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The role of Japanese multinationals' affiliates in China: A dynamic CGE analysis of FDI between Japan and China

(Preliminary version)

María C. Latorre
(Universidad Complutense de Madrid)

Nobuhiro Hosoe
(National Graduate Institute for Policy Studies)

Abstract

This paper analyzes the impact of the foreign direct investment (FDI) evolution of Japanese multinational enterprises (MNEs) operating in China during the recent financial crisis. The study is conducted by means of a three region (Japan-China-ROW) recursive dynamic computable general equilibrium (CGE) model of MNEs. Outstanding data from the METI of the operations of Japanese MNEs are used. Thus, we model Japanese MNEs taking into account their export and import propensity, the value added and production they generate, as well as, their capital intensity patterns. These features stand out among the few CGEs that consider the presence of MNEs. The FDI decrease would seem to produce rather small adjustments in the aggregate variables of China and Japan. However, their bilateral trade patterns are considerably affected. Furthermore, in the case of Japanese MNEs operating in the Chinese transport equipment sector, the fall in FDI would bring about a reduction in exports to the rest of the world region. This would suggest a potential conduit by which FDI patterns between China and Japan would also impact world trade flows.

1. Introduction

In the *World Investment Prospect Survey* by UNCTAD, China has always appeared as the world's most attractive destination of foreign direct investment (FDI) in 2008-2012. China also seems to rank at the top among Japanese preferred foreign investment destinations (Ramstetter, 2011). In turn, Japan has recently recovered its position as the world wide second largest investor after the US (UNCTAD, 2012). However, this contrasts with the initial collapse of Japanese's FDI in China at the beginning of the crisis, which constitutes the center of the analysis of this paper.

Generally, analyses of FDI have concentrated on the impact of their expansion. Our aim is to shed light on the effects of reductions in FDI flows that have been the norm across the world during the beginning of the recent financial crisis. The potential effects of the decrease in FDI could *a priori* very vast. They may affect factors remunerations, savings, GDP growth, technological transfers and productivity, the climate of competition among firms, foreign trade (Lipsey, 2002; Barba Navaretti and Venables, 2004; Latorre, 2009)…etc. Further, some authors have suggested particular patterns in the FDI conducted in East Asia (e.g., Petri, 2012), which would suggest different impacts compared to other regions. The impressive increases in Chinese GDP growth has often been related to the huge amount of FDI flows received (e.g., Kym et al., 2003). The explosion of its foreign trade flows also seems to be very much related to the activities of MNEs in that country (e.g., Dean et al., 2009). Some authors have pointed out that in the absence of FDI flows, the Chinese high rates of GDP growth and exports would be in danger (Whalley and Xin, 2010). By contrast, Japanese FDI in China, despite the sizeable increases experienced before the crisis, constitutes a small share of its overall foreign investments (Greaney and Yao, 2009). Therefore, its evolution could turn out to be not very important for the Japanese economy. Or would it?

In this study we address these issues. In particular, we have tried to answer the following two main questions. The first one is how the pattern of FDI from Japan to China

has transformed these domestic economies in terms of, especially, industrial composition and competition between local firms and multinational enterprises (MNEs). The second question is how much the evolution of FDI has changed the comparative advantages of their industries and the resulting trade patterns between them. We also study whether the adjustments in Japan and China have an effect for the rest of the world. Indeed, the effects of the reduction of Japanese FDI flows in China have been studied with a world trade and recursive dynamic CGE model, calibrated to the GTAP database version 8. The presence and uniqueness of Japanese MNEs' affiliates in China, in terms of sourcing of input and sales of output, is estimated with their rich and detailed survey dataset by METI.

Regarding MNEs' operations several characteristics of the model contribute to a literature where the CGEs incorporating MNEs are rather scarce. With respect to earlier static studies by Latorre et al. (2009) and Latorre (2010) our model develops a dynamic setting. Further, the present model exhibits a technological differentiation between MNEs' and national firms operating in the same sector. This is absent in prominent CGE models of MNEs, such as Jensen and Tarr (2012) which extend their important contributions in Jensen et al. (2007) and Rutherford and Tarr (2008) to a multiregional framework. On the other hand, the CGE model with MNEs by Lakatos and Fukui (2012) includes some detail on the technological differentiation between national firms and MNEs of the same sector. We broaden the scope of that technological differentiation by including the export propensity, imported as well as domestic intermediates linkages and value added creation of national firms versus MNEs. This information, based on the MNE data obtained from METI, provides a sound base to proxy the complex strategies that FDI exhibits nowadays (Baldwin and Okubo, 2012).

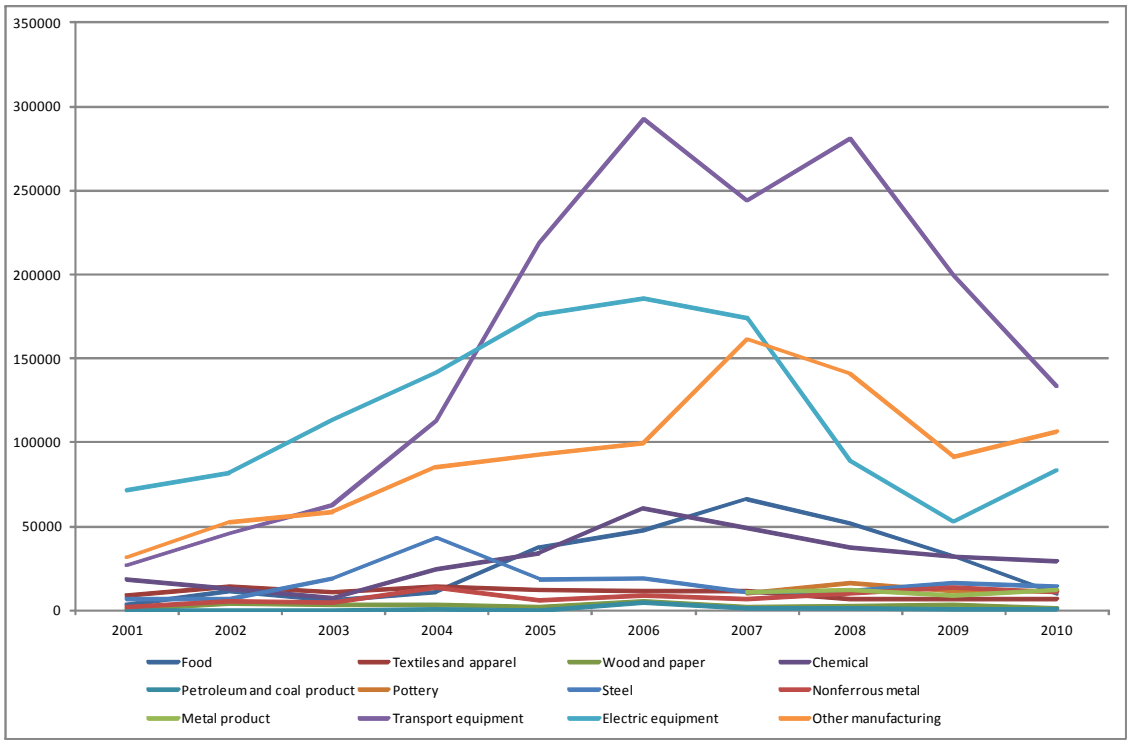
The rest of the paper is organized as follows. The next section summarizes the recent evolution of Japanese FDI China. Section 3 explains the model used in our analysis. Section 4 describes the data and the simulation run and it also offers a picture of the export structure of Japan and China. The main results are discussed in section 5. Finally, section 6

concludes.

2. Recent Evolution of Japanese FDI in China

Japanese MNEs in China are more predominant in manufacturing sectors (Greaney and Yao, 2009; Dean et al., 2009). Figure 1 presents the evolution of these manufacturing FDI outflows to China in the period 2001-2010 and shows a more intense concentration of FDI investments in transport equipment, electronic equipment and other manufacturing. They steadily increase before the crisis but then sharply decrease. As FDI is closely linked with investment activities, FDI is often found highly volatile. Therefore, we should examine the impact of FDI not only by its volume but also by the presence of MNEs in each host sector in terms of production, employment and foreign trade (Markusen, 2002). This motivates us to take a computable general equilibrium (CGE) approach, where the micro and macroeconomic effects of MNEs and their FDI are described in an integrated manner.

Figure 1: Japanese FDI flows in China 2001-2010 (in millions of nominal JPY)



3. Model

The model follows the lines of Hosoe (2013).The innovation appears in the fact that we consider Japanese firms' investment and activity in their affiliates located in China (Figure 2). [1] There are 20 sectors distinguished, among which, only in China, 12 manufacturing sectors are split into two: those for local firms (j ={AGR, …, GAS, FOD, …, MAN, ELY, SRV})and those for Japanese firms' affiliates (j_MN ={FOD2, …, MAN2}) (Table 1). This aggregation pattern is made to use the sectors of METI data with maximum details conformable to the GTAP sectors and matches the above documented concentration of Japanese FDI in Chinese manufacturing. No MNE affiliates are assumed to operate in either Japan or the rest of the world (ROW), but only China hosts MNE affiliates established by Japanese FDI.[2] The model structure for Japan and the ROW is conventional; thus detailed description is made only for China as follows.

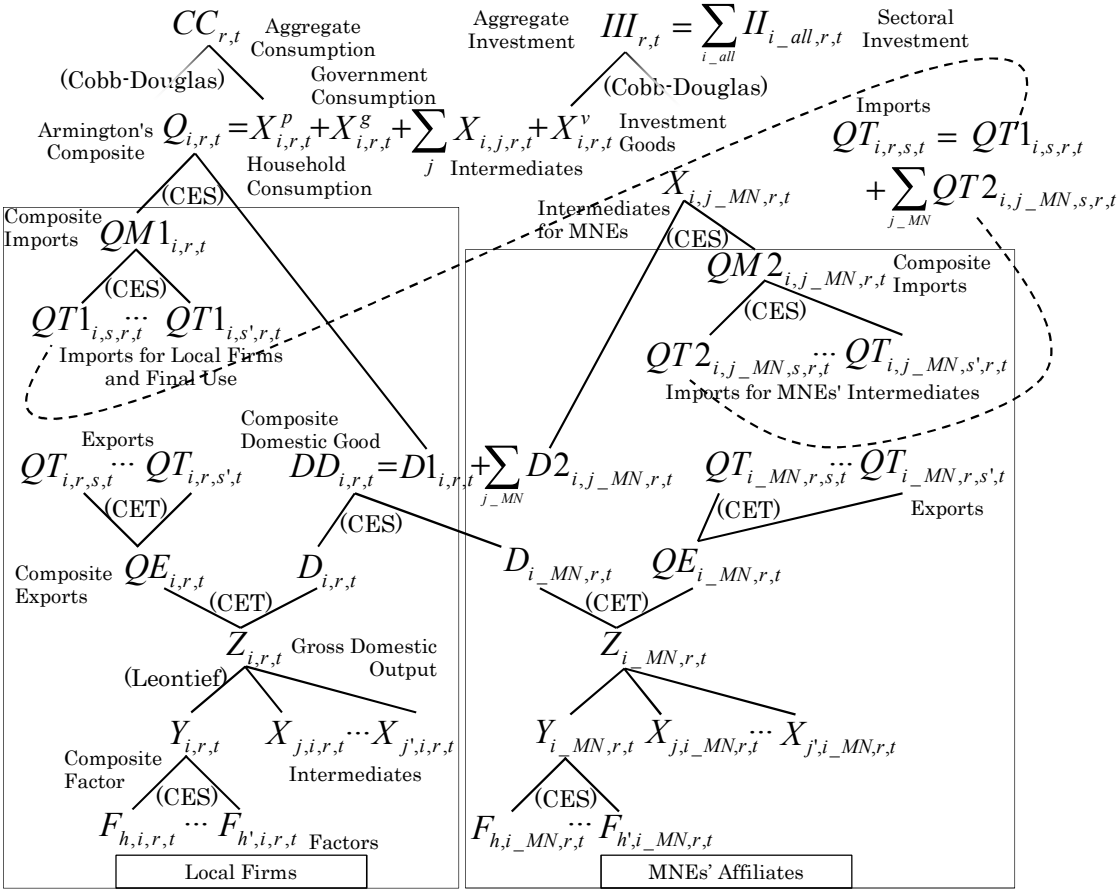
In China, the gross domestic output $Z_{i,CHN,t}$ and $Z_{i\_MN,CHN,t}$ are transformed into the composite exports $QE_{i,CHN,t}$ and $QE_{i\_MN,CHN,t}$ and the domestic goods $D_{i,CHN,t}$ and $D_{i\_MN,CHN,t}$ with CET technology. The shares of Japanese MNEs in Chinese production are proxied by their weight in shares (Table 2). By assuming two separate CET structure individually for local firms and MNE affiliates, we can assume different export-domestic supply ratios for them to reflect the actual observation provided by METI (Table 3). The domestic good produced by the local firms $D_{i,CHN,t}$ and that of the MNEs'affiliates $D_{i\_MN,CHN,t}$ in the corresponding sector, if any, are combined into a composite domestic good $DD_{i,CHN,t}$ using aconstant elasticity of substitution (CES) aggregation function, according to the sectoral correspondence shown in Table 1. For this CES function, we use the

[1]"China" refers to mainland China unless otherwise specified.

[2]Although multinationals in Japan and the ROW as well as those in China have foreign affiliates in reality, we omit them for simplicity.

elasticity of substitution often assumed for that between imports and domestic goods, following Latorre et al. (2009).

Figure 2: Structure of the CGE Model for FDI Analysis (within a period)



The Armington's composite goods for local firms' intermediate input and final uses are produced in a conventional manner by combining the composite imports $QM1_{i,CHN,t}$ and the domestic goods $D1_{i,CHN,t}$. The Armington's composite for MNEs' intermediate inputs are made separately from that Armington composite so that we can assume different import-domestic demand ratio between these, which can partly reflect the linkages between MNE headquarters in Japan and MNE affiliates established in China (Table 3).

Table 1:Sectoral Aggregation

Abbreviation	Sector
AGR	Agriculture
COA	Coal (mining)
OIL	Oil (mining)
GAS	Gas (mining)
FOD, FOD2*	Food
TXA, TXA2*	Textiles and apparel
WPP, WPP2*	Wood and paper
CHM, CHM2*	Chemical
PTC, PTC2*	Petroleum and coal product
POT, POT2*	Pottery
STL, STL2*	Steel
NFM, NFM2*	Nonferrous metal
MET, MET2*	Metal product
TEQ, TEQ2*	Transport equipment
EEQ, EEQ2*	Electric equipment
MAN, MAN2*	Other manufacturing
ELY	Electricity (energy)
TWG	Town gas (energy)
TRS	Transportation
SRV	Service

*: Sectors hosting Japanese MNEs' affiliates in China.

Table 2: Sales, Exports and Imports Computed Share of Japanese Affiliates in Mainland China (mil. JPY and percentages)

	Sales		Exports		Imports	
Sector	Sales	Share	Exports	Share	Imports	Share
Food	566,320	1.0	70,682	2.45	95,360	0.71
Textiles and apparel	368,773	0.7	214,484	1.13	1113,822	5.36
Wood and paper	70,382	0.2	16,207	0.27	182,338	0.95
Chemical	761,871	0.9	188,210	7.38	1540,958	6.89
Petroleum and coal product	31,756	0.1	1,993	0.02	71,386	0.04
Pottery	125,163	0.3	48,274	1.63	311,420	0.43
Steel	605,860	1.1	82,876	1.89	1846,646	7.61
Nonferrous metal	191,994	0.7	72,948	3.77	440,928	0.96
Metal product	171,904	0.7	93,059	1.81	343,317	3.65
Transport equipment	5,338,184	12.7	687,613	14.29	10042,343	37.26
Electric equipment	3,568,637	6.2	2,438,628	7.53	16080,770	9.75
Other manufacturing	4,412,727	3.2	2,480,315	6.24	11421,649	8.43

Source: METI and GTAP Database.

Table 3: MNEs' Input and Sales Share by Origin and Destination [%]

	Share of Input from			Share of Sales to		
	JPN	CHN	ROW	JPN	CHN	ROW
Food	1.7	97.1	1.2	10.4	87.5	2.1
Textiles and apparel	32.9	53.0	14.1	48.6	41.8	9.5
Wood and paper	27.4	52.8	19.8	4.5	77.6	17.9
Chemical	21.8	65.2	13.0	12.9	75.3	11.8
Petroleum and coal product	19.8	68.4	11.8	4.5	93.7	1.8
Pottery	33.7	52.5	13.8	18.9	61.4	19.6
Steel	37.4	58.6	4.0	2.2	86.3	11.4
Nonferrous metal	25.4	65.1	9.5	23.7	62.0	14.2
Metal product	28.8	62.7	8.5	36.5	45.9	17.7
Transport equipment	25.8	71.2	3.0	7.5	87.1	5.4
Electric equipment	44.9	31.8	23.3	38.1	31.7	30.2
Other manufacturing	27.7	58.8	13.5	30.8	43.9	25.3

Source: METI, compiled by the authors.

The structure driving Japan's FDI in China is the new feature (Figure 3). As the MNEs' affiliates in China are established by Japan's FDI, their investment behavior is determined by the rate of returns of capital and its sectoral mass in both Japan and China. They allocate the aggregate investment (or new capital) $III_{JPN,t}$ as sectoral investment $II_{j,JPN,t}$ or $II_{j\_MN,CHN,t}$ not only among Japanese domestic sectors $j=\{AGR,...,FOD,...,MAN,...,SRV\}$ but also the MNEs' sectors in China $j\_MN=\{FOD2,...,MAN2\}$ considering their share of gross operating surplus (Figure 3). The investment goods allocated to MNEs' affiliates in China $II_{j\_MN,CHN,t}$ increase their capital stocks while these MNE sectors employ labor forces $h\_mob=\{SLB,ULB\}$ but no capital in China.

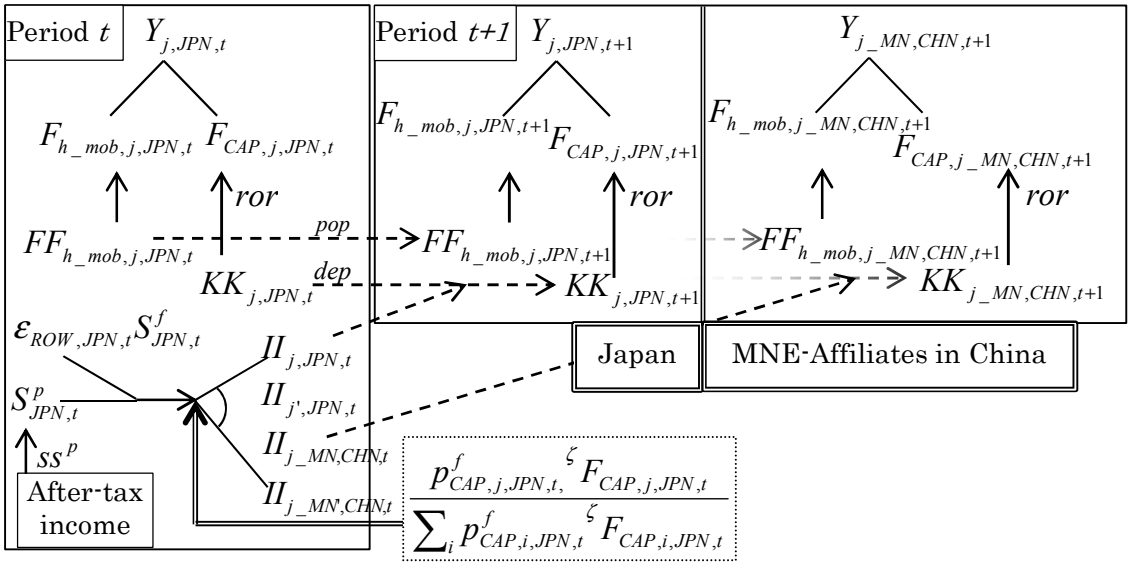
Savings and investment are modeled by following Hosoe (2013) (Figure 3). The domestic savings $S^p_{r,t}$ are generated with the constant propensity to save in each region ss^p_r and combined with foreign savings $S^f_{r,t}$, which is exogenous but growing constantly at the

rate of pop , to cover investment expenses. These funds are allocated among investment for domestic firms $II_{j,r,t}$ and the MNE affiliates (only in China) $II_{j\_MN,CHN,t}$. The domestic sectoral investment $II_{j,r,t}$ is determined by the share of their sectoral operating surplus $p^{f}_{CAP,j,r,t}{}^{\zeta} F_{CAP,j,r,t}$ in their total. In contrast to the original model by Hosoe (2013), however, the FDI $II_{j\_MN,CHN,t}$ is assumed to be exogenous so that we can manipulate it to examine their hypothetical changes in our counter-factual simulation. The aggregate investment goods (or new capital) $III_{JPN,t}$ is made from various investment good input $X^{v}_{i,r,t}$ with a Cobb-Douglas type production technology and allocated among the sectoral investment in the r-th region $II_{j\_all,r,t}$.

Theoretically, there are three typical patterns of FDI. One is horizontal FDI–a firm establishes its affiliates located close to their local customers to save transportation costs or avoid high trade barrier. In this case, the MNE affiliatesare established in the same sector where its headquarter (HQ) company belong. The second is vertical FDI–a firm locates its affiliates where cheap input (often labor) is offered. In this case, the foreign affiliates' sector tends to differ from that of its HQ company (e.g., an automobile company establishes its sales company abroad). The third is export-platform FDI. While this type of FDI is made often in the same sector as their HQ company seeking for cheap input just like the horizontal FDI, this is mainly for exports to the third country, not for sales in the local market. This is often observed in export processing zones. Other than these three, FDI nowadays becomes more complicated (Baldwin and Okubo (2012)). These FDI patterns imply that we have to assume some structure who in Japan invests in which sector in China. However, we cannot exactly identify or predict which type of FDI among these three occurs empirically in reaction to the assumed shocks in our macro model. Therefore, as a rule-of-thumb, we assume the above-mentioned new capital allocation structure as well as the nested Armington (1969) structure. They can depict the mixture of these FDI patterns of cross-border investment,

sales, and sourcing.

Figure 3: Dynamic Model Structure for the j-th Sector in Japan



4. Data and Simulations

We use GTAP version 8 for the year 2007. As mentioned above, one of the strengths of our simulations is the detailed dataset which is used to grasp the presence of Japanese subsidiaries in China and their FDI evolution. In the present version of the model we compute the share of Japanese affiliates in all the Chinese manufacturing industries by using *Survey of Overseas Business Activities* by METI for 2007 and the annual average foreign exchange rate (117.754 JPY/USD) reported in *International Financial Statistics* by IMF for 2007. Table 2 (above) shows that the share of Japanese MNEs in their sectoral sales in China is sizable in such sectors as transport equipment (12.7%), electronic equipment (6.2%) and other manufacturing (3.2). These sectors have appeared as main FDI recipients in the recent evolution of these inward flows to China (Figure 1). As is the case in many of the sectors considered in Table 2, the weight of Japanese MNEs in China rises in terms of exports and imports compared to their weight in output. However, to have the insight of MNEs overall importance in Chinese and Japanese foreign trade we also need a broader picture of their exports structure. This is what Table 4 presents. It is clear that for both

Japan and China the rest of the world region is their main market, which will have important implications for our analysis below.

Parameters characterizing the dynamics are common among all the regions. The rate of return of capital is (parameter ror) is equal to 0.10, the rate of growth of population (parameter pop) equals 0.02, the depreciation rate (dep) is 0.04, and the parameter ζ, which is comparable to the coefficient υ representing adjustment costs of investment in the investment-driven recursive dynamic model by Hosoe (2013), is equal to 1.00.

FDI flows experienced sharp falls in the period 2007-2010 (Table 5).While we assume a constantly growing business-as-usual (BAU) path at the rate of 2% p.a., we assume the (mostly negative) growth rate of FDI for 2007-2021 (15 years). The exact evolution of sectoral FDI flows is reflected in Table 5. Across all manufacturing sectors, there is a reduction of 44% in the FDI inflows received. Behind this general reduction there are a few sectors, most of them related with metals or metal products, which have experienced an exceptional pattern of FDI increases. The rest have received a smaller amount of FDI flows compared to their levels before the crisis.

Table 4: Export structure in China and Japan (in percentages and in US millions of $)

	Exports from Japan				Exports from China			
	To China (%)	To ROW (%)	Total exports (%)	Total exports (Millions $)	To Japan (%)	To ROW (%)	Total exports (%)	Total exports (Millions $)
Agriculture	0.00	0.09	0,09	732	0,14	0,77	0,91	11445
Coal	0.00	0.00	0.00	0	0.06	0.15	0.21	2693
Oil	0.00	0.00	0.00	0	0.01	0.08	0.09	1073
Gas	0.00	0.00	0.00	0	0.00	0.00	0.00	1
Food	0.04	0.36	0.40	3164	0.53	1.42	1.95	24541
Textiles and apparel	0.43	0.60	1.03	8155	1.63	11.21	12.83	161660
Wood and paper	0.20	0.47	0.67	5342	0.31	3.77	4.08	51404
Chemical	0.36	1.04	1.40	11055	0.21	1.51	1.72	21665
Petroleum and coal	2.64	8.77	11.42	90452	0.74	6.41	7.15	90038
Pottery	0.18	0.80	0.98	7760	0.18	1.82	2.00	25177
Steel	0.77	3.14	3.91	30955	0.12	2.84	2.96	37300
Nonferrous metal	0.73	1.66	2.39	18898	0.15	1.15	1.30	16421
Metal product	0.30	1.10	1.41	11142	0.25	3.22	3.47	43768
Transport equipment	1.15	21.42	22.57	178771	0.29	2.96	3.24	40859
Electric equipment	3.81	8.84	12.65	100204	1.71	20.12	21.84	275054
Other manufacturing	5.71	20.17	25.88	205001	2.48	24.32	26.80	337595
Electricity	0.00	0.00	0.00	0	0.00	0.07	0.07	929
Town gas	0.00	0.00	0.00	0	0.00	0.04	0.04	510
Transportation	0.37	7.74	8.12	64280	0.24	4.11	4.35	54750
Service	0.70	6.40	7.09	56184	0.52	4.45	4.98	62665
TOTAL	17.40	82.60	100.00	792095	9.56	90.44	100.00	1259548

Source: Authors' own calculations based on GTAP8.

Table 5: Average Growth Rate of FDI Inflows (2007-2010) [%]

Host Sector in China	FDI Growth Rate
Food	-85
Textiles and apparel	-44
Wood and paper	-16
Chemical	-40
Petroleum and coal product	-59
Pottery	15
Steel	32
Nonferrous metal	57
Metal product	12
Transport equipment	-45
Electric equipment	-51
Other manufacturing	-33
Total	-34

Source: Computed by the authors based on METI data.

5. Results

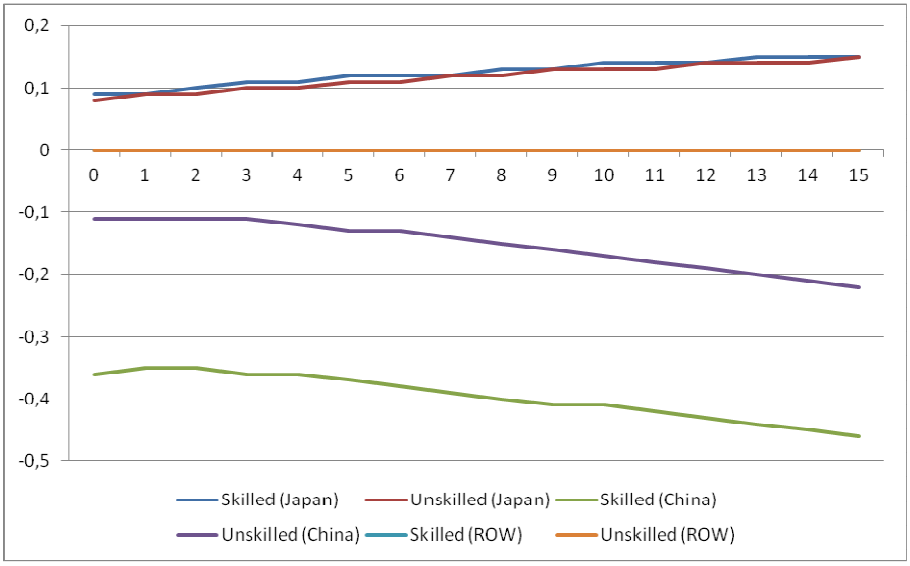
5.1 Aggregate Results

In the simulation run (Table 5) some sectors would experience an increase in FDI while others would experience a reduction. Overall, however, a decrease in FDI in China would prevail. This means that there would be a fall in investment in the Chinese economy compared with the BAU level. Consequently, capital accumulation in China would be smaller and the capital stock scarcer than in the BAU scenario. As found in other previous CGE models of MNEs (e.g., Latorre et al. 2009; Latorre, 2013), the deceleration of FDI, would lead to a higher price of capital and lower wage rate in China. This is what we find in Figure 4, which reports factor remunerations in that economy. However, the rise in the price of capital would last only for the first three periods and would begin to fall thereafter. As a result, total factor remunerations in China would go down as the FDI inflow to China decreases. This implies that the national income would also decline and so would do savings and investment (including the investment related to FDI) in the economy. This would finally lead to exacerbating the initial fall in investment (Figure 5).

Figure 4: Factors' remunerations (wages and capital remuneration)

(Deviations from BAU, %)

Wages



Capital remuneration

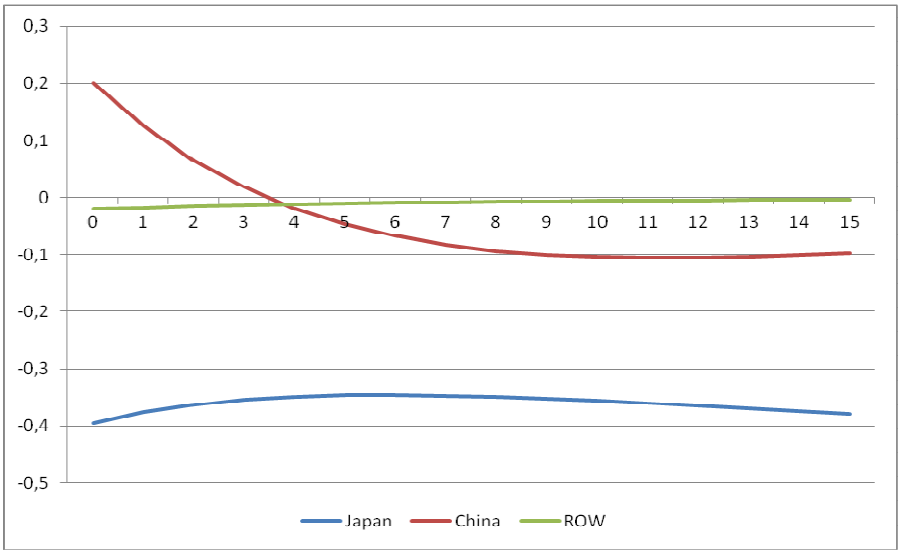
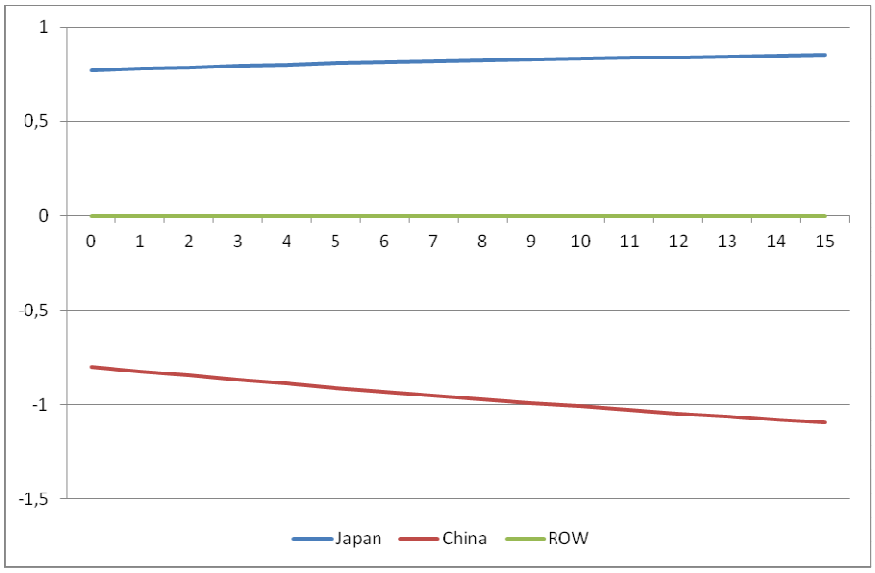


Figure 5: Aggregate Investment (Deviations from BAU, %)



By contrast, wages in Japan would rise since investment and capital accumulation would increase in this country after the shock. The price of capital would fall, as the marginal productivity of capital would decrease according to the capital accumulation in Japan accelerated by the decline of FDI to China. However, wages would rise and, overall, national income in Japan would increase and generate more investment to further accelerate its domestic capital accumulation. In the ROW, adjustments in aggregate variables are negligible.

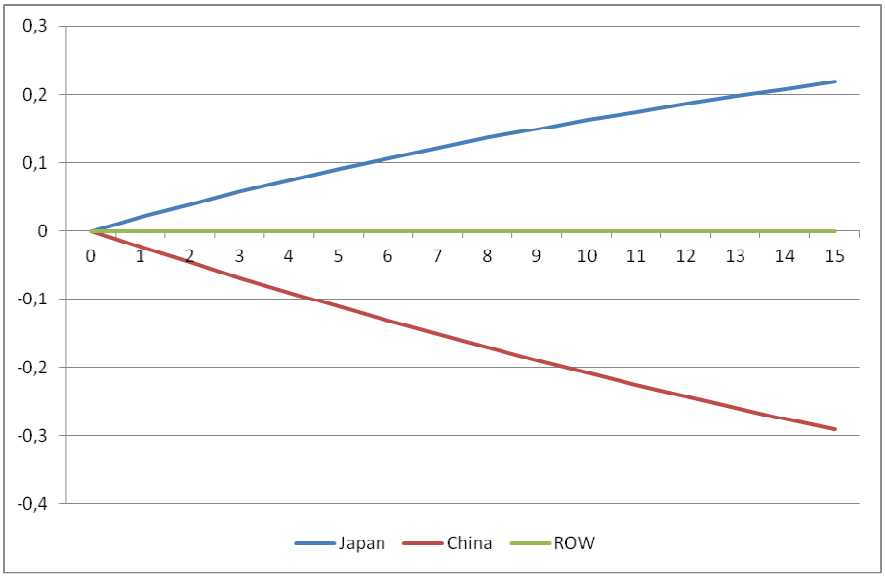
Lower levels of national income in China would lead to lower investment and consumption which, coupled with the reduction in FDI, would contract slightly its GDP, compared to the BAU level (Figure 6). By contrast, the rising national income in Japan would expand its investment and consumption and lead to a slightly larger GDP. As GDP includes value added generated by the capital stock located in China but owned by Japanese MNEs, a part of the GDP is to be transferred as a capital service payment to Japan. When we examine GNP rather than GDP, GNP would show a somewhat smaller increase in Japan and a smaller fall in China. Japanese GNP is taking into account the reduction in FDI income generated in China, that is why it would increase less than the Japanese GDP. Chinese, GNP, however, does not include the fall in FDI, therefore it would experience a less intense

fall than the Chinese GDP. Comparing the evolution (of the deviations from the BAU) of GDP and GNP for both regions the differences would be around 0.2% in the final period.

The reduction of FDI in Japanese MNEs in China would lead to a reduction of aggregate Japanese exports and to an increase in its aggregate exports (Figure 7). For China, the tendency is the reverse, since its aggregate exports would increase and imports would decrease, compared to the BAU scenario. To understand these tendencies the evolution of factor prices gives us a good hint. In China wages and the price of capital diminish, this will push Chinese prices down, thus increasing its export propensity and diminishing its imports. In Japan the tendency is the reverse, higher prices, due to higher factor costs, would decrease its export propensity and increase its import propensity (always compared to BAU levels).

Figure 6: GDP and GNP (Deviations from BAU, %)

GDP



GNP

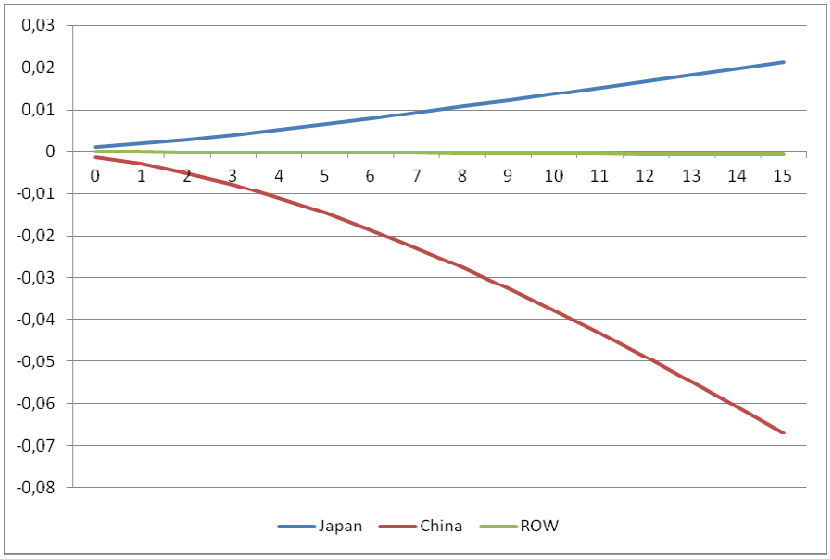
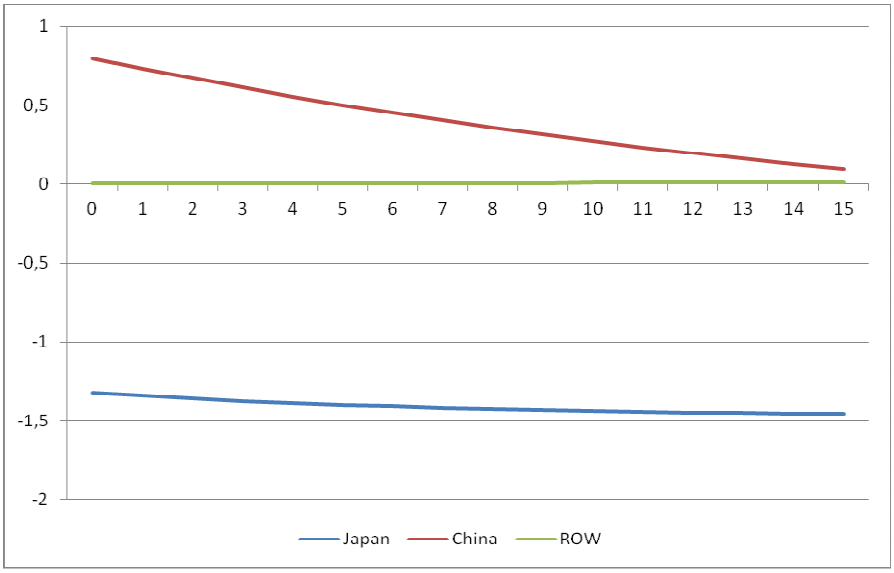
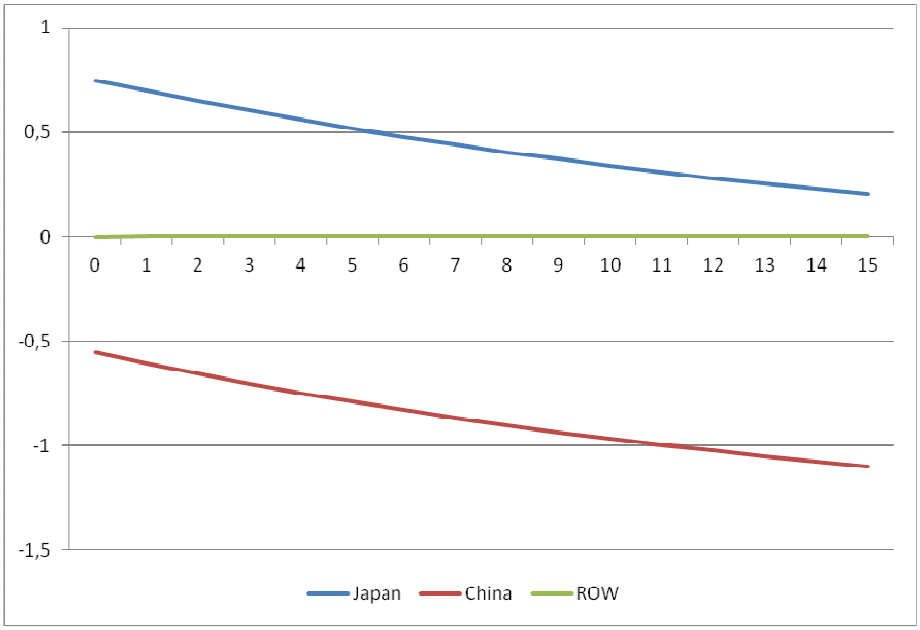


Figure 7: Aggregate exports and imports (Deviations from BAU, %)

Aggregate exports



Aggregate imports

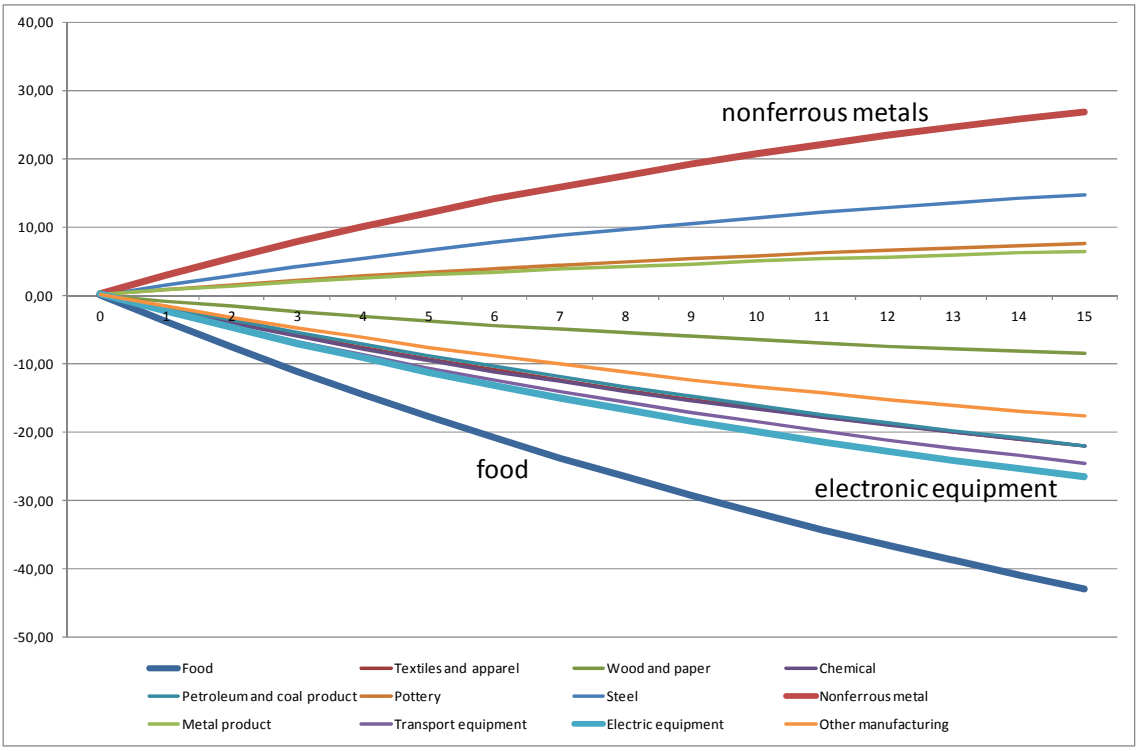


5.2 Sectoral Impact

At the sectoral level, we can observe some interesting patterns emerge in more detailed manner. FDI inflows in China would determine the evolution of sectoral investment and production in Japanese MNEs operating in China. Figure 8 shows the evolution of the

resulting output levels compared to the BAU scenario. The largest output increases would take place in non-ferrous metals, steel, pottery and metal products (in descending order of importance), which would naturally match their assumed FDI increases in Table 5. In a similar way, the sector experiencing the largest fall in FDI, namely, food, would also experience the most sizeable decrease in production. Output adjustments would be sizeable across most sectors.

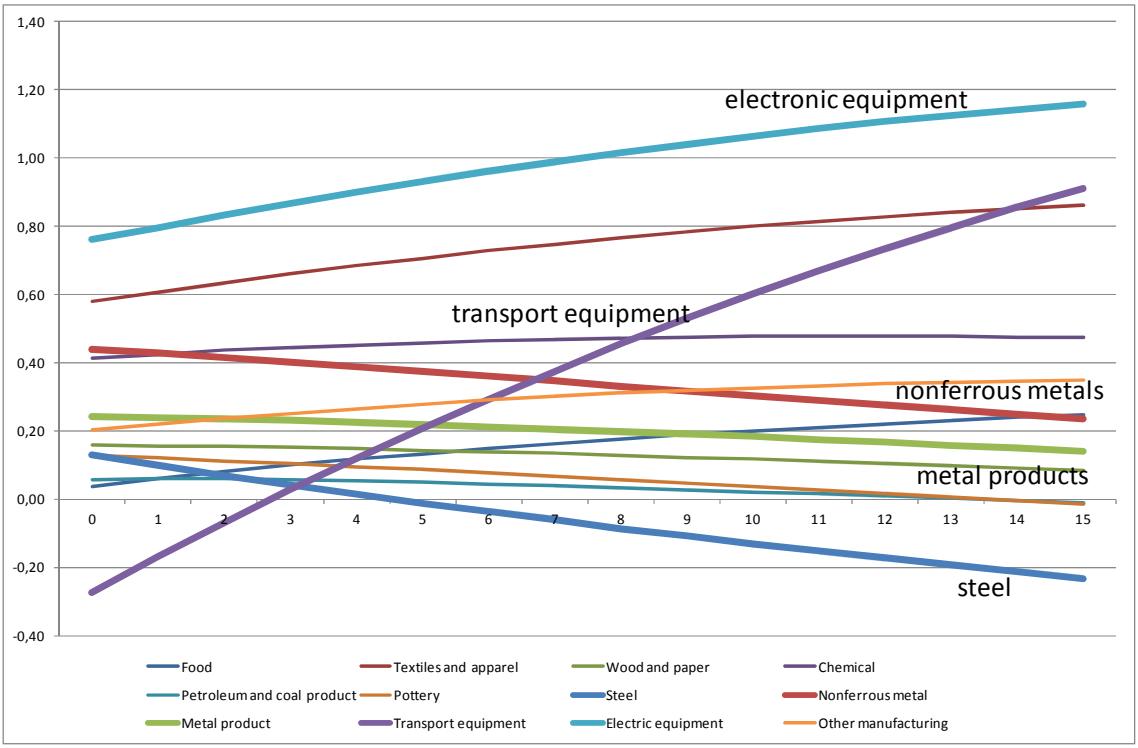
Figure 8: Japanese MNEs' production in China (Deviations from BAU, %)



In general, local sectors in China (Figure 9) would not experience significant increases in output compared with the above described Japanese MNEs' output changes (Figure 8), even though their competition in their output market and the labor markets would become less severe with the smaller presence of MNEs. This is mainly because the original presence of Japanese MNEs is not so large in many sectors. However, there are several interesting exceptions observed. With a decrease of FDI (by 45% p.a.), the transport equipment sector would initially experience a fall and then recover very quickly. We will come back later to analyze the evolution of this sector. In the opposite way, the steel sector

would increase in the short run, but despite of its increase of inward FDI it would decrease in the long run. Similar although less intense finding can be pointed for pottery, non-ferrous metal, and metal, which are all assumed to accept more FDI. Accelerated FDI requires more local investment goods. These sectors are more or less involved in production of goods for investment purposes. Therefore, in a short run, they would increase their output but would be (though gradually) substituted by the competing MNEs acquiring larger presence through accelerated FDI. All in all, Figure 9 would suggest, a general upward mild trend of production across manufacturing sectors in local firms in China.

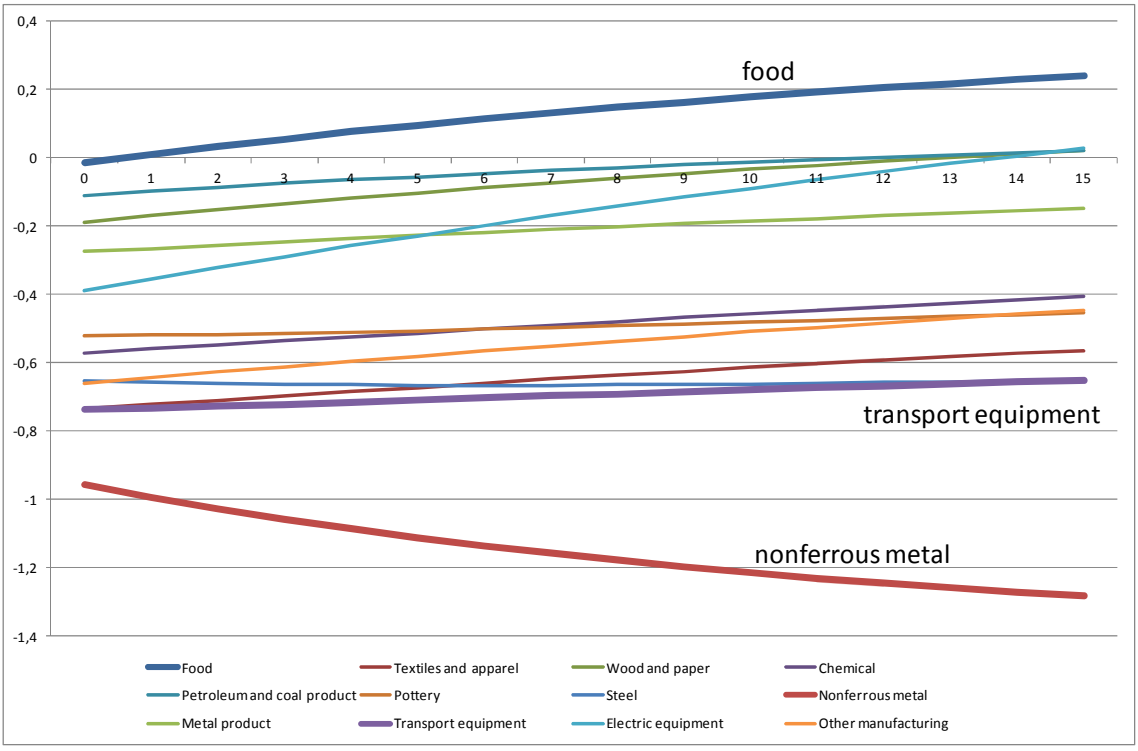
Figure 9: Local firms' production in China (Deviations from BAU, %)



After the fall in FDI, the output in Japanese local output would also vary only slightly (as happened in Chinese local production). However, the direction of the adjustment would tend to be the opposite compared to the local firms in China. In Japan production tends to *decrease* slightly (Figure 10). The only sector which would tend to experience a sustained increase in production is food. Recall that Japanese MNEs in China from this sector had experienced the largest fall in output production across sectors. This had followed

the fact that food was the sector with the largest fall in FDI flows. However, as explained above, national income would be increasing in Japan. Around 10% of private consumption expenditure is devoted to food. So the increase in national income will imply a more pronounced rise in demand for this good, which will push up domestic food production in Japan. In clear contrast to the evolution of food, Figure 10 would suggest a general downward mild trend in local production in Japan.

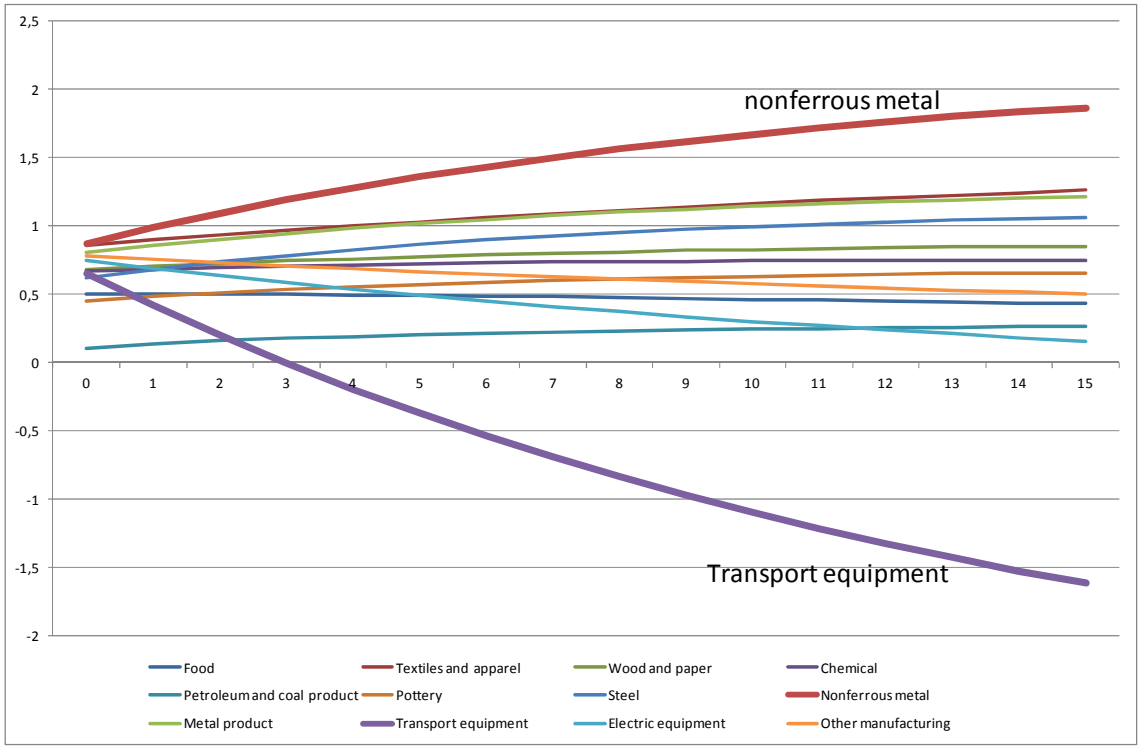
Figure 10: Local firms' production in Japan (Changes from BAU, %)



The Rest of the World is nearly unaffected by the fall in FDI. Changes in its sectoral output are negligible. We will see now that the overall upward trends in sectoral production in China and the general downward trends in Japan are very much related to the evolution of sectoral exports.

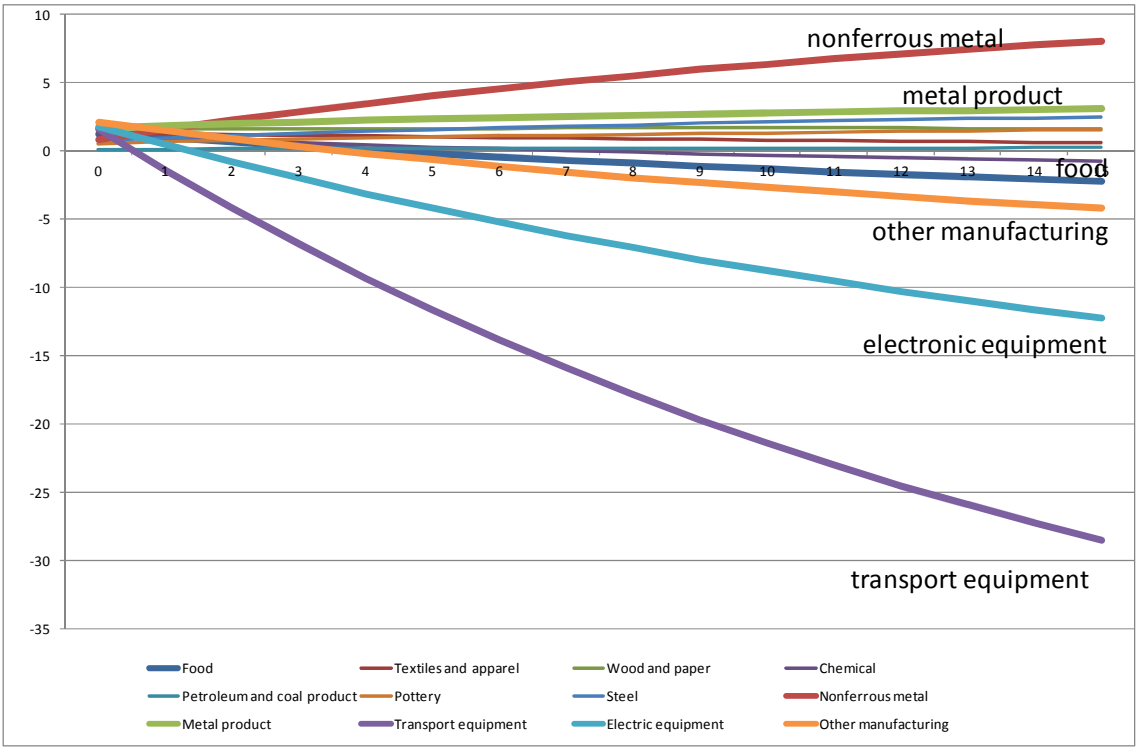
First, we reproduce Chinese sectoral exports going to ROW (Figure 11). Note that these sectoral exports are the sum of both exports of local Chinese firms and Japanese MNEs operating in China. There would be an overall trend of increases across sectors with the only exception of transport equipment.

Figure 11: Chinese (local+MNEs) exports to ROW (Changes from BAU, %)



With respect to total (i.e, local and MNEs) exports from China to Japan (Figure 12), those sectors in which the presence of Japanese MNEs is most important (in production, exports and imported intermediates, see Table 2), and in which FDI flows have decreased, experience a very marked reduction in exports. They are transport equipment, electronic equipment and other manufacturing. Food and chemicals would also experience small reduction in exports following the decrease in the FDI flows received. The four sectors (nonferrous metal, steel, metal products, and pottery) would increase "boomerang" exports mainly by Japanese MNE affiliates, whose capital stocks are increased by the FDI (Shinohara, 1996). For the rest of sectors, an overall increase in exports from China to Japan would be experienced.

Figure 12: Chinese (local+MNEs) exports to Japan (Changes from BAU, %)



Japanese exports to China (Figure 13) would go down more intensively in transport equipment. Exports from food would also be reduced since the demand for this product has risen markedly in Japan. Overall there would be a decreasing trend in exports from Japan to China. The same general decreasing tendency in exports would be experienced for exports from Japan to ROW (Figure 14). However, in the case of exports to ROW the decreasing tendency would tend to fade out and become less and less negative in subsequent periods. Much in the same way as production in Japan (Figure 10) would moderate its fall in the subsequent periods.

Figure 13: Japanese exports to China (Changes from BAU, %)

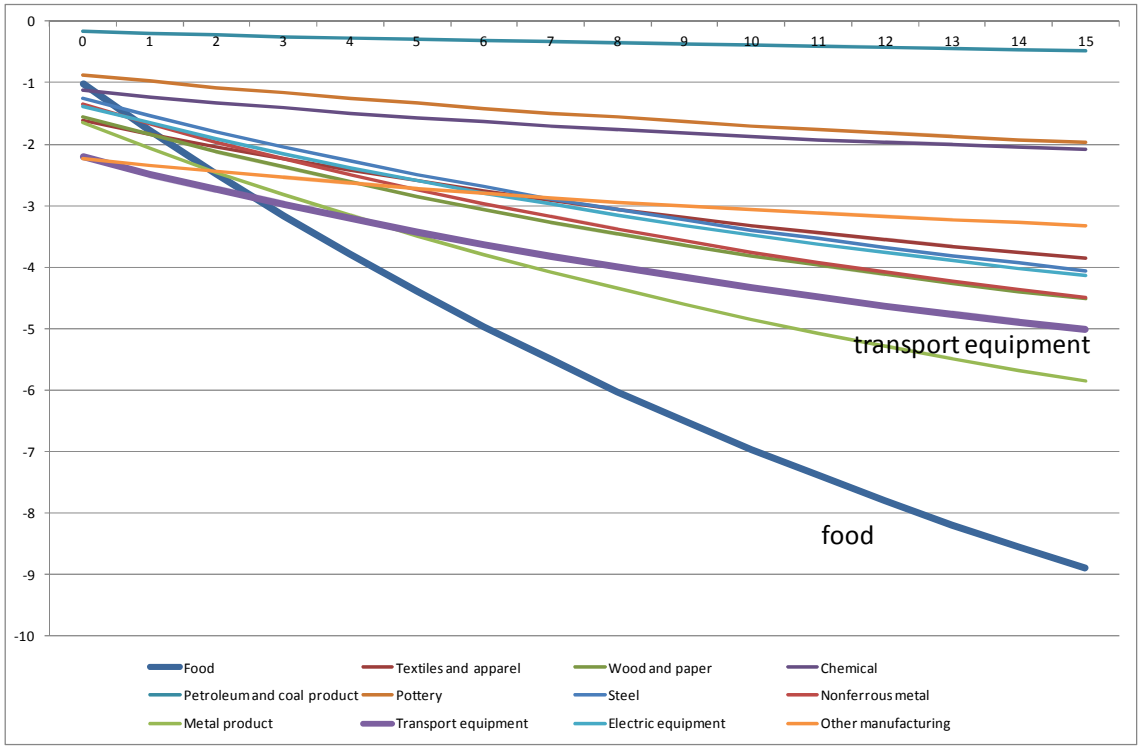
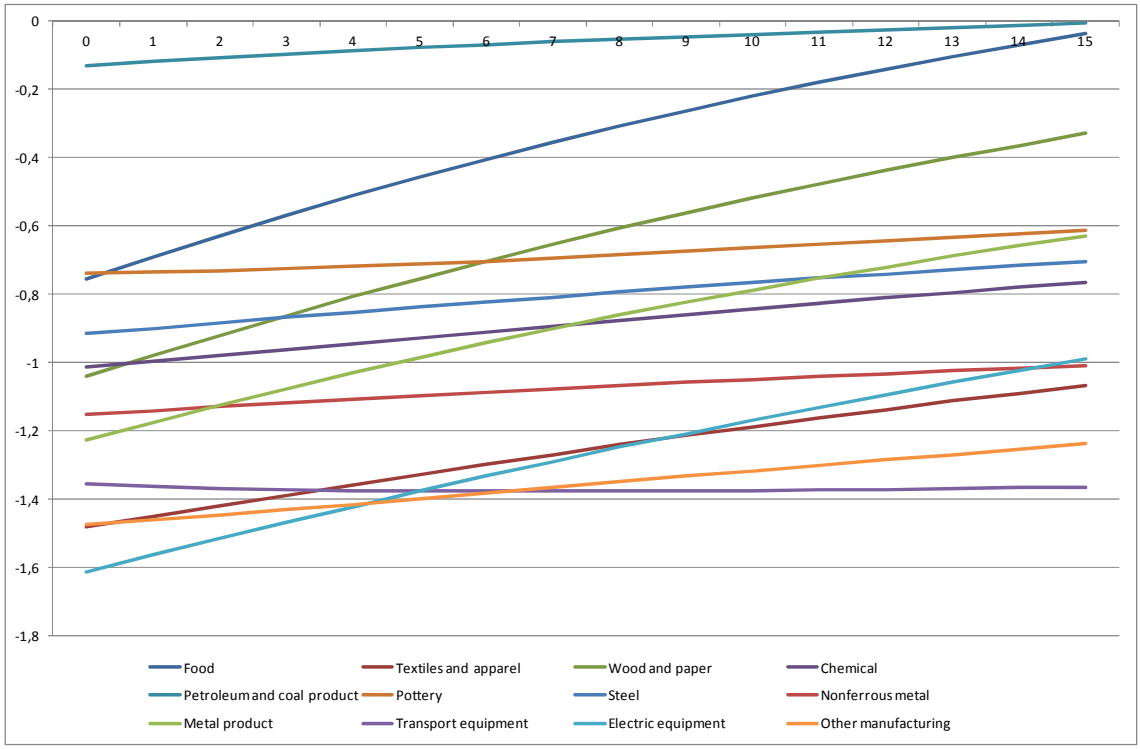


Figure 14: Japanese exports to ROW (Changes from BAU, %)



ROW is the most important market for both China and Japan (as can be seen in

Table 4). This means that the trends experienced in exports to ROW from both regions would generally end up determining aggregate exports (Figure 7). Indeed, the increase in aggregate exports from China and the opposite fall in exports from Japan, would rely on the sectoral trends operating in the same direction in Figures 11 and 13 (which reflect *only* exports to ROW). This evolution of exports, in turn, lies behind the evolution of sectoral production in China and Japan across manufacturing sectors (Figures 9-10).

Except for the evolution of Japanese MNEs production in China, which would follow FDI patterns, in general, local sectoral output would be higher to satisfy a higher demand for exports. The opposite tendency for output would take place for Japan, whose exports to ROW would decrease.

An exceptional tendency arises for the sector of transport equipment, though. In this sector the weight in production, exports and imported intermediates is the highest among Japanese MNEs in China (Table 2). As a consequence, the reduction in FDI inflows would produce a reduction in Chinese exports to ROW (Figure 11). In other words, for this sector the impact of the Chinese-Japan sectoral trade has also an effect for world trade flows. This would suggest that the presence of Japanese MNEs in China in this particular sector has a worldwide impact. By contrast, for the rest of sectors, the evolution of FDI implies (important) adjustments for the bilateral trade patterns between Japan and China, with no effects for the rest of the world. The lack of effects for world trade flows would be in line with some previous findings obtained using other methodologies (Armstrong, 2009). However, in our analysis, we would find an exception to this pattern in the case of the world impact of Japanese MNEs operating in the Chinese transport equipment sector.

6. Conclusions

This paper analyzes the impact of an overall reduction of FDI flows from Japanese MNEs in China using a dynamic setting. The real sectoral patterns in FDI observed in the period 2007 to 2010 are extended to a longer period of fifteen years. One of the few CGE models that considers the presence of MNEs is used for the simulations. By relying on data

from the METI (2012), it is based on a detailed macro and microeconomic characterization of the production structure of Japanese MNEs and its FDI evolution.

Japanese subsidiaries exhibit a considerable weight in Chinese production in transport equipment, electronic equipment and other manufacturing. Across the rest of manufacturing sectors their shares in production are rather small (below 1.1%). However, even with rather small weights in production, the share of Japanese affiliates in Chinese foreign trade is remarkable in many sectors.

The contraction in FDI flows in China would lead to rather small adjustments in aggregate variables of opposite sign in China and Japan. For the rest of the world, macroeconomic adjustments would be negligible.

Wages and the price of capital would decrease slightly in China. Lower factor costs would increase its Chinese competitiveness and, therefore, aggregate exports would increase slightly. However, lower factor remunerations in China would also lead to a slightly lower national income and, thus, a small decrease in its aggregate imports. By contrast, In Japan national income would increase a little leading to a slightly higher level of aggregate imports. But higher factor costs, coupled with less activity in its foreign subsidiaries in China, would result in a small decrease in Japanese aggregate exports.

At the sectoral level, the expansion in Chinese exports would lead to an overall mild tendency in output increases in Chinese local firms. Japanese MNEs operating in China would follow its particular sectoral FDI tendency (i.e., increases in FDI would lead to higher production levels and viceversa).

The operations of Japanese MNEs in China would have an important impact in the sectoral bilateral trade between Japan and China, but not generally for the rest of the world. Only in the case of the sector of transport equipment would the evolution of Japanese affiliates in China have an effect for the rest of the world. Japanese MNEs in this sector account for 12.7%, 14.29% and 37.26% of total Chinese production, exports and imports. This would imply that the reduction in FDI flows accruing to this sector in China would reduce the output produced by Japanese MNEs in that host economy. As a result exports from China to the rest of the world of transport equipment would also diminish.

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