit demand in each period, and can be *X* or *Y*. This is a Quasi-Monopoly Market because the consumer with strong demand are much powerful on price and trade amount compared to the consumer with potential demand. More concretely, suppose each period of time, each consumer with strong demand will choose h_x unit of *X*, and each consumer with potential demand will choose l_x unit of *X*, $h_x \succ l_x$.

W_X and W_Y separately denotes the welfare rates of strong and potential demands. According to the assumption of linear production function, in the condition of equilibrium, each demand's welfare rate is equal to the estimated value, which has very close relationship with the consumption amount in a Quasi-Monopoly Market. As we have fixed $P_X = 1$, strong demand at *X* choice 's welfare rate can be denoted by h_x, any potential demand at *Y* choice's welfare rate is P_Y. We have,

(3) $$W_X = h_x,\ W_Y = I$$

Then, we deduce the equilibrium of P_Y. y^* is the Norminal GNP per Person. According to the containing assumption of the fixed expenditure rate of Cobb-Douglas utility function, and the condition of trade balance, which means in each demand, the generally norminal expenditure is equal to the general norminal welfare revenue.

(4) $$(1-m)W_X = (1-m)h_x = Ay^*$$

(5) $$mW_Y = mP_Y = By^*$$

combine equation (4) and equation (5), we have

(4) $$\frac{mP_Y}{(1-m)h_x} = \frac{B}{A}$$

The rate of (*B*/*A*) is given by *k*, equation（4） implies that in the condition of equilibrium, the scale of *Y* demand should be *k* times which of *X* demand. Rearrange equation（4）as follows:

(5) $$P_Y = k\frac{1-m}{m}h_x$$

Equation（5）reflects that P_Y is decided by three facors: parameter of strong demand welfare (h_x) , parameter of preference (k) , and the proportion of strong and potential demand. We demonstrate the "Heterogenous Demand Community Effect" as: the strong demand always has a higher welfare (h_x); following the share of information in the community, the rate of (1-m)/m is also raised; given a fix preference (k), P_Y will be higher, which leads to a higher demand level. As the same logic, heterogenous demand community in Internet trade will lead to seamless higher demand, which overtakes Linder's overlapping demand and promote more driving force to overcome middle income trap.

Secondly, the extension of Positive Feedback Effect creats more chances to homoeconomicus (firms) to improve their productivity, which brings opportunities to improve the comparative advantage level of middle-income countries and overcomes low-end comparative advantage trap.

Thirdly, heterogenous cooperation and Internet trade brings more transnational technology innovation and institution transformation, which creats more incentives and guarantee of the growth of economy.

Based on the above analysis, we can reveal that Heterogenous Demand Community effect in Internet trade extends the scope of overlapping demands, elevate comparative advantage, promotes open innovation and creats more incentives to overcome the problem of trade barriers.

4 Empirical Analysis Ⅰ: Internet Effect and Logistics Upgrading[3]

The trade types of CBEC are mainly multi-orders and small amounts, which puts forward new requirements to the logistics. To meet the logistics demand of CBEC, the logistics system has gradually diversified into new forms such as overseas warehouse, third-party logistics and so on. the logistics' tracking system is also greatly promoted. Cross-border logistics mode has got great innovation. Based on Gravity Model, the Internet effect and logistics upgrading of cross-border e-commerce reduce the barrier of geographic distance to bilateral trade: Firstly, the Internet can reduce the limitation of geographic distance by reducing transaction cost, accurately mining user demand and real-time user interaction. Secondly, the innovation of logistics mode makes it

[3]See Feng Yanyan: "The Impact of Internet Effect and Logistics Upgrading on China's Cross-border E-commerce Export Trade —— An analysis based on Gravity Model", 2020 graduation thesis Library, Peking University.

more convenient for small and medium-sized enterprises and individual users to participate in cross-border trade, thus weakening the influence of geographic distance to some extent.

We introduce Internet and geographic distance interaction term, logistics performance and geographic distance interaction item into the gravity model. Based on the World Bank's database, CEPII database, and China's National Bureau of Statistics database, we estimate the model using 41 countries and regions' data from 2007-2018, including China's TOP10 CBEC export destination. The data has personal perspective because CBEC can refer to online trade between a business (retailer or brand) and consumer (B2C), between two businesses, often brands or wholesalers (B2B), or between two private persons (C2C). Based on traditional Gravity Model, we have,

$$lnT_{ij} = \alpha + \beta_1 lnY_{it} + \beta_2 lnY_{jt} + \beta_3 lnD_{ij}$$

T_{ij} and D_{ij} separately denotes trade volumn and distance between trade partners i and j. Y_{it} and Y_{jt} separately denotes GDP of i and j in t period.

	(1)
VARIABLES	lnTrade
lnGDP1	0.940***
	(0.0175)
lnGDP2	0.340***
	(0.0660)
discap	-0.349***
	(0.0559)
Constant	7.630***
	(0.517)
Observations	492
R-squared	0.864

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

It is found by empirical analysis that the Internet and geographic distance interaction term's coefficient is positive, significantly weakening the barriers to CBEC caused by geographic distance. At the same time, logistics upgrading does weaken the negative effect of geographic distance, though the weakening effect is not obvious. Then we introduce internet effect and logistics upgrading, The relative model is as following:

$$\ln EXP = \alpha + \beta_1 lnY_{it} + \beta_2 lnY_{jt} + \beta_3 net_j lnD_{ij} + \beta_4 LPI_j lnD_{ij} + \beta_5 net_j + \beta_6 LPI_j + \beta_7 lnD_{ij}$$

Using Stata13.0 empirical analysis, we have,

Decriptive statistics

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
EXP	492	58.21	165.4	0.0262	1,931
GDP1	492	1.299	2.711	0.0132	20.54
GDP2	492	8.611	3.105	3.550	13.61
discap	492	8.939	0.489	6.862	9.856
LPI	492	3.519	0.421	2.370	4.226
LPIdiscap	492	31.41	3.825	20.54	37.90
CLPI	492	3.522	0.0938	3.320	3.661
net	492	72.05	19.17	3.950	99.01
netdiscap	492	6.408	0.407	3.483	6.789

VARIABLES	(1) lnEXP	(2) lnEXP	(3) lnEXP	(4) lnEXP	(5) lnEXP
LPI	0.164**	-3.498*			-0.279
	(0.0667)	(1.935)			(2.016)
LPIdiscap		0.409*			0.0494
		(0.216)			(0.225)
CLPIdiscap					0.352*
					(0.206)
net			0.0125***	0.0116***	0.0101***
			(0.00181)	(0.00281)	(0.00292)
netdiscap				0.0406	0.0631
				(0.0952)	(0.0956)
lnGDP1	0.698***	0.703***	0.622***	0.612***	0.615***
	(0.0771)	(0.0769)	(0.0744)	(0.0781)	(0.0776)
lnGDP2	2.316***	2.313***	2.105***	2.110***	1.403**
	(0.0351)	(0.0350)	(0.0464)	(0.0478)	(0.543)
Constant	-2.314***	-2.262***	-2.285***	-2.497***	-12.65**
	(0.247)	(0.247)	(0.130)	(0.513)	(5.490)
Observations	492	492	492	492	492
R-squared	0.971	0.971	0.974	0.974	0.974
Number of country	41	41	41	41	41

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

The Internet effect and logistics upgrading of CBEC may enable trade to further break through the restrictions of geographic distance, which provides a theoretical

basis for China to develop CBEC. According to Long Tail Theory, each individual consumer has a specific, relatively stable sense of self-comfort stimulation point, which is the most appropriate consumer stimulus level. There is an inverted U-shaped function relationship between consumer's stimulus obtained from the external market environment and consumer's emotion response to the stimulus. At the apex of the function locates the consumer's optimal level of stimulation.

As consumers focus more and more on forgotten things, they find themselves more opportunities to choose. And if Internet merchants can capture these forgotten corners, there will be a bigger market than the traditional mainstream market with huge potential. When the level of stimulation provided by the external market environment is below the optimal level of stimulation for the consumer, the consumer tends to seek novel, unique and sophisticated experiential exploration to increase the level of stimulation. CBEC can provide more choices at a lower cost and with shorter intermediate links, which help consumers find the information of the products or services they need, and reduce the search costs of consumers, so as to explore "Long-tail market" potential demand, extending CBEC market "long-tail".

5 Empirical Analysis Ⅱ: Regional Positive Feedback Effect

We have studied Heterogenous Community Effect based on Belt and Road initiative. Large countries and regions have been contesting in this area through FDI, technology diffusion, information super highway etc. According to China's National Bureau of Statistics database， China Economic Information Network and Statistical Bulletin of China's FDI, based on 71 countries' FDI data from 2009 to 2016, we compared China with U.S.A., Russia and EU. The relative model [4]is as following:

$$lnX_{it} = \alpha_0 + \alpha_1 lnsumGDP_{it} + \alpha_2 lnD_{it} + \alpha_3 lnFDI_{CN_{it}} + \alpha_4 Open_{it} + \alpha_5 lnFDI\_US_{it} + \alpha_6 lnFDI\_RU_{it} + \alpha_7 lnFDI\_EU_{it} + \varepsilon$$

FDI_US_{it}, FDI_RU_{it}, and FDI_EU_{it} denote for the direct investment from U.S.A., Russia, and EU to countries along the Belt and Road. Considered an open environment, regression with fixed effect model and correction with FGLS gave us the following conclusion in short term(stock) , medium term(flow) effect. The empirical analyses explores the significant interaction of economic impact in countries along the Belt and Road.

[4]See Liu Xueyin: An Analysis of the Trade Effects of China's FDI under B&R Initiative: a Geo-economics Perpective, 2018 graduation thesis Library, Peking University.

	Flow		Stock	
	Export	Import	Export	Import
lnsumGDP	0.89*** (6.60)	0.52** (2.27)	0.71*** (6.81)	0.80*** (3.65)
lnD	-0.01*** (-14.69)	-0.01*** (-7.81)	-0.0043*** (-7.37)	-0.0058*** (-5.68)
FDI_CN	0.13*** (9.73)	0.20*** (6.68)	0.25*** (14.42)	0.31*** (9.87)
Open	-0.14* (-1.85)	0.03 (0.26)	-0.04 (-0.63)	0.28*** (2.79)
FDI_US	0.32*** (18.15)	0.28*** (8.93)	0.35*** (17.83)	0.33*** (8.63)
FDI_RU	0.0097 (0.54)	-0.03 (-0.83)	0.01 (1.22)	-0.07*** (-3.31)
FDI_EU	-0.0079 (-0.35)	-0.0032 (-0.07)	-0.10*** (-3.22)	0.15** (2.54)
Constant	-6.19*** (-2.61)	-0.15 (-0.04)	-4.87*** (-2.65)	-10.91*** (-2.70)

Note: regression coefficient *Z* are in brackets, with *,*, and *** denote the significant degree as 10%、5%、1% separately。

6 Conclusion

China is facing transition of trade patterns based on double pilot projects of CBEC and FTZs. We explored value-added product space with Internet effect and FTZ's Heterogenous Community Effect which elimates the difference among heterogenous trade partners. Modern Leontief Paradox revealed the existence of trade barriers and protectionism. Traditional world trade system based on comparative advantage is facing challenges to promote further liberalization. We need to find stereoscopic pattern to realize pluralism and reach a more open environment.

This paper puts forward Heterogenous Community Effect, which extends the research of homogeneous overlapping demand and Positive Feedback Effect. The Rule of Positive Feedback Effect not only exists in Internet, but also has its realistic forms in many economics actions. Heterogenous Community Effect creats lower labor costs, higher demand levels and more chances to improve comparative advantage, which produces incentives to overcome the problem of trade barriers and reach a win-win settlement through new trade pattern.

For example, experiece and evidence of Guangxi's Economic Zone of Beibu Gulf revealed that "factors of environment", "policy environment" and "micro-market

environment" did not effectively promote the development of new development model in this region. The establishment of pilot projects of CBEC and FTZ in Guangxi supplies feasible settlement to these problems. In Shandong Province, we have the largest agriculture base in China. CBEC and FTZ pilots brought linkage effect which connect domestic market with regional markets including Japan and Korea. In the future research, we will give some detailed analyses on the interaction of heterogenous factors based on survey data from Guangxi, Shandong, etc.

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