Can behind-border measures in free trade agreements benefit domestic firms?

Keywords: Behind-border measures, domestic firms, FTA, RCEP, CGE

1. Introduction

With the significant reduction of on-border protection, the central piece of FTA negotiation has gradually shifted to behind-border measures (BBMs) (Sheng, 2015). BBMs are those non-tariff measures (NTMs) that flow from domestic laws, regulations, and practices, differentiated from border barriers of NTMs (customs procedures, etc.) (Kawasaki, 2015). In FTAs, BBMs cover issues such as transparency requirements, intellectual property rights (IPR), competition, services trade and investment. In sophisticated FTAs, BBMs may extend to regulatory system and government administration. For instance, Pelkmans et al. (2016) point out that the cumbersome FDI regulatory system of China is a potential behind-border issue that need to be addressed in the future EU-China FTA.

While FTAs have a market expansion effect, they also have a competition effect on domestic industries (Hur & Qiu, 2020; Mezarina, 2020). The main target of FTAs is to promote trade. Along with the reduction of trade barriers, more imported products flow into domestic market, increasing competition to local suppliers. A deep liberalization of BBMs in FTA tends to promote more trade, as well as foreign investment, which may intensify the competition to domestic firms. Thus, concerns of the competition effect have deterred countries from joining FTAs. The withdrawal of India from the recently signed RCEP is a vivid example.

However, the competition effect of FTA would be mitigated if BBMs can benefit domestic firms. Some BBMs are viewed as threats to domestic industries since they tend to deprive the advantages of domestic firms over foreign firms. In fact, many BBMs proposed in FTAs aim to improve business environments for all incumbents. Transparency of BBMs pursues policy openness and certainty, which is key to prevent arbitrariness and capture by special interests (Ing, Cadot, & Walz, 2018). Competition of BBMs pursues fair competition between domestic and foreign, small and large firms. Although it may hurt monopolistic firms such as state-owned enterprises, the mass of firms would benefit from fair competition. These BBMs initially aims to facilitate the operation of foreign firms, but will eventually influence domestic regulatory system or even stimulate reforms of the system. The US-Morocco FTA, for example, has promoted the government of Morocco to launch an initiative to streamline investment procedures and eliminate barriers to foreign and domestic investment. By doing so, domestic firms will benefit from BBMs of FTAs. Investigating the benefits of FTAs to domestic firms is crucial for attracting more countries to economic integration.

In this article we explore the benefits of BBMs to domestic firms by developing a quantitative

framework that simulates BBMs. We first define BBMs by disentangling BBMs from border barriers and non-tariff barriers, and analyze potential impacts of BBMs on domestic firms. We then model BBMs within a firm heterogeneity computable general equilibrium (CGE) framework. Finally, we conduct simulations to compare the effects of free trade agreement with and without BBMs. Using the RCEP as an example, we first simulate the RCEP with the current 15 members, and then simulate with India joining the RCEP. In addition to trade liberalization, we also simulate FDI liberalization to see the competition effect from trade and FDI and the alleviation effect of BBMs on domestic firms.

The recently signed RCEP has formed the biggest free trade area in the world. Its population, GDP and trade each account for 30% of the world. The RCEP members have achieved the highest level of commitments in several areas. Services is one area that reaches the highest commitments of all 15 members, overtaking the foundational five ASEAN+1 FTAs. Even though intellectual property right is usually resisted by developing countries, the developing country-dominated RCEP contains a comprehensive IPR chapter, covering 12 areas of IPR with 83 provisions and 2 appendixes. The E-commerce chapter of the RCEP is the first in Asia-Pacific that reaches multilateral agreements on comprehensive and high standard rules in E-commerce. The RCEP also makes extensions in terms of competition and government procurement from the ASEAN+1 FTAs. The high commitments of members in services, IPR, E-commerce, investment, competition and government procurement reflect the achievements of the RCEP in terms of BBMs. Thus, we use the RCEP as an example to simulate BBMs.

Simulations of the RCEP and other FTAs have taken non-tariff measures into consideration (Balistreri & Tarr, 2019; Kawasaki, 2015; Q. Li & Moon, 2018). NTMs reflect deeper trade liberalization in comparison with tariff barriers, and thus including NTMs would generate more trade and welfare gains (Winchester, 2009). However, given the increasing importance of BBMs, there are few papers further isolating BBMs from NTMs. As a traditional topic of FTAs, services liberalization has attracted lots of attention in CGE studies (Egger, Francois, Manchin, & Nelson, 2015; Latorre, Olekseyuk, & Yonezawa, 2020; Lejour, Rojas-Romagosa, & Verweij, 2008). But services liberalization is only one aspect of BBMs. More importantly, the literature of FTAs mainly focuses on trade effect, income effect and welfare effect (Kawasaki, 2015; Lee & Itakura, 2017; C. Li, Wang, & Whalley, 2016). Few studies examine the impact on domestic firms, and even less endeavors to explore the possible benefits of advanced FTAs to domestic firms. This article contributes to the literature in twofold. First, we identify BBMs in NTMs and applies distinct treatment to BBMs in CGE modelling. Second, we extend the estimation of effects of FTA to domestic firm effects, with a particular interest in positive effects.

The rest of the paper is organized as follows. The next section disentangles BBMs from border barriers and NTMs. Section 3 introduces the modelling of BBMs in CGE model and data used in simulation. Section 4 presents simulation scenarios and results. Section 5 conducts sensitivity tests. The final section concludes.

2. Behind-border measures

FTAs generally cover both tariff and non-tariff measures and nowadays the latter receives more

attention. The traditional NTMs include sanitary and phytosanitary measures (SPS), technical barriers to trade (TBT) and services barriers. Recent NTMs of FTA extend to IPR, competition and other measures that flow from domestic laws, regulation and practices. Some NTMs such as SPS and TBT are border measures that are imposed on foreign goods at borders, while the majority of NTMs are behind-border measures that affect foreign firms after firms entering domestic market.

Based on the hot-debated issues in free trade agreements raised by the former Trans-Pacific Partnership (TPP) and our understanding of behind-border measures, Table 1 attempts to classify border measures and BBMs that are common in FTAs. Border barriers contain tariff elimination, rules of origin, customs cooperation and trade facilitation, as well as SPS and TBT. Some of services trade measures such as movement of natural person also belong to border barriers.

BBMs deal with a wider range of issues than border measures. Transparency is a common rule of FTAs, generally requiring parties to provide enough information about trade policy and the process of designing and implementing regulations. Competition policy could be as shallow as committing to ensure a fair competition environment, or as deep as disciplining state-owned-enterprises (SOEs) (Kawase & Ambashi, 2018). Intellectual property protection used to be regarded as the tool of industrialized countries to seize extra profits from developing countries, but now FTAs start to embrace it (Finger & Nogués, 2002). IPR has a high demand for regulatory coherence, the same as E-commerce. Parties with stricter IPR would pursue a high level of IRP in other parties, and parties valuing free-flow and use of data in E-commerce would like other parties to allow data flow and free use. BBMs also include rules about FDI and services, as well as government procurement. Other measures such as environment and labor standards are non-commercial rules in FTAs.

Table 1 Border and behind-border measures in FTAs

Border measures	**Behind-border measures**
Tariff elimination	Transparency
Rules of origin	Competition policy
Customs cooperation and trade facilitation	Intellectual property rights
Sanitary and phytosanitary measures	Electronic commerce
Technical barriers to trade and standard conformity	Investment and services trade
Services trade	Government procurement
	Environment and sustainable development
	Labor standards

Behind-border measures are in essence designed to facilitate foreign trade and investment through pursuing regulatory coherence (Wang, 2016). Regulatory coherence would create a business environment with convergent regulations, which tends to reduce adaption costs of firms operating in different markets. To achieve regulatory coherence, domestic regulations and sometimes the regulation system would be adjusted or reformed. Regulations relate to foreign trade would be adjusted first, such as trade policies about services and FDI. Then regulations that are universal to foreign and domestic firms would be adjusted, such as IPR and E-commerce. Meanwhile, regulation systems that are applied to all incumbents would be modified, such as improving the transparency of designing regulations and the efficiency of government governance. Finally, regulation coherence

may trigger domestic law and economic reform. For example, as a response to emerging trading rules focusing on regulatory coherence, China initiated Free Trade Zones (FTZs) to experiment with institutional innovation and reforms, including simplifying trade regulation procedures, promoting financial system reform to make RMB capital account convertible, and promoting post-filling regulation 'as a way to transform government functions.'

While regulatory coherence facilitates foreign firms to operate in local market, the improvement of domestic regulations would impact on domestic firms. For instance, stricter IPR would protect high-tech firms, encouraging more domestic firms to innovate. Likewise, free-flow and usage of consumer data is good for E-commerce firms to utilize data to make more profit. Moreover, domestic law and economic reform triggered by regulatory coherence would affect domestic firms even deeply. The reforms of institutions generally facilitate all incumbents by removing cumbersome procedures relate to government governance, or by reducing ambiguity in policy interpretation and implementation, or by generating more flexibility.

With a focus on regulatory coherence, behind-border-measures are generally beneficial to domestic firms.[1] Behind-border-measures represent the desires of foreign firms for more liberalized business environment, more efficient bureaucratic system, more transparent and expectable policy, etc. These desires also meet the expectation of domestic firms.

3. The CGE model and data

3.1 The CGE model

We adopt the FHFDI model of Q. Li, Scollay, and Gilbert (2017) to simulate behind-border measures. The FHFDI model is able to simulate FDI liberalization of FTA by separating domestic firms and foreign invested firms, which allows us to examine a more comprehensive competition effect of FTA on domestic firms. Figure 1 shows the firm structure of the FHFDI model. Foreign invested firms refer to those firms that are 100% owned by foreign citizens.[2]Domestic firms and foreign invested firms are further split into exporters and non-exporters. Exporters would benefit from trade liberalization, but non-exporters might face a competition effect.

[1] We have recognized that some firms may be hurt by high-standard rules. For instance, State-owned enterprises (SOEs) may be hurt by the competition measure. However, the disciplining of SOEs by disclosing government supports or restricting non-market behaviors is good for creating a fair and efficient market for all firms.

[2] Joint ventures are treated as domestic firms since we assume that foreign firms can get around FDI barriers by forming joint ventures.

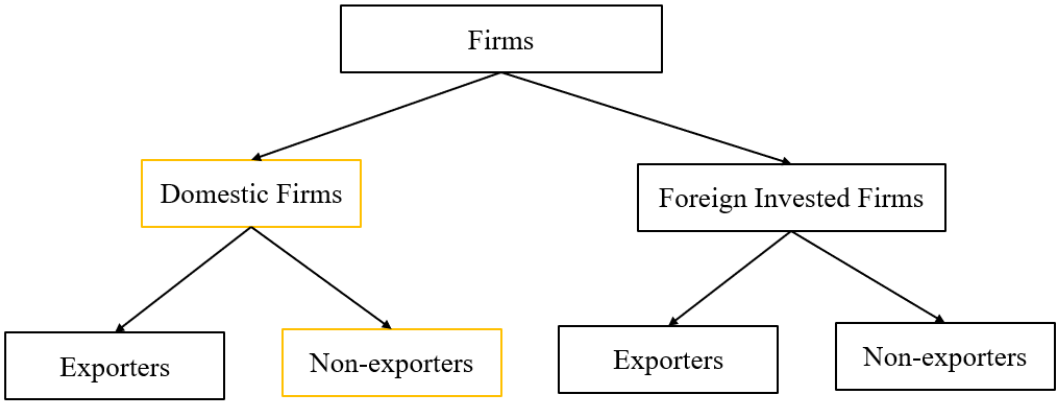

Figure 1 Firm structure of the FHFDI model

To simulate with the RCEP, we set a model of 7 regions, including ASEAN, China, Japan, Korea, India, Australia and New Zealand (ANZ), and the rest of the world (ROW). India was a negotiation party of the RCEP, but quit in the last moment. We simulate with scenarios of India joining the RCEP to see the effect of BBMs on India. The model includes 4 sectors, agriculture (a), manufacturing (m), tradable services ($s1$) and non-tradable services ($s2$). Non-tradable services aggregate public services such as electricity, gas manufacture and distribution, water, and public administration. Non-tradable services cannot involve in foreign trade and FDI, i.e. they could only be provided by domestic firms and sell to the local market. And thus, trade policies could hardly affect non-tradable services. In this sense, non-tradable services and agriculture are treated as homogeneous sectors, while manufacturing and tradable services are heterogeneous sectors. The FHFDI model includes 3 factors, land, labor and capital. Land is specific to agriculture. Capital can move across sectors and borders.

The FHFDI model is grounded in the firm heterogeneity theory of Melitz (2003) and its FDI extension by Helpman, Melitz, and Yeaple (2004). The firm heterogeneity theory has become the workhorse in explaining trade since it was proposed. The nexus of fixed trading costs and productivity plays a central role in the model, which selects firms into exporting markets and determines the extensive margin of trade. Melitz (2003) points out that fixed trading costs faced by exporters include the costs of learning laws and regulations of the foreign market. If laws and regulations not only discipline incumbents, but also distort trade, the fixed trading costs would be higher than the costs of learning regulations. Firms may need to adjust products or operation strategy to meet trade-distorting regulations. Some of restrictive regulations may raise the fixed trading costs to a forbidden level that bloc firms.

Rooted in the firm heterogeneity theory, the FHFDI model incorporates fixed trading costs, as well as trade variable costs. Thus, the FHFDI model provides a framework to disentangle the fixed cost and variable cost effects of different trade barriers. In CGE models, NTMs are usually modeled as raising trade variable costs (Hertel, Walmsley, & Itakura, 2001). However, more and more empirical studies show that NTMs not only constrain trade volumes (variable cost effect), but also restrain trade probability (fixed cost effect) (Crozet, Milet, & Mirza, 2016; Fontagné, Orefice, Piermartini, & Rocha, 2015; Webb, Gibson, & Strutt, 2019). Accordingly, CGE models start to capture the fixed cost effect of NTMs along with variable cost effect (Jafari & Britz, 2018).

Within NTMs, regulation-based behind-border measures are more likely to increase fixed costs than variable costs. Benz, Rouzet, and Spinelli (2020) find that the costs created by service barriers are to a large extent incurred at the time of initial market entry. Similar to service barriers, the market access and national treatment measures of investment tend to raise fixed costs of foreign invested firms on and after the entry of firms. Other BBMs such as transparency and competition would reduce the one-off costs of adapting to regulatory systems and coping with unfair competition behaviors. Even though some BBMs may have a variable cost effect, the fixed cost effect is more evident for regulation-based BBMs. Thus, this paper treats BBMs as raising fixed costs.

Figure 2 shows policy tools of FTAs and their impact mechanisms in the FHFDI model. FTAs cover both tariff and non-tariff measures. BBMs are separated from NTMs. Tariff reduction would reduce variable costs of trade firms, corresponding to tm_{ij}^{s} in the FHFDI model. NTMs other than BBMs (other NTMs) are modelled as tariff equivalents that affect variable costs of trade firms, corresponding to tn_{ij}^{s}. In services sector $s1$, the tariff equivalent of NTMs is split into a rent-creation effect, v_j^{s1}, and a cost-raising effect, λ_{ij}^{s1}, following Konan and Maskus (2006). Detailed calculations are shown in Q. Li et al. (2017).

BBMs impact on fixed costs, corresponding to $FD_{ij}^{ss}, FF_{gij}^{ss}$. According to the analysis of BBMs in Section 2, BBMs may first affect foreign suppliers, and then affect domestic suppliers, which means that the fixed cost effect impacts on all types of firms. In FHFDI model, only manufacturing and tradable services are heterogeneous sectors, and thus, the fixed cost effect of BBMs only exist in these two sectors. In the homogeneous sector of agriculture, all NTMs would raise variable costs.

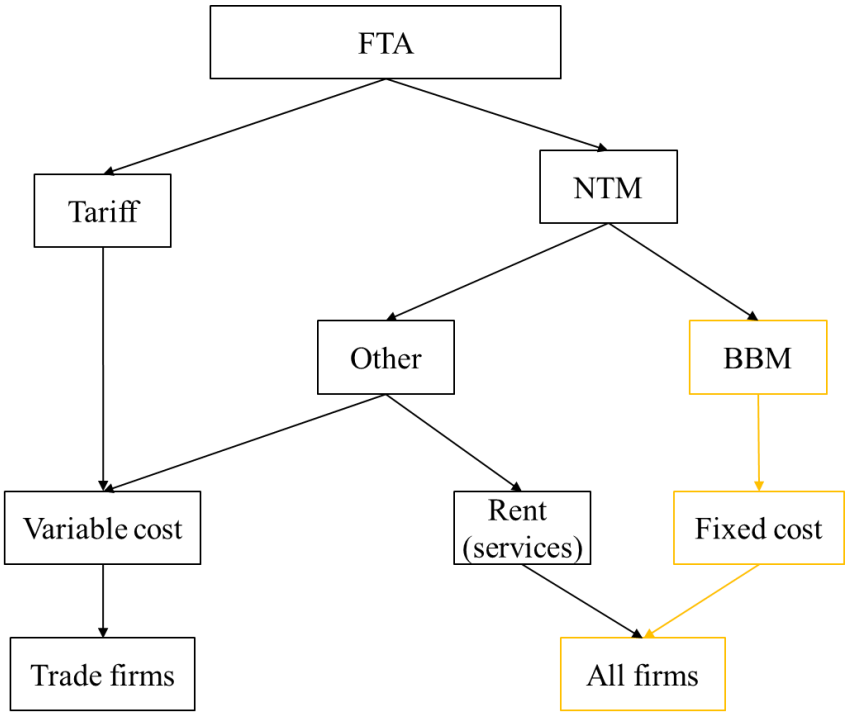

Figure 2 Impact mechanisms of policy tools in FTA

The fixed cost is a channel through which BBMs firstly affect productivity threshold, then the number of active firms in market, and finally prices. In the FHFDI model, fixed cost is defined as a

fixed combination of labor, capital and intermediate inputs as follows:

$$FD_{ij}^{ss} = \delta_l WL_i LD_{ij}^{ss} + \delta_k WDK_i^{ss} QDK_{ij}^{ss} + \sum_c \delta_i^c PQ_i^c INTCD_{ij}^{css} \quad (1)^3$$

FD_{ij}^{ss} is the fixed cost of domestic firms in region i to enter market j in heterogeneous sector ss. WL_i is wage and LD_{ij}^{ss} is labor demand. WDK_i^{ss} is the rental price of domestic capital and QDK_{ij}^{ss} is capital demand. PQ_i^c is the price of aggregate demand for product c and $INTCD_{ij}^{css}$ is the intermediate input of c in the production of ss. δ_l, δ_k and δ_i^c are the shares of each input in total fixed cost.

The interrelation between fixed costs and productivity is reflected by the productivity threshold function:

$$\varphi D_{ij}^{ss^*} = \frac{\tau_{ij}^{ss} CD_{ij}^{ss}}{(\sigma^{ss}-1)} \left(\frac{P_j^{ss}}{\sigma^{ss}\left(1+t_{ij}^{ss}\right)\left(1+v_j^{ss}\right)} \right)^{\frac{\sigma^{ss}}{1-\sigma^{ss}}} \left(\frac{FD_{ij}^{ss}}{Q_j^{ss}\left(1+v_j^{ss}\sigma^{ss}\right)\theta_{ij}^{ss}\theta D_{ij}^{ss}} \right)^{\frac{1}{\sigma^{ss}-1}} \quad (2)$$

$\varphi D_{ij}^{ss^*}$ is the productivity threshold of domestic firms in region i to enter market j. CD_{ij}^{ss} is marginal cost. Q_j^{ss} and P_j^{ss} indicate the aggregate demand and price of product ss in region j. τ_{ij}^{ss} is the iceberg cost of trade and t_{ij}^{ss} is trade variable cost. v_j^{ss} is the rent generated by service barrier that only exists in the tradable service sector. The parameter θ_{ij}^{s} is the share of imports from region i in the aggregate demand of region j, and θD_{ij}^{s} is the share of products produced by domestic firms. σ^{ss} is substitution elasticity, $\sigma^s > 1$. Given that $\sigma^s > 1$, the productivity threshold is positively correlated with costs, including fixed costs. The productivity requirement for firms increases along with fixed costs.

Based on the standard assumption of Pareto distribution, we obtain the number of active firms as follows:

$$MD_{ij}^{ss} = N_i^{ss}\left(1 - G\left(\varphi D_{ij}^{ss^*}\right)\right) \quad (3)$$

MD_{ij}^{ss} is the number of domestic firms. N_i^{ss} is the total mass of firms in region i sector ss, which is exogenous in the FHFDI model. $G\left(\varphi D_{ij}^{s^*}\right)$ is the cumulative distribution of productivity, $G\left(\varphi D_{ij}^{s^*}\right) = 1 - \varphi D_{ij}^{s^{*-\gamma}}$ and γ is the shape parameter of the distribution of productivity. A decrease of productivity threshold will allow more firms to enter the market.

Finally, with the number of firms in the market, we can derive the aggregate industrial price in heterogeneity sectors as follows:

$$PD_{ij}^{ss} = \left(1 + v_j^{ss}\right)\frac{\sigma^{ss}}{\sigma^{ss}-1}\frac{\left(1+t_{ij}^{ss}\right)\tau_{ij}^{ss} CD_{ij}^{ss}}{\widetilde{\varphi D_{ij}^{ss}}} MD_{ij}^{ss\,1/1-\sigma^{ss}} \quad (4)$$

There are three component parts to equation (4). The $\left(1 + v_j^{ss}\right)$ term reflects the rent created by services barriers. The term $\frac{\sigma^{ss}}{\sigma^{ss}-1}$ captures the price mark-up. The remaining component is the unit

[3] Q. Li et al. (2017) present the equations of foreign invested firms. Here in this paper we provide the equations of domestic firms.

cost adjusted by average sectoral productivity $\widetilde{\varphi D_{ij}^{ss}}$ and MD_{ij}^{ss}.

3.2 Data and parameters

The FHFDI model is calibrated to a social accounting matrix (SAM) based on the GTAP 9.0 database, with a base year of 2011. Since the model separately identifies domestic and foreign-owned firms, we need to supplement the GTAP data with foreign affiliate sales data and FDI flow data. To be compatible with the GTAP data, the two FDI databases need to be dimensioned source by host by sector. UNCTAD (2014) provides a global bilateral FDI flow database for 2001-2012. Based on the availability of FDI data, we choose GTAP 9.0 to construct a SAM table with 2011 as the base year.

We aggregate the UNCTAD global FDI data to match the seven regions in our model. To obtain the data along the required sectoral dimension, we collect information on the sectoral distribution of FDI in each region, and then calculate sector-level bilateral FDI based on the share of each sector. As for foreign affiliate sales data, Fukui and Lakatos (2012) estimate GTAP-compatible foreign affiliate sales data with a base year of 2007. We update the data to match the 2011 base year by assuming the growth rate of foreign affiliate sales is the same as the growth rate in the FDI stock. Using the foreign affiliate sales data and FDI flow data, we are able to disaggregate the SAM into domestic firm accounts and foreign-owned firm accounts. The disaggregation generates one domestic firm activity account and six foreign-owned firm activity accounts for each sector and each region.

The firm activity accounts of the SAM are further disaggregated by market. We calculate the sales of firm in each market based on bilateral trade data and the share of each firm in total output. In total, there are 147 firm activity accounts (7 home countries ×7 markets ×3 sectors) in each region's SAM.

Drawing the SAM table data into the CGE model allows us to calibrate most parameters, while those remaining are obtained from the literature or using standard assumptions. The Ad Valorem Equivalent (AVE) of NTMs for trade in goods are obtained from the World Bank and the NTMs for trade in services are obtained from CEPII (Fontagné, Guilin, & Mitaritonna, 2011).[4] Table 2 provides tariff equivalents of NTMs for agriculture, manufacturing and tradable services. The general levels of NTMs are higher than 30%. Manufacturing has lower NTMs than services and agriculture. NTMs of each sector are very close for the 7 regions. The manufacturing of Korea is an exception, the NTMs of which is as low as 0.5%. India and China have relatively higher NTMs in services, 87.2% and 69.6% respectively. The tariff equivalents of NTMs are used for other NTMs besides BBMs.

Table 2 Tariff equivalents of NTMs

Region	Agriculture	Manufacturing	Tradable services
ANZ	49.5	37.1	55.7

[4] Fontagné, Mitaritonna, and Signoret (2016) estimate NTMs for the year of 2011. We find that the NTMs of 2011 are evidently higher than that of 2004 (Fontagné et al., 2011). In the 2011 database, the average NTMs in services are around 100% for Australia, China and Japan. Considering that we use the AVE of NTMs to quantify the remaining NTMs besides BBMs, we choose the lower estimation of NTMs of 2004.

China	54.6	35.8	69.6
Japan	46.3	34.2	44.9
Korea	41.8	0.5	45.8
ASEAN	46.9	35.9	42.8
India	45.0	39.0	87.2
ROW	49.0	38.9	53.9

Source: CEPII and the World Bank

Table 3 Elasticity of substitution and shape parameter

Sector	Price mark-up	Elasticity of substitution	Shape parameter
agriculture		3.5	
manufacturing	20%	6	7.75
tradable services	30%	4.3	5.17
non-tradable services		2.44	

Source: Zhai (2008) and GTAP

Table 3 shows the elasticities of substitution and shape parameters. The elasticities of substitution for homogeneous sectors are drawn from the GTAP parameters considering that the GTAP model adopts the same perfect competition market structure as homogeneous sectors. For heterogeneous sectors of manufacturing and tradable services, we adopt the parameters of Zhai (2008). Following Zhai (2008), the elasticity of substitution is derived from price mark-up, and then determines shape parameters of productivity distribution. Details about the calculation of elasticity of substitution and shape parameters can be found in Q. Li et al. (2017).

4. Simulation scenarios and results

4.1 Simulation scenarios

To simulate the RCEP with a database of 2011, we first set a benchmark scenario (4FTA) to account for the effect of the major bilateral FTAs among RCEP member economies that have been ratified since 2011. There are four important FTAs between RCEP members over this period: The China-Australia Free Trade Agreement, the Korea-Australia Free Trade Agreement, the Japan-Australia Economic Partnership Agreement, and the China-Korea Free Trade Agreement. As shown in Figure 3, in these agreements Australia is at the core of the hub-spoke network formed by the four FTAs, which provides Australia with the privilege of entering the three major Asian markets of China, Japan and Korea. Since we aggregate Australia with New Zealand in our model, in the simulation we assume that ANZ replaces Australia in these FTAs. Based on the commitments of the agreements, we assume the 4FTA scenario reduces tariffs by 90% and NTMs by 20%. The reduction of tariffs is channeled by the parameter of tm_{ij}^{s}, and NTMs by tn_{j}^{s}.

With the 4FTA scenario set as the benchmark, we consider 5 RCEP scenarios, as summarized in Table 4. There are two pairs of comparisons and one simulation of FDI liberalization in the 5 RCEP

scenarios. We first compare the RCEP with and without BBMs. In the scenario without BBMs (NBBM), the RCEP is assumed to reduce tariffs and NTMs by the same margin as 4FTA, but only in the remaining bilateral relations besides the 4 FTAs. This scenario is based on a conservative assumption that the RCEP can hardly make progress in the four FTAs bounded before, since they already reached a high level of liberalization. Figure 4 shows the six remaining bilateral trade liberalization within RCEP, including ASEAN-China, ASEAN-ANZ, ASEAN-Japan, ASEAN-Korea, Japan-China, and Japan-Korea. In this arrangement, ASEAN and Japan get access to more markets than other members.

By comparison, the BBM scenario simulates BBMs. The reduction of BBMs is channeled by the exogenous variable of fixed costs, FD_{ij}^{ss}. Fixed cost can be calibrated by the FHFDI model. The calibrated fixed cost is a mix of all one-off costs, including production fixed costs and the costs raised by BBMs. We have not isolated the fixed costs created by BBMs from total costs, but simulate with a reduction of total fixed costs to reflect the removal of BBMs. In the BBM scenario, the fixed costs of domestic firms would be reduced. Based on the analysis of Section 2 that trade is the primary target of BBMs, the BBM scenario assumes that the fixed costs of exporters would be reduced by 20%, reflecting deep trade liberalization, while the fixed costs of non-exporters would be reduced by 10%, reflecting the benefits of BBMs to all firms.[5]

Based on BBM, we simulate with FDI liberalization in the BBM-FDI scenario. FDI barriers are behind-border measures. The RCEP liberalizes FDI by removing BBMs on investment, and thus, the BBM-FDI scenario simulates a reduction of fixed costs of foreign invested firms, FF_{gij}^{ss}, on top of the BBM scenario. Similar to exporters and non-exporters, foreign invested firms from partner countries would take a 20% reduction of fixed costs, and firms from non-member countries would take a 10% reduction.

The second pair of comparison adds India, with an aim to investigate the effect of the RCEP on Indian domestic firms. The two scenarios of India are analogous to NBBM and BBM, in which India is assumed to commit to the same level of trade liberalization as other members. The NBBM-I scenario simulates India joining the RCEP without BBMs, while BBM-I simulates India joining the RCEP with BBMs.

[5] The 20% and 10% may seem rather arbitrary numbers. Since the RCEP is a new FTA, it is hard to estimate the effect of its behind-border measures on fixed costs.

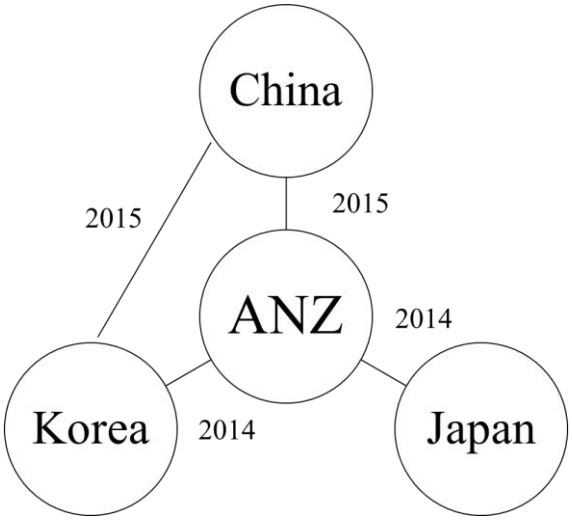

Figure 3 The four FTAs bound between RCEP members after 2011

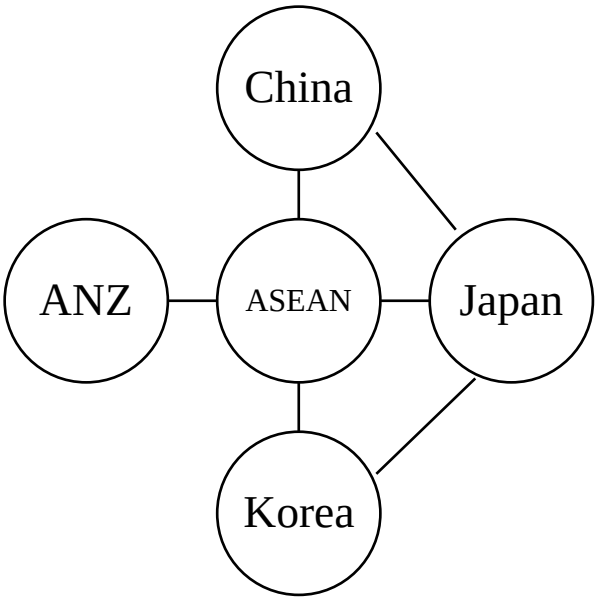

Figure 4 The six remaining bilateral trade liberalization in the RCEP

Table 4: Simulation Scenarios

Scenario	Implementation	Tools in FHFDI
4FTA (Baseline)	Four bilateral FTAs between RCEP members formed after 2011 (the ANZ-Japan, ANZ-China, ANZ-Korea, China-Korea FTAs) reduce tariffs by 90%, NTMs by 20%.	tm_{ij}^{s}, tn_{j}^{s}
NBBM	Aside from the four FTAs, the remaining bilateral trade relations of the RCEP reduce tariffs by 90% and NTMs by 20%.	tm_{ij}^{s}, tn_{j}^{s}
BBM	On top of NBBM, the RCEP reduces fixed costs of domestic firms by 20% for exporters and by 10% for non-exporters.	$tm_{ij}^{s}, tn_{j}^{s}, FD_{ij}^{ss}$

BBM-FDI	On top of BBM, the RCEP reduce fixed costs of foreign invested firms by 20% for firms from partner countries and by 10% for firms from other regions, i.e. FDI liberalization.	$tm_{ij}^{s}, tn_{j}^{s}, FD_{ij}^{ss}, FF_{gij}^{ss}$
NBBM-I	India joins the RCEP without covering BBMs.	tm_{ij}^{s}, tn_{j}^{s}
BBM-I	India joins the RCEP covering BBMs.	$tm_{ij}^{s}, tn_{j}^{s}, FD_{ij}^{ss}$

4.2 Simulation results

4.2.1 Effects of BBMs on domestic firms

In order to show the effects of BBMs on domestic firms confronting the competition effect, we first show trade effects of the RCEP. Figure 5 shows changes of total exports in the NBBM and BBM scenarios. Japan stands out in terms of export increase. The exports of Japan will increase by 33% in NBBM and 55% in BBM. The extraordinary increase of Japan reflects the fact that the RCEP is the first time Japan liberalizing with its neighbors of China and Korea. Other RCEP members would also increase exports after the formation of RCEP. However, in the BBM scenario, ANZ and ASEAN would experience export decreases, and the decrease of ANZ is particularly significant. The decrease of ANZ is partly attributed to its reduced exports to Japan, as shown by the bilateral trade changes in Table 5. China, Korea and ASEAN expand markets in Japan, which probably squeeze the market share of ANZ. In addition, ANZ reduces exports of tradable services to all markets except ASEAN.

As shows by Figure 5, the export increases of China and Korea are clearly higher in BBM than in NBBM, suggesting that deeper trade liberalization covering BBMs can help big economies to expand more trade. India and ROW would reduce exports in both scenarios. Table 5 shows that the reductions are especially evident in Japan's market, indicating trade diversion effects of the RCEP.

From Table 5, we find that the pattern of bilateral trade expansion follows exactly the bilateral trade liberalization depicted in Figure 4. To detect the competition effect, we examine imports. Japan would increase imports from China, Korea and ASEAN. ASEAN would increase imports from all RCEP partners. The increases in imports of China and Korea are mainly from Japan and ASEAN. Comparing import increases in different countries, we find that the competition effect may be more significant for Japan and ASEAN than other members.

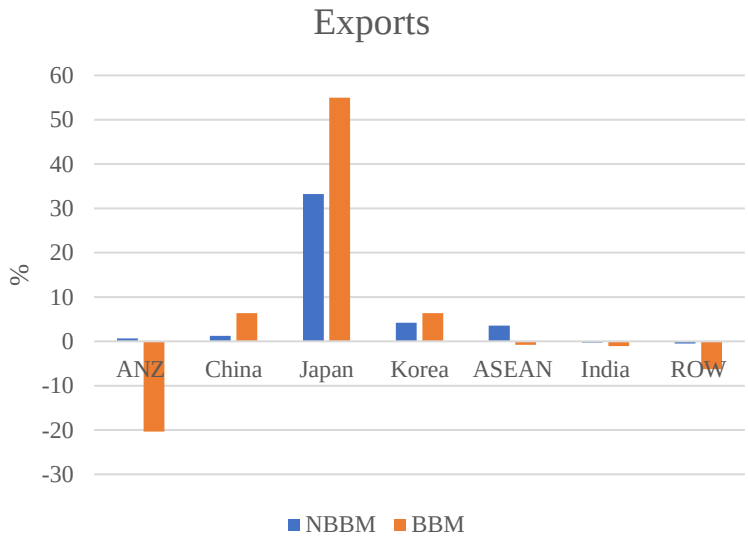

Figure 5 Changes of exports in NBBM and BBM scenarios (%)

Table 5 Changes of bilateral trade in NBBM and BBM scenarios (%)

Exporter	Importer	NBBM			BBM		
		a	m	s1	a	m	s1
ANZ	China	0	9	-2	11	15	-49
ANZ	Japan	-15	-36	-13	-10	-34	-52
ANZ	Korea	-2	3	-2	3	12	-41
ANZ	**ASEAN**	**42**	**149**	**45**	**50**	**184**	**10**
ANZ	India	-2	7	0	4	16	-39
ANZ	ROW	-2	7	0	-1	16	-38
China	ANZ	1	-9	-1	-16	-21	90
China	**Japan**	**47**	**42**	**26**	**45**	**44**	**38**
China	Korea	-1	-5	-2	-4	0	17
China	**ASEAN**	**67**	**158**	**45**	**65**	**186**	**117**
China	India	-1	-2	0	-3	3	21
China	ROW	-2	-2	0	-7	3	22
Japan	ANZ	-49	25	10	-86	19	107
Japan	**China**	**25**	**291**	**81**	**45**	**342**	**82**
Japan	**Korea**	**66**	**163**	**60**	**70**	**203**	**87**
Japan	ASEAN	-9	**274**	**61**	-69	**355**	**137**
Japan	India	-30	**35**	**11**	-5	**56**	**32**
Japan	ROW	0	**35**	**11**	-6	**56**	**33**
Korea	ANZ	3	-5	0	-12	-21	65
Korea	China	2	4	-1	8	4	-13
Korea	**Japan**	**65**	**33**	**27**	**67**	**30**	**20**
Korea	**ASEAN**	**52**	**159**	**46**	**54**	**177**	**89**
Korea	India	0	2	1	1	4	5

Korea	ROW	0	2	1	-4	4	6
ASEAN	**ANZ**	**30**	**105**	**54**	**10**	**62**	**134**
ASEAN	**China**	**57**	**131**	**63**	**64**	**117**	**32**
ASEAN	**Japan**	**25**	**29**	**26**	**25**	**20**	**10**
ASEAN	**Korea**	**51**	**76**	**44**	**49**	**69**	**36**
ASEAN	India	-1	1	0	-1	-3	-4
ASEAN	ROW	-1	1	0	-6	-3	-3
India	ANZ	2	-7	-1	-11	-24	56
India	China	2	2	-2	9	-1	-17
India	Japan	-14	-41	-13	-11	-43	-22
India	Korea	0	-4	-2	1	-4	-4
India	ASEAN	1	-2	1	-65	4	25
India	ROW	0	0	0	-2	0	0
ROW	ANZ	3	-8	20	-11	-26	-100
ROW	China	2	1	0	9	-4	4
ROW	Japan	-13	-41	-14	-11	-45	-22
ROW	Korea	1	-4	25	2	-7	77
ROW	ASEAN	1	-2	-7	3	1	-100
ROW	India	0	0	-7	2	-3	81

Source: Authors' estimations

Based on trade effects, we now look at the effects on domestic firms. Table 6 shows the changes of productivity thresholds for domestic firms to enter different markets in NBBM and BBM scenarios. In the NBBM scenario, reductions of tariff and NTMs make it easier for firms to export, and the productivity thresholds to enter foreign markets tend to decline. The decline is particularly evident for the firms of Japan, Korea and ASEAN, implying that more firms from these countries would enter export markets after the formation of the RCEP. For China, the productivity thresholds for entering Japan and ASEAN would drop, corresponding with China's trade expansions in the two markets. ANZ would gain easier market access only in the ASEAN market. Its accesses to China, Japan and Korea have been obtained from the bilateral FTAs before RCEP.

As for the access to domestic markets, trade liberalization in the NBBM scenario tends to raise productivity thresholds. The rising of productivity thresholds indicates that a lot of firms with lower productivity will exit the domestic market. The rising of productivity thresholds is especially significant for Japan. In the two heterogeneous sectors, manufacturing would increase by 2.9% and tradable services by 0.7%.

In the BBM scenario, when the RCEP deals with BBMs, the fixed costs of domestic firms would be reduced. The reduction of fixed costs directly impacts on productivity threshold, which allows more firms to enter both foreign and domestic markets. Table 6 shows that the productivity thresholds drop significantly for all RCEP countries. The drops are more significant in foreign markets than domestic markets since the reduction of fixed costs for exporters is twice as large as for non-exporters. In the domestic market of Japan's manufacturing industry, however, the productivity thresholds would still increase. Nevertheless, if we compare the two scenarios, we find that the

increase of productivity threshold drops from 2.9% in NBBM to 0.9% in BBM. The smaller increase in productivity threshold suggests that more firms can survive in the liberalized local market.

The manufacturing industry of ANZ will also experience increasing of productivity threshold, but its tradable services would reduce productivity threshold dramatically. The opposite changes in the two sectors may lead to exit of firms from manufacturing and entry of firms to tradable services. As shown in Figure 6, the total number of firms in ANZ will increase 22% in the BBM scenario, indicating that the number of new entrants exceeds the number of exiting firms.

Figure 6 shows significant increases of domestic firm numbers in all member countries in the BBM scenario, forming a contrast to decreases in NBBM. Without BBMs, Japan will lose firm numbers by 5.2%. With BBMs, the firm numbers of Japan would increase by 6.9%. That shows the positive effect of BBMs is strong enough to overtake the negative competition effect. In other member countries, BBMs also show evident effects on promoting firm numbers. The increases of domestic firm numbers show that BBMs can benefit domestic firms by helping them to secure markets in face of trade competition.

We also examine the effect on domestic firms from a view of sales. Table 7 shows changes of domestic firms' sales to foreign and local markets in NBBM and BBM scenarios. We first look at the NBBM scenario. Domestic firms of member countries would generally increase sales to foreign markets and reduce sales to local markets. Japan will reduce sales to the local market in all sectors. Even though the exports of Japan domestic firms will expand dramatically, the decrease of local sales leads to a 5% reduction of total sales. Other member countries display decreases in some sectors, but total sales will increase. That suggests the competition effect on Japan is more significant.

In the BBM scenario, BBMs show a promoting effect on sales, which tends to reduce decreases and enlarge increases in local sales. The decreases of Japan's sales to local market would reduce in all sectors, and total sales will drop by 4.1%, smaller than the 5.4% reduction in NBBM. In China, the local sales in agriculture and manufacturing would increase more in BBM than NBBM. Sales of tradable services will decrease, but total sales to the local market increase by 0.9%, higher than the 0.2% increase in NBBM. Similarly, domestic firms of Korea and ASEAN expand local sales in BBM. Together with sales expansion to foreign markets, the total of sales to foreign and local markets of China, Korea and ASEAN become higher than in NBBM. The better performances in total sales suggest that BBMs can benefit domestic firms by promoting their sales either in foreign markets or local markets.

ANZ, however, could hardly benefit from BBMs. Its sales to both foreign and local markets would decrease. The possible reason is that ANZ has not enjoyed reductions of tariffs and NTMs in the simulations of RCEP, but other members have. The significant reductions of tariffs and NTMs endow firms of other members with strong competitiveness relative to ANZ firms. The deepening of liberalization with BBMs further intensifies the unbalance in competitiveness. However, studies show that ANZ would benefit greatly from bilateral FTAs with China, Japan and Korea (Qi & Zhang, 2018; Quansah & Ahn, 2017).

Table 6 Changes of productivity thresholds for domestic firms to enter different markets in NBBM and BBM scenarios (%)

RCEP country	Market	NBBM		BBM	
		m	s1	m	s1
ANZ	ANZ	0.6	-0.1	2.8	-5.3
ANZ	China	-0.6	0.5	-3.0	3.3
ANZ	Japan	6.6	3.0	4.1	4.4
ANZ	Korea	0.1	0.4	-2.6	0.2
ANZ	ASEAN	-11.8	-7.9	-14.8	-12.1
ANZ	India	-0.3	-0.2	-3.0	-0.7
ANZ	ROW	-0.3	-0.2	-3.0	-0.8
China	China	0.0	0.3	-1.7	-1.1
China	ANZ	1.2	0.2	-0.6	-15.3
China	Japan	-5.7	-5.4	-9.2	-11.0
China	Korea	0.7	0.5	-3.6	-6.9
China	ASEAN	-12.9	-7.7	-17.1	-18.3
China	India	0.2	-0.1	-4.0	-7.7
China	ROW	0.2	0.0	-4.0	-7.8
Japan	Japan	2.9	0.7	0.9	-1.6
Japan	ANZ	-2.8	-1.7	-5.0	-16.7
Japan	China	-17.5	-12.1	-21.1	-15.9
Japan	Korea	-12.7	-9.7	-16.7	-16.1
Japan	ASEAN	-17.0	-9.6	-21.4	-19.7
Japan	India	-3.8	-2.0	-8.2	-9.2
Japan	ROW	-3.8	-2.0	-8.2	-9.3
Korea	Korea	0.1	0.0	-1.5	-2.6
Korea	ANZ	0.6	0.0	-0.9	-14.1
Korea	China	-0.6	0.4	-4.2	-2.7
Korea	Japan	-4.9	-5.6	-8.1	-9.7
Korea	ASEAN	-12.9	-7.9	-16.9	-17.2
Korea	India	-0.4	-0.3	-4.2	-6.4
Korea	ROW	-0.4	-0.3	-4.2	-6.5
ASEAN	ASEAN	0.0	-0.3	-1.3	-5.1
ASEAN	ANZ	-9.9	-9.3	-10.3	-20.4
ASEAN	China	-11.3	-10.4	-13.7	-11.2
ASEAN	Japan	-4.4	-5.4	-6.7	-7.6
ASEAN	Korea	-7.8	-7.8	-10.5	-11.4
ASEAN	India	-0.1	-0.1	-3.0	-4.2
ASEAN	ROW	-0.1	0.0	-3.0	-4.3

Source: Authors' estimations

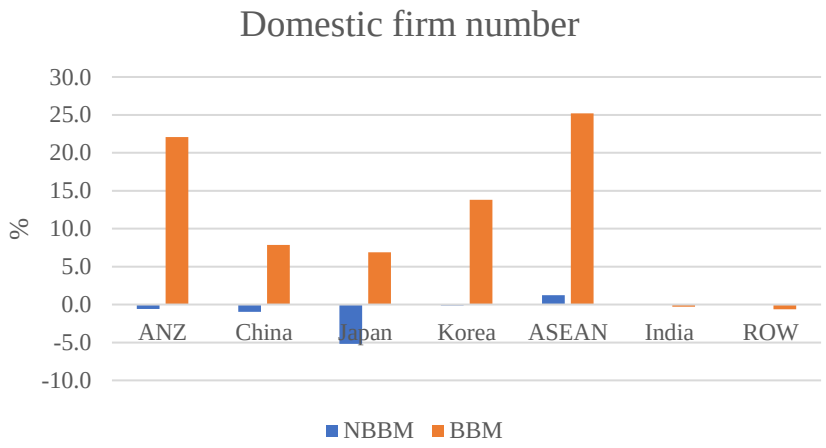

Figure 6 Changes of domestic firm numbers in NBBM and BBM scenarios (%)

Table 7 Changes in sales of domestic firms to foreign and local markets, and total sales in NBBM and BBM scenarios (%)

NBBM

Country	Sales to foreign market				Sales to local market					Total sales				
	a	m	s1	sum	a	m	s1	s2	sum	a	m	s1	s2	sum
ANZ	3.0	-2.6	0.4	0.5	0.5	-4.9	0.9	0.2	-0.1	1.2	-4.0	0.7	0.2	0.1
China	21.1	0.9	0.9	2.0	0.7	0.2	-0.3	0.1	0.2	1.3	0.5	-0.3	0.1	0.5
Japan	56.5	45	11.2	33	-5.7	-19.7	-2.4	-1.9	-5.4	-5.5	-17.2	-2.3	-1.9	-5.0
Korea	29.8	5.6	2.5	4.8	0.4	-0.7	0.9	0.6	0.3	0.7	2.9	1.6	0.6	1.8
ASEAN	16.7	5.0	0.8	3.6	-0.1	0	3.1	1.3	0.7	0.8	2.3	1.7	1.3	1.5

BBM

Country	Sales to foreign market				Sales to local market					Total sales				
	a	m	s1	sum	a	m	s1	s2	sum	a	m	s1	s2	sum
ANZ	7.2	-3.8	-17.1	-7.8	-11.5	-27.1	19.8	-5.0	-4.0	-6.0	-17.8	1.8	-5.0	-5.0
China	18.0	12.3	22.4	13.4	3.5	3.1	-3.7	0.2	0.9	3.9	6.6	-2.5	0.2	2.8
Japan	58.4	67.3	33.1	54.8	-3.5	-16.3	-1.3	-1.8	-4.1	-3.3	-13.1	-1.0	-1.8	-3.5
Korea	31.3	14.4	14	14.3	0.4	1.3	3.7	1.3	1.7	0.7	8.7	8.0	1.3	6.2
ASEAN	13.9	4.8	0.7	3.3	-0.4	-0.7	19.5	3.5	3.0	0.4	1.9	8.0	3.5	3.1

Source: Authors' estimations

Table 8 Changes of foreign firm numbers, imports, domestic firm numbers and domestic firm sales in BBM-FDI scenario (%)

Country	Foreign firm number	Imports	Domestic firm number		Domestic firm sales	
	BBM-FDI	BBM-FDI	BBM-FDI	BBM	BBM-FDI	BBM
ANZ	-0.8	-31.7	21.3	22.1	-4.2	-5.0
China	2.1	2.8	10.6	7.9	1.4	2.8
Japan	0.4	3.2	8.8	6.9	-1.8	-3.5
Korea	16.7	15.2	19.7	13.8	7.8	6.2
ASEAN	10.5	-7.2	20.7	25.2	0.1	3.1

Source: Authors' estimations

Table 8 shows the competition from FDI and trade, and the performance of domestic firms in the BBM-FDI scenario. With FDI liberalization, the number of foreign invested firms grows. The growth is particularly significant for Korea and ASEAN, 16.7% and 10.5% respectively. China will experience an increase of 2.1% and Japan will increase by 0.4%. At the same time, imports to China, Japan and Korea would increase. The simultaneous increases in FDI and imports tend to squeeze the local markets of domestic firms. However, the domestic firm numbers and sales shown in Table 8 indicate that domestic firms can cope with the competition of FDI and trade. Domestic firm numbers would increase in all member countries in the BBM-FDI scenario, and the increases are close to that of the BBM scenario. Total sales of domestic firms would increase in China, Korea and ASEAN, but decrease in ANZ and Japan. However, the decreases are less than that of the BBM scenario. The performances of domestic firms suggests that the additional competition from FDI would not cause further contraction of domestic industries.

4.2.2 Effects of BBMs on India

In scenarios of NBBM-I and BBM-I, we simulate India joining the RCEP. These two simulations aim to detect the shock of the RCEP to India's domestic industry. Table 9 shows changes of Indian domestic firms in terms of exports, domestic sales, total sales, firm number, productivity threshold and variable costs. In the NBBM-I scenario, Indian firms would expand exports in all sectors, resulting in a 2.7% increase of total exports. In terms of domestic sales, manufacturing and services would increase sales, but sales in agriculture will decrease, leading to a 0.68% reduction of total sales. Nevertheless, the total sales in foreign and domestic markets will increase by 0.68%. In terms of firm numbers, trade liberalization would not cause firms to exit. The numbers of domestic firms increase in the two heterogeneous sectors of manufacturing and tradable services along with drops of productivity threshold. The drop of productivity threshold probably relates to variable production costs, since variable costs would reduce in all sectors. The reduction of variable costs enables firms with lower productivity to survive in the market.

The simulation results of NBBM-I show that the competition effect of the RCEP is not serious for India. Only the agriculture sector would be shocked. However, BBMs of FTA could hardly impact on agriculture, since the main NTMs in agriculture are SPS measures, which belongs to border barriers as shown in Table 1. From the BBM-I scenario of Table 9, we find that BBMs can help manufacturing and tradable services to attract more domestic firms by reducing productivity thresholds. Domestic sales of tradable services increase by 6.4%, higher than the increase of 3.9% in NBBM-I. Non-tradable services also enlarge the increase in domestic sales from NBBM-I. Manufacturing would export more in BBM-I than NBBM-I. Agriculture would face reductions in sales to foreign and local markets, but the reduction in domestic sales is smaller in BBM-I than NBBM-I. In total, Indian firms would increase exports by 10.1%, domestic sales by 1.3%, and total sales by 2.4% in BBM-I, as comparing to 2.7%, -0.68%, and 0.68% in NBBM-I. The better performance of sales in BBM-I suggests that BBMs can benefit Indian firms.

The benefits of BBMs are verified by welfare improvements of India (Figure 7). India can gain welfare from the RCEP even when India is not a member of it. The RCEP covering BBMs can benefit India more, raising its welfare by 65 billion USD. India will gain even more by joining the RCEP, especially the RCEP with BBMs. If India joins the RCEP with BBMs, the welfare of India

will increase by 178.6 billion USD.

Table 9 Changes of Indian domestic firms in NBBM-I and BBM-I scenarios (%)

NBBM-I						
Sector	Exports	Domestic sales	Total sales	Firm number	Productivity threshold	Variable costs
a	51.8	-4.1	-2.3			-1.6
m	10.6	8.7	9.4	8.7	-1.1	-1.1
s1	1.9	3.9	3.1	0.9	-0.2	-0.4
s2		2.3	2.3			-0.5
total	2.7	-0.68	0.68	1.7		
BBM-I						
Sector	Exports	Domestic sales	Total sales	Firm number	Productivity threshold	Variable costs
a	-9.5	-1.3	-1.6			-3.0
m	14.2	8.3	10.6	20.3	-2.4	-1.6
s1	12.7	6.4	9.0	14.7	-2.6	-0.3
s2		3.1	3.1			-0.7
total	10.1	1.3	2.4	15.3		

Source: Authors' estimations

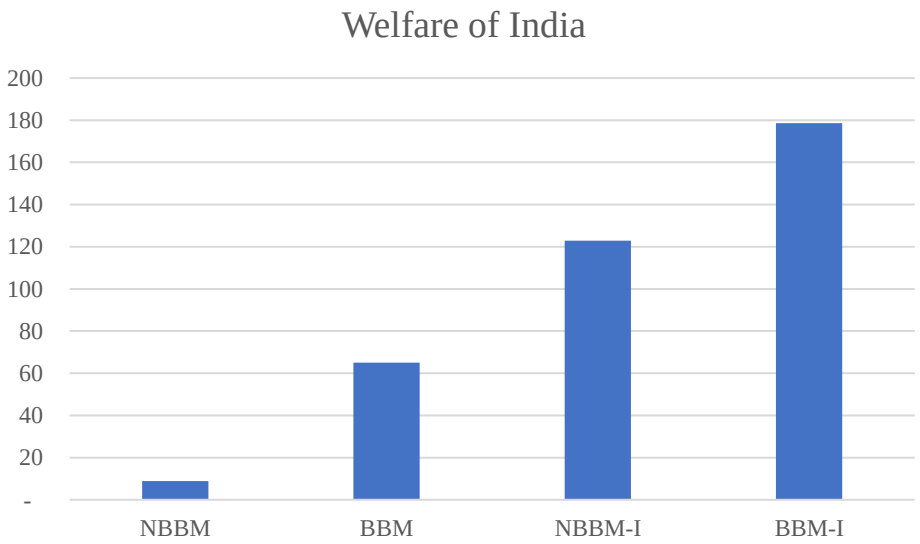

Figure 7 Welfare of India, in billion USD

4.2.3 Welfare effects

Based on the better performance of domestic firms in BBM than NBBM, we expect the welfare of members would be higher in BBM. Figure 8 shows that the RCEP can improve the welfare of members, and the welfare improvement is more evident in BBM scenario. Japan will benefit the most among members given its dramatic export expansion. China could only gain a small amount

of welfare in NBBM scenario, but in the BBM scenario China's welfare will increase by 87.4 billion USD, accounting for 0.68% of its real GDP. The welfare gains of ASEAN are more than Korea in both scenarios. ANZ could only improve welfare in the NBBM scenario, but lose in BBM. The loss of welfare is consistent with sales contraction of ANZ firms. However, we should remember that ANZ gains from the 4 FTAs.

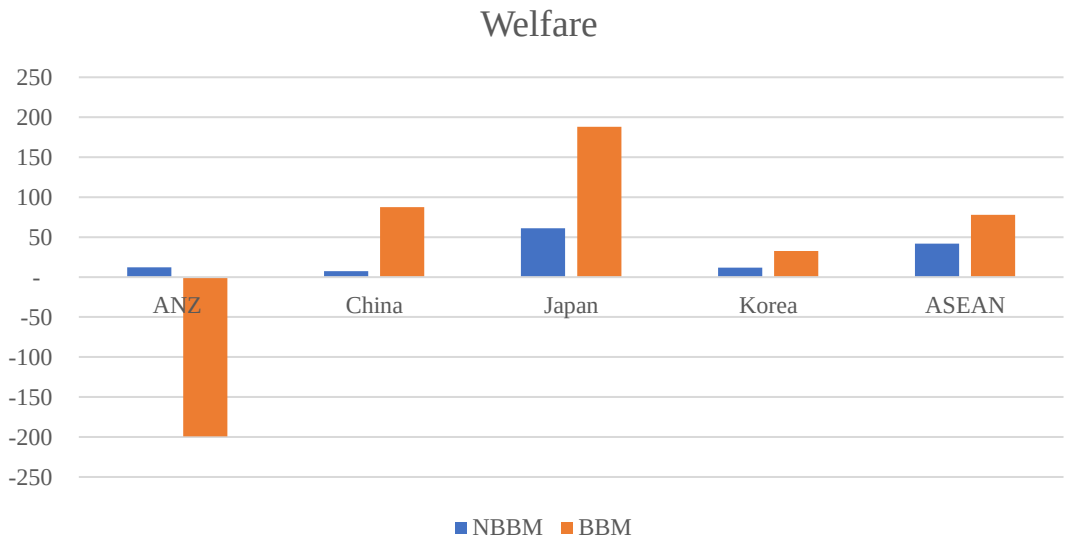

Figure 8 Welfare changes in NBBM and BBM scenarios, in billion USD

5. Sensitivity tests

Elasticity of substitution (σ) and related shape parameters (γ) of productivity distribution are critical parameters of the FHFDI model. We conduct two sensitivity tests with higher and lower elasticities, as shown in Table 10. The shape parameters change with the elasticity of substitution.

Simulation results for the BBM scenario show that the main results are robust (Table 11). We compare the results of sensitivity tests with the base results for three main variables, including total exports, domestic firm numbers and total sales of domestic firms. In terms of exports, Japan remains the biggest winner with large export increases. The increases of exports tend to be larger in higher elasticity and smaller in lower elasticity, consistent with theoretical expectation as higher elasticity indicates that the demand for imports is more sensitive to prices, and the price reduction following trade liberalization can stimulate more trade, and vice versa. In terms of domestic firm numbers and sales, the changes in sensitivity tests are very close to the base simulation.

Table 10 Parameters for sensitivity tests

Sector	Base elasticity		Higher elasticity		Lower elasticity	
	σ	γ	σ	γ	σ	γ
agriculture	3.5		3.75		3	
manufacturing	6	7.75	6.5	8.53	4.3	5.2

tradable services	4.3	5.17	4.5	5.43	4.1	4.8
non-tradable services	2.44		2.5		3	

Table 11 Results of sensitivity tests for changes in exports, domestic firm number, total sales of domestic firms in the BBM scenario (%)

	Exports			Domestic firm numbers			Total sales of domestic firms		
	Base	H	L	Base	H	L	Base	H	L
ANZ	-20	-20	-24	22	22	22	-5	-5	-6
China	6	6	5	8	8	10	3	3	3
Japan	55	57	42	7	6	9	-3	-4	-2
Korea	6	6	7	14	14	18	6	6	7
ASEAN	-1	-1	-7	25	26	31	3	3	1
India	-1	0	-1	0	-1	1	0	1	0
ROW	-6	-7	-5	-1	-1	-1	-2	-2	-2

Source: Author's estimations

6. Concluding comments

After decades of development, behind-border barriers have become the frontier of trade liberalization within an FTA framework. BBMs deal with domestic regulations that cause barriers to trade. The regulation-based barriers more than often not only hinder trade, but also cause obstacles to domestic firms. When FTAs tackle BBMs by removing restrictive regulations or improving regulatory regimes, domestic firms are likely to benefit too. This paper investigates the benefits of BBMs to domestic firms. Considering concerns of countries about the competition effect of FTA, this study is of important policy implications.

Using the recently signed RCEP as an example, we simulate the effects of BBMs on domestic firms. The simulation is conducted via a firm heterogeneity CGE model that separates foreign invested firms from domestic firms. The CGE model treats BBMs as raising fixed costs, and treat NTMs besides BBMs as raising variable costs. Through the channel of fixed costs, BBMs directly impact on productivity threshold and the number of active firms in market.

Simulation results reveal that BBMs can benefit domestic firms by promoting firm numbers and sales. In terms of firm numbers, BBMs not only can stop the reduction of firm numbers caused by trade competition, but also can promote new firms to enter the market. In terms of sales, BBMs can promote sales of domestic firms in foreign and local markets. BBMs assist firms of China, Japan, and Korea to significantly expand exports, and assist firms of China, Korea and ASEAN to increase sales to local markets. Even though domestic firms of Japan would reduce sales in the local market, the sales reduction becomes smaller with BBMs than without.

We also simulate with India joining the RCEP. Simulation results show that the competition effect is not significant for India. Only its agriculture sector would reduce sales. Compared with the RCEP without BBMs, BBMs can reduce the contraction of agriculture in sales to the local market, and meanwhile promote sales in manufacturing and services sectors. The total sales of India to both

foreign and local markets would increase with BBMs. The result suggests that India does not need to excessively worry about the competition from RCEP members. The RCEP covering BBMs can bring India expanded foreign markets and extended domestic markets, raising India's welfare.

Our paper has significant policy relevance, demonstrating the channel through which domestic firms can cope with the competition of trade and FDI under the FTA framework. In particular, we show that the RCEP with BBMs can greatly lift member countries' welfare by securing the share of local market for domestic firms while at the same time helping domestic firms to expand foreign market. This finding echoes Webb, Strutt, Gibson, and Walmsley (2020) that the improvements in regulatory regimes motivated by the pursuing of BBMs in free trade agreements should be seen as a tool for encouraging economic growth.

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Reference

Balistreri, E. J., & Tarr, D. G. (2019). Comparison of deep integration in the Melitz, Krugman and Armington models: The case of The Philippines in RCEP. *Economic Modelling*. doi:https://doi.org/10.1016/j.econmod.2019.05.023

Benz, S., Rouzet, D., & Spinelli, F. (2020). Firm heterogeneity in services trade: Micro-level evidence from eight OECD countries. *The World Economy, 43*(11), 2905-2931. doi:https://doi.org/10.1111/twec.13031

Crozet, M., Milet, E., & Mirza, D. (2016). The impact of domestic regulations on international trade in services: Evidence from firm-level data. *Journal of Comparative Economics, 44*(3), 23.

Egger, P., Francois, J., Manchin, M., & Nelson, D. (2015). Non-tariff barriers, integration and the transatlantic economy. *Economic Policy, 30*(83), 46.

Finger, J. M., & Nogués, J. J. (2002). The Unbalanced Uruguay Round Outcome: The New Areas in Future WTO Negotiations. *The World Economy, 25*(3), 321-340. doi:https://doi.org/10.1111/1467-9701.00435

Fontagné, L., Guilin, A., & Mitaritonna, C. (2011). *Estimations of Tariff Equivalents for the Services Sectors*. Retrieved from CEPII:

Fontagné, L., Mitaritonna, C., & Signoret, J. E. (2016). Estimated Tariff Equivalents of Services NTMs. *CEPII Working Papers*.

Fontagné, L., Orefice, G., Piermartini, R., & Rocha, N. (2015). Product standards and margins of trade: Firm-level evidence. *Journal of International Economics, 97*, 16.

Helpman, E., Melitz, M. J., & Yeaple, S. R. (2004). Export versus FDI with Heterogeneous Firms. *The American Economic Review, 94*(1), 300-316. doi:10.2307/3592780

Hertel, T. W., Walmsley, T., & Itakura, K. (2001). Dynamic Effects of the "New Age" Free Trade Agreement between Japan and Singapore. *Journal of Economic Integration*(16), 39.

Hur, J., & Qiu, L. D. (2020). Tariffs and formation of free trade agreements networks. *The World Economy*(43), 27.

Ing, L. Y., Cadot, O., & Walz, J. (2018). Transparency in non-tariff measures: An international comparison. *The World Economy, 41*(3), 884-912. doi:https://doi.org/10.1111/twec.12552

Jafari, Y., & Britz, W. (2018). Modelling heterogeneous firms and non-tariff measures in free trade agreements using Computable General Equilibrium. *Economic Modelling*(73), 16.

Kawasaki, K. (2015). The relative significance of EPAs in Asia-Pacific. *Journal of Asian Economics, 39*(Supplement C), 19-30. doi:https://doi.org/10.1016/j.asieco.2015.05.001

Kawase, T., & Ambashi, M. (2018). *Disciplines on State-Owned Enterprises under the Trans-Pacific Partnership Agreement: Overview and assessment*. Retrieved from

Konan, D. E., & Maskus, K. E. (2006). Quantifying the Impact of Services Liberalization in a Developing Country. *Journal of Development Economics, 81*(1), 142-162. doi:http://dx.doi.org/10.1016/j.jdeveco.2005.05.009

Latorre, M. C., Olekseyuk, Z., & Yonezawa, H. (2020). Foreign multinationals in service sectors: A general equilibrium analysis of Brexit. *The World Economy, 43*(11), 2830-2859. doi:https://doi.org/10.1111/twec.13034

Lee, H., & Itakura, K. (2017). The welfare and sectoral adjustment effects of mega-regional trade agreements on ASEAN countries. *Journal of Asian Economics*. doi:https://doi.org/10.1016/j.asieco.2017.09.001

Lejour, A., Rojas-Romagosa, H., & Verweij, G. (2008). Opening Services Markets within Europe: Modelling Foreign Establishments in a CGE Framework. *Economic Modelling, 25*(5), 1022-1039. doi:http://dx.doi.org/10.1016/j.econmod.2008.01.007

Li, C., Wang, J., & Whalley, J. (2016). Impact of mega trade deals on China: A computational general equilibrium analysis. *Economic Modelling, 57*, 13.

Li, Q., & Moon, H. C. (2018). The trade and income effects of RCEP: implications for China and Korea. *Journal of Korea Trade, 22*(3), 306-318. doi:10.1108/JKT-03-2018-0020

Li, Q., Scollay, R., & Gilbert, J. (2017). Analyzing the Effect of the RCEP on Foreign Direct Investment within a Firm Heterogeneity CGE Framework. *Economic Modelling, 66*. doi:http://dx.doi.org/10.1016/j.econmod.2017.07.016

Melitz, M. J. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica, 71*(6), 1695-1725.

Mezarina, J. L. C. (2020). The impact of free trade agreements in national markets: Evidence from the telecommunications sector in Latin America. *Review of International Economics*(00), 44.

Pelkmans, J., Hu, W., Mustilli, F., Salvo, M. D., Francois, J., Bekkers, E., . . . Tomberger, P. (2016). *Tommorrow's Silk Road: Assessing an EU-China Free Trade Agreement*. Retrieved from

Qi, C., & Zhang, J. X. (2018). The economic impacts of the China-Australia Free Trade Agreement - A general equilibrium analysis. *China Economic Review, 47*, 1-11. doi:https://doi.org/10.1016/j.chieco.2017.11.002

Quansah, K. A., & Ahn, W. C. (2017). The Effect of the Korea-Australia Free Trade Agreement (KAFTA) on the Korea-Australia Trade Structure. *The Asian Journal of Shipping and Logistics, 33*(4), 229-235. doi:https://doi.org/10.1016/j.ajsl.2017.12.006

Sheng, B. (2015). *China's trade development strategy and trade policy reformes: Overview and preosepct*. Retrieved from Manitoba:

Wang, H. (2016). The Challenges of China's Recent FTA: An Anatomy of the China-Korea FTA. *Journal of World Trade, 50*(3), 417-446. Retrieved from <Go to ISI>://WOS:000378471600003

Webb, M., Gibson, J., & Strutt, A. (2019). Market access implications of non-tariff measures: Estimates for four developed country markets. *The World Economy, 42*(2), 376-395. doi:https://doi.org/10.1111/twec.12706

Webb, M., Strutt, A., Gibson, J., & Walmsley, T. (2020). Modelling the impact of non-tariff measures on supply chains in ASEAN. *The World Economy, 43*(8), 2172-2198. doi:https://doi.org/10.1111/twec.12955

Winchester, N. (2009). Is there a dirty little secret? Non-tariff barriers and the gains from trade. *Journal of Policy Modeling*(31), 16.

Zhai, F. (2008). Armington Meets Melitz: Introducing Firm Heterogeneity in a Global CGE Model of Trade. *Journal of Economic Integration, 23*(3), 575-604.