The Effect of Corporate Taxation on the Location Choice of Japanese Multinationals

Evidence from Industry-level Panel Data

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Abstract

This paper studies the effects of foreign/host country corporate taxes as well as some other country factors (such as research intensity/excellence and market potential) on the location/country choice of Japanese multinationals. The industry-level results obtained by static panel data econometric modeling contribute to the literature in two dimensions. First, they demonstrate that there are only six (out of 25) Japanese industries for which corporate tax rate is found statistically significant. As corporate tax rate is reduced [raised] by 1% in a foreign economy, the Japanese multinationals in the sectors "General-Purpose Machine," "Mining," "Construction" and "Retail" [those in "Electrical Machinery" and "Miscellaneous Nonmanufacturing"] will choose to locate another foreign subsidiary in the country. For all other sectors, however, the effects of corporate tax rate turn out statistically insignificant. Second, the results evidence strong location/country- and time-specific effects (unexplained by explanatory variables included) that enable us to identify, for each industrial sector, countries attracting greater or smaller inbound investments than a particular reference country (China excluding Hong Kong), and to infer effects on the investments of such time-varying factor as foreign exchange rates by refering to a particular fiscal year (2007). Together, these results portray a fruitful panel data econometric picture of Japanese foreign direct investment determinants that sheds light on the theory of multinational corporate behavior, with focus on corporate taxation and location choice.

*Department of Commerce, Seinan Gakuin University, Fukuoka, Japan. E-mail: kojima@seinan-gu.ac.jp Lessening global competitiveness of Japanese multinational firms as well as Japan's tax system (corporate tax code, in particular) has concerned both the government and the corporate sector in Japan, over the nation's past "lost" decade. This motivated me to initiate the present, panel data econometric research.

1 Introduction

At country/government level, taxes constitute a country's international competitiveness. With an objective to empirically study international tax competitiveness, Pomerleau and Cole (2015) compute, for each of the 34 OECD (Organisation for Economic Co-operation and Development) countries, International Tax Competitiveness Index (ITCI) which measures the degree to which the countries' global competitiveness is promoted under a tax system imposing low tax burdens on business investment (Pomerleau and Cole 2015, pages 2 and 6).

When addressing the international tax-competition issues related to business investment being mobile between countries, an important first step is to understand the impact of taxes on the location of the (mobile) investment (Devereux and Griffith 2002, p.81). A country's tax system (or tax code, to be more specific) is likely an important determinant when businesses decide where to invest (or locate their subsidiaries). Realizing this, many countries have indeed attempted to revise their tax codes to become in effect more (tax-)competitive (Pomerleau and Cole 2015, p.1); this is evidenced in Fig. 1 that draws the *statutory* corporate tax rates of 28 countries (27 hosts/destinations, U.S.A. through New Zealand, and a home, Japan) for two years 2007 and 2012. In the figure you will notice (*i*) the downward tendency of the tax rates in many countries including Canada, China, Germany and Japan (respectively, country numbers 2, 6, 19 and 28), over the two years, and (*ii*) the grid line drawn at 38.01%, the Japanese corporate tax rate in 2012, below which are the tax rates of all countries but the U.S.A. (country number 1) in 2012.[1]

[1] See Table 17 in Appendix C for the Japanese (statutory) corporate tax rates trending gradually downward during the period from 2007 through 2015.

For how the corporate tax rates have changed in the world over the recent ten-year period, visit the KPMG's Webste whose URL is shown in (*ii*) in Subsection 2.1.

There are present two contrasting international tax systems: worldwide tax system, employed by the U.S.A., Korea, etc., and territorial tax system, employed by Japan, Iceland, etc. (see Hasegawa and Kiyota 2013 and Pomerleau and Cole 2015, pp.21-27). The international tax system and its related problems such as double taxation will, however, not be studied in the present paper and thus are beyond the scope of the paper. (The problem of double taxation may be briefly summarized as follows: income earned in foreign countries such as foreign-sourced/earned dividend income will be taxed in the parent firm's home country as well as its subsidiary's host country; the double taxation could likely occur under the worldwide tax system.)

At country/government level, there are two further vital issues: corporate tax-base erosion/evasion and tax avoidance. They are closely related to low income/developing countries and have been fully investigated by OECD in its

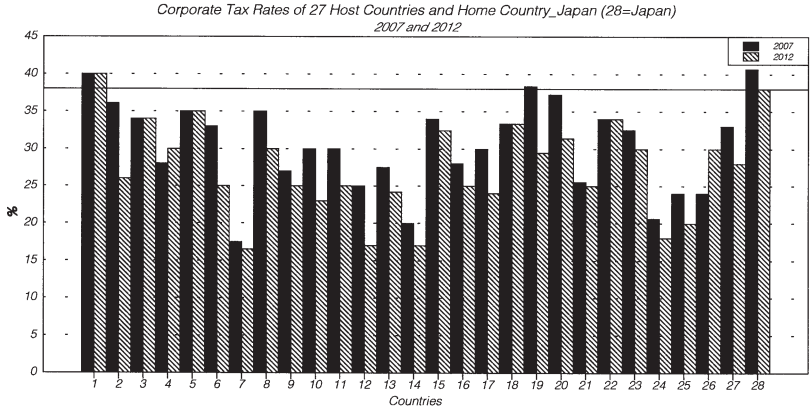

Figure 1 Statutory Corporate Tax Rates of 28 Countries (U.S.A. through N.Z., and Japan), for Years 2007 (black, filled bars) and 2012 (shaded bars). Note: A grid line is drawn at 38.01%, the Japanese corporate tax rate in 2012 (for country number 28). Data source: CTaxR being compiled in Table 16; the Japanese corporate tax rates in Table 17; the first 27 country numbers along the horizontal axis in Table 1, with 28=Japan.

At firm level, multinational companies are exposed to keen global competition in today's integrated markets and one strategy for them to stay competitive is "to select the location which best suits their strategic, operational and financial interests" (Priede 2013, p.111). Studied in previous research as factors most likely affecting multinationals' location choice include a market ("market potential factor"), production

Base Erosion and Profit Shifting (BEPS) Project (November 2014): "BEPS is of major significance for developing countries due to their heavy reliance on corporate income tax, particularly from multinational enterprises (MNEs)." (Visit OECD's Websites located at http://www.oecd.org/tax/beps.htm and http://www.oecd.org/tax/strategy-deepening-developing-country-engagement.pdf) Most recently (as of October 7, 2015) available at http://www.oecd.org/tax/beps-2015-final-reports.htm is "BEPS 2015 Final Reports: Final BEPS package for reform of the international tax system to tackle tax avoidance."

The Japanese government's recent attempt in accordance with OECD's BEPS Project is summarized in The NIKKEI Asian Review's electronic article titled "Japan mulls slashing deduction on interest payments" (available on August 10, 2015 2:00 am JST, at http://asia.nikkei.com/Politics-Economy/Policy-Politics/Japan-mulls-slashing-deduction-on-interest-payments).

BEPS is, too, beyond the scope of the present research.

costs (such as labor costs and corporate taxes), homogeneity (such as presence of companies with similar industries and similar country of origin) and availability of resources (such as labor force and government services) (Priede 2013, pp.111-112).

Surveying Harvard Business School (HBS) alumni and interviewing senior executives at U.S. multinationals, Porter and Rivkin (2012) relate their location choices involving the U.S.A. to several factors such as those listed above (including taxes in the destination country), and propose to improve "the quality of location decision-making processes" for managers to "favor a U.S. location" rather than "move activities out of the U.S.A."[2] Employing a similar survey approach, Simmons (2000, p.1) emphasizes at the outset that, as barriers to international investment (such as "government-induced distortions to the global free flow of capital") have been recently reduced, corporate taxation may now be a more influential factor in the investment location decisions.

More specifically, Auerbach, et al. (2010, pp.853-855) assert that different corporate tax rates will be appropriate in the first through fourth stages of multinational's decision making. The first and second stages (which are, respectively, whether to produce abroad and where to locate production) will involve *average effective* tax rate and the third stage (which is how much to invest abroad) *marginal effective* tax rate: both tax rates are those *actually paid.* In the final, fourth stage (which is where to declare taxable income) the location of profit will be determined primarily by the *statutory* tax rate, a *legally imposed* rate.

Considering, thus, a critical role corporate taxes are likely to assume, at firm level in particular, in the second stage just above, the present paper attempts to empirically study the effects of host country corporate taxes as well as some other country factors (such as research intensity/excellence and market potential) on the country choice of Japanese multinationals. Though focusing on the second stage, we will use statutory (rather than effective) tax rates, since the former are publicly and accurately available (in tax laws) for all foreign/host countries studied.[3]

The particular mode of foreign market entry that is studied is Japanese

[2]As documented in Appendix C, the U.S. corporate tax rates are among the highest during the whole sample period (2007 through 2012). This could become one primary reason why the U.S. firms would rather choose to move out of the U.S.A., their home country, as evidenced by Porter and Rivkin's (2012) HBS alumni survey. (The U.S. corporate location choices are beyond the scope of the present paper.)

[3]For the two tax rates being slightly different and yet trending similarly downward in recent years in Japan, a home country, see Appendix C.

outbound FDI (in the forms of merger and acquisitions, joint ventures and wholly owned subsidiaries); and 27 host locations/countries and 6 fiscal years, 2007 through 2012, will compose the industry-level panel data (for each of 25 industrial sectors). (See countries and industries listed in Table 1 in Subsection 2.1.)

The empirical methodology is static panel data econometric modeling of location and annual data; the paper only employs fixed-effects modeling, following approaches A and B as summarized by Kojima (2004, Appendix B). A reason for only using fixed-effects models is because it is fixed-effects modeling that will enable us to specifically identify country names that would have statistically significant country-specific effects.[4]

1.1 Two empirical issues in international business

The two empirical issues in international business are summarized in Kojima (2004, pp.38-40): an issue of where international business facilities will be located is location-theoretic; and that of who will own the business facilities is in the framework of internalization theory. Both theories play complementary role in explaining the creation and presence of multinational firms,[5] and lead to several interesting hypotheses. For the purposes of the present paper, one hypothesis under the location-theoretic approach will be:

L: The Japanese outbound FDI is a *substitute* for exporting to the region.

Possible substitutive relationship between FDI and exporting by Japanese firms may be due to the import restrictions imposed by the host countries, voluntary export restraints in the home country, government induced incentives encouraging FDI, and so on. Kemsley (1998), briefly summarized in the next subsection, relates the possible substitutive re-

[4]Searching for the determinants of Japanese business entry into the North American market (though with no particular attention on the effect of corporate taxes on the Japanese multinationals' location choice), Kojima (2004) did a similar panel data econometric study of the industry-level Japanese foreign direct investment (FDI), documenting evidence on factors that determine Japaenese FDI in North American markets, by estimating and examining both fixed- and random-effects models. To my knowledge, Kojima (2004) was then the only extensive panel econometric study of Japanese FDI determinants, attempting to find possible industry- and/or time-specific effects that are *not* explained by the variables included in the regression models. (Studying explicitly such effects is made possible indeed by panel data econometric modeling.)

[5]See Rugman (1981, p.48).

lationship in L to foreign/host country corporate taxes.

1.2 Literature review

There is an extensive literature that studies specifically the effect of corporate taxation on the locations decisions of multinational firms: for its extensive review see, for example, Hines (2000), Devereux and Griffith (2002), Markle and Shackelford (2011), and Lawless, et al. (2014). Six relevant studies are briefly reviewed or summarized below:

Modeling jointly the decision to locate a foreign plant abroad or to export (as related to the hypothesis L in the previous subsection), Kemsley (1998) finds that the multinationals will morel likely use exports to serve high-tax foreign markets.

Analyzing firm-level tax information on the location of FDI (investment in property, plant and equipment abroad) by U.S. manufacturing firms separately in 1984 and 1992, Altshuler, et al. (2000) find that the location of the FDI is highly sensitive to tax rates and that the sensitivity of the FDI to taxation has risen over time with the U.S. statutory tax rate reductions introduced by the Tax Reform Act of 1986.

Grubert (2000) analyzes tax return information for U.S. multinational firms in 1984 and 1992 to examine the responses of taxpayers and governments to changed circumstances after 1986 in the U.S. (that is, "tax planning by companies" and "tax competition by governments"). The average tax rates paid by American firms abroad were found to sharply fall in the years after 1986.

Using publicly available financial statement information from 82 countries from 1988 to 2009, Markle and Shackelford (2011) estimate country-level effective tax rates (ETRs) and find that the location of a multinational and its subsidiaries substantialy affects its worldwide ETR.

Barrios, et al. (2012) study the effect of not only host but also home country/economy taxation on the location decisions of European multinationals. Their research is novel in that three taxation channels are separated out: host economy corporate income tax, host economy dividend withholding tax and home economy corporate income tax. Their results based on a conditional logit model suggest that both host and home country taxation are critical determinants of location choice of multinational firms.

In April 2009 Japan changed the corporate tax system from the worldwide tax system (that taxes foreign-sourced income upon repatriation)

to a territorial tax system that exempts foreign dividend income from home taxation. Hasegawa and Kiyota (2013, pages 1 and 20) argue that "While taxing foreign source income would raise revenue, international tax rules significantly influence the business activities of multinational corporations, including the location of foreign direct investment, income reallocation (income shifting) through transfer pricing, and profit repatriation" and conjecture that "After April 2009, because dividend repatriations are exempt from taxation in Japan and Japanese multinationals must pay taxes on foreign incomes only to the host governments, they should be likely to have more incentive to invest in low-tax countries than they did before April 2009."

Lawless, et al. (2014) are similar to Barrios, et al. in data (both host and home economy corporate income taxes, in particular) and methodology (a conditional logit model, in particular). Their main finding is that "a one percent increase in the policy/statutory rate of corporate tax would lead to a reduction in the conditional location probability of 0.68 per cent." (Lawless, et al., Marginal Effects-Summary Table, p.v, and Table 18, p.28)

The paper proceeds as follows: In Section 2, industry-level panel data and their sources are described along with the data descriptive statistics and the variable definition for the panel data econometric fixed-effect models; the panel data and Japan's (statutory and effective) corporate tax rates are tabulated, respectively, in Appendices B and C. The three types of panel data models (those with only individual (country) effects, those with only time effects, and those with both effects) are estimated and their statistical features are extracted in Section 3; also explored there based on both-effects models are the determinants of the Japanese multinationals' location choice. Sections 4 attempts to study the effects on location choice, unexplained by explanatory variables included. Several concluding remarks are made in the final section. Appendix A summarizes essentials of panel data econometric fixed-effects modeling.[6]

2 Data and Panel Data Models

Our industry-level panel data consist of 27 host countries, USA through New Zealand, and 6 fiscal/calendar years, FY(fiscal year)/CY(calendar

[6]For random-effects modeling and Hausman specification tests, see Kojima (2004, Appendix A).

year)2007 to FY/CY2012.[7] The whole panel data set used in the present analysis is being compiled and laid out in Table 16 in Appendix B. (Not compiled in the table, (statutory) corporate tax rates in Japan during the sample period are tabulated in Table 17 in Appendix C.)

The panel data as complied in Table 16 are balanced in the sense that every individual (country) has data for exactly the same set of time periods, though with some missing values being included.[8]

2.1 Data sources

The data sources are described below for variables used in the panel data analysis (that are defined later in Table 3):

(i) Number of Japanese subsidiaries chosen to be located in each i of 27 host countries in FY t (for each of 25 industrial sectors):

Ministry of Economy, Trade and Industry, *Essential Survey on Japanese Overseas Operations*, Nos. 38 through 43 (for operations in FY2007 through operations in FY2012), available at

http://www.meti.go.jp/statistics/tyo/kaigaizi/result-2.html

The surveys No. 38 through No. 43 are used as data sources, since there is a consistency in classifying industrial sectors across these surveys. (The surveys up to No. 37 employ a (old) different classification than that for those more recent No. 38 on.) For how parent firms and foreign subsidiaries are defined in the surveys, see Subsection 2.1.1.

(ii) Corporate tax rate (%) in country i in CY t:

KPMG_corp-tax-rates-table, available at

https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html

Compiled in KPMG's table above are *statutory/policy* corporate tax rates (Lawless, et al. 2014, pp.7-8).[9]

(iii) Number of applications for patent in country i in CY t:

GLOBAL NOTE (original source: WIPO=World Intellectual Property Organization), available at

http://www.globalnote.jp/post-5380.html

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[7] In the remaining, for example, "FY2007" stands for the fiscal year 2007-2008, which is the period from April 1, 2007 through March 31, 2008. "CY2007" is the period from January through December in 2007.

[8] See *RATS 7.0 Reference Manual*, pp.348-349. The panel data would be unbalanced if different individuals (countries) have different numbers of observations.

[9] For statutory and *effective* tax rates, though the latter not studied in the present paper, see Appendix C for Japan, a home country.

(iv) Nominal GDP, Per capita Nominal GDP, in country i in CY t:
GLOBAL NOTE (original source: IMF=International Monetary Fund), available, respectively, at
http://www.globalnote.jp/post-12794.html , http://.../post-12796.html
(v) Population in country i in CY t:
GLOBAL NOTE (original source: UN=United Nations), available at
http://www.globalnote.jp/post-1555.html

2.1.1 Types of firms

A parent firm and a foreign subsidiary are each defined by Ministry of Economy, Trade and Industry, *Essential Survey on Japanese Overseas Operations*, Nos. 38 through 43, in its survey guide.[10] Useful diagrams illustrating the definitions are available on pp.1-2 of the survey guide. The present study focuses on foreign subsidiaries as defined above; parent firms will not be studied.

2.1.2 Area/countries and industries

27 host area/countries and 25 industrial sectors studied in the present research on location choice are listed in Table 1. The list is exactly the same as that employed by Ministry of Economy, Trade and Industry, *Essential Survey on Japanese Overseas Operations*, Nos. 38 through 43.

2.1.3 Exchange rate data

Compiled in Table 2 are yearly simple averages of monthly average exchange rates (Japanese yen per U.S. dollar and per euro) for the sample

[10]The guide is available, for FY2007 for instance, at http://www.meti.go.jp/statistics/tyo/kaigaizi/gaiyo/pdf/h2c4f38t.pdf

(i) A parent firm is a Japanese firm which has foreign subsidiaries as of the end of March in 2008 (for FY2007), for instance, or used to own foreign subsidiaries in the past. The parent firms as such exclude parents classified as financial/insurance and real estate institutions;

(ii) A foreign subsidiary is either:

a foreign subsidiary (*ko-gaishya* wholly or partially owned by the parent firm) in which a Japanese total investment is 10 percent or more;

a foreign subsidiary (the parent's *mago-gaishya*) in which a foreign subsidiary (the parent's *ko-gaishya*) in which a Japanese investment totals more than 50 percent invests more than 50 percent; or

a foreign subsidiary (the parent's *mago-gaishya*) in which a foreign subsidiary (the parent's *ko-gaishya*) in which a Japanese parent's investment and a Japanese investment total more than 50 percent invests more than 50 percent.

period. The exchange rate might be critical when searching for reasons behind possible time effects that are by definition individual (country)-*in*variant.

A study of the Japanese FDI in the North American markets by Kojima (2004, pp.70-73 and Table 19) shows that a statistically significant time effect detected in FY2000 is apparently due to the sharp yen appreciation against U.S. dollar in the fiscal year (as compared to FY1997). More recently, again, there occurred a sharp yen appreciation against U.S. dollar in FY/CY2012 (as compared to FY/CY2007). We will explore whether an observation similar to Kojima's(2004) could be again found for the Japanese FDI across the world that might be useful in explaining location choice by Japanese multinational firms, while studying corporate tax rate as a possible reason behind their location choice.

Table 1 Host Area/Countries and Industries Studied

Country/Sector Number	Host Area/Countries	Industrial Sectors
Mfg		Manufacturing
1	USA	Food
2	Canada	Textile
3	Brazil	Lumber-Pulp-Paper
4	Mexico	Chemical
5	Argentina	Oil-Coal
6	ChinaExcldHK[a]	Ceramics-SoilStone
7	ChinaHongKongSAR	Steel
8	Philippines	NonferrousMetals
9	Malaysia	MetalProducts
10	Thailand	GeneralPurposeMachine
11	Indonesia	MachineForProduction
12	Taiwan	MachineForCommercialUse
13	Korea, Republic of	ElectricalMachinery
14	Singapore	MachineForInformationCommunication
15	India	TransportationEquipment
16	Vietnam	MiscellaneousManufacturing
Nonmfg		Nonmanufacturing
17	United Kingdom	AgricultureForestryFishery
18	France	Mining
19	Germany	Construction
20	Italy	InformationCommunication
21	Netherlands	Transportation
22	Belgium	Wholesale
23	Spain	Retail
24	Switzerland	Service
25	Russia	MiscellaneousNonmanufacturing
26	Australia	
27	New Zealand	

[a]HK stands for Hong Kong.

Table 2 Yearly Averages of Exchange Rates[a]

Year	Japanese Yen per U.S. dollar	Japanese Yen per Euro
2007	117.75 (117.750)	161.16 (161.281)
2008	103.36 (103.397)	151.41 (152.294)
2009	93.57 (93.570)	129.99 (130.241)
2010	87.78 (87.756)	116.26 (116.448)
2011	79.81 (79.724)	110.94 (110.995)
2012	79.79 (79.820)	110.91 (102.685)

[a]Yealy average exchange rates of each of yen per U.S. dollar and yen per euro, as applied for currency-conversion purposes by Ministry of Economy, Trade and Industry, *Essential Survey on Japanese Overseas Operations*, for each of FY2007 through FY2012. Their original source is IMF, *InternationalFinancialStatistics* (see Table 1 on pp.18-20 of the survey guide for FY2012, for instance). Each of those parenthesized is a yearly simple (arithmetic) average of twelve monthly average exchange rates (for January through December) extracted from the Database Retrieval System (v2.11), available at the University of British Columbia's Sauder School of Business (http://fx.sauder.ubc.ca/data.html).

2.2 Panel data econometric models

The static panel data econometric models to be studied in the paper are given formally in vector form in Appendix A:[11]

Models with neither individual (country) nor time effects, (2);

Models with only individual (country) effects: Fixed-effects model, (7);

Models with only time effects: Fixed-effects model, (10);

Models with both individual (country) and time effects: Fixed-effects model, (12).

[11]See Kitamura (2003) for an extensive survey of panel data econometrics and its applications.

Random-effects models will not be studied here,[12] for the present research intends to obtain useful implications from the estimated individual (country) and time *dummy* variables models which are essentially fixed-effects models.

In all these models, the dependent variable y_{it} represents the (logged) number of Japanese subsidiaries chosen to be located in ith host country (for each of the 25 industrial sectors), as defined in Panel A of Table 3. As we attempt to study the effect of foreign/host country corporate taxes on the location choice of Japanese multinationals, the number of Japanese subsidiaries located around the world is our ciritical variable whose variations are to be empirically explained by the magnitude of corporate tax rate as well as a few more country factors (such as research intensity/excellence and market potential factors).

We thus set the $K(=4)$ column vector of the explanatory variables $\boldsymbol{x}_{it} = (x_{1it}, ..., x_{4it})' = (\text{CTaxR}_{it}, \text{RelAppPatent}_{it}, \text{RelpcNomGDP}_{it}, \text{RelPopul}_{it})'$ where each variable is defined in Panel B of Table 3.

2.3 Descriptive statistics of model variables

The descriptive statistics of the dependent variables in Panel A of Table 3 and each of explanatory variables in Panel B are as reported, respectively, in Tables 4 and 5.[13] Table 4 shows that *(i)* the logged numbers of Japanese subsidiaries located abroad in ten manufacturing sectors (LNumSubsid_S1, LNumSubsid_S2, LNumSubsid_S5 through LNumSubsid_S7, LNumSubsid_S9, LNumSubsid_S10, and LNumSubsid_S12 through LNumSubsid_S14) and those in six non-manufacturing sectors (LNumSubsid_S17 through LNumSubsid_S19, LNumSubsid_S22, LNumSubsid_S23 and LNumSubsid_S25) are non-normally distributed, while *(ii)* the remaining dependent variables (including LNumSubsid_Mfg and LNumSubsid_Nonmfg) appear normally distributed.

Notice in Table 5 that there are observed 12 skipped/missing data points of RelAppPatent for ChinaHongKongSAR and Taiwan, six each: their data are missing for the whole six-year period. This will in effect reduce the sample size by 12 for every estimation throughout the paper: ChinaHongKongSAR and Taiwan will be ignored throughout (see row

[12] See Kojima (2004) for a panel data econometric analysis employing both fixed- and random-effects models.

[13] The subscript "*it*" as attached to explanatory variables in Table 3 will be omitted in the remaining of the paper unless needed.

Table 3 Variable Definition for Panel Data Models[a]

Variable Name in Tables 4 - 10 and Table 16	Definition

A. Dependent Variable y_{it}:
Logged Number of Japanese Subsidiaries Located in Each i of 27 Countries in FY/CY t (for each of 25 Industrial Sectors)[b]

"LNumSubsid_" followed by:	Logged number of Japanese subsidiaries in:
Mfg	The whole manufacturing sector
Nonmfg	The whole non-manufacturing sector
Sj	Industrial sector j, $j = 1, ..., 25$

B. Independent/Explanatory Variables:
$\boldsymbol{x}_{it} = (CTaxR_{it},\ RelAppPatent_{it},\ RelpcNomGDP_{it},\ RelPopul_{it})'$

Host tax factor	CTaxR	Corporate tax rate (%)[c] in host country
Host r.t.[d] home research-excellence/ intensity factor	RelAppPatent	Number of applications for patent in host country divided by that in home country (Japan)[e]
Host r.t. home market-potential factors	RelpcNomGDP	Per capita nominal GDP in host country divided by that in home country (Japan)[f]
	RelPopul	Population in host country divided by that in home country (Japan)[g]

[a]For the whole panel data set of variables defined here, see Table 16.

[b]For the numbering of countries and industrial sectors, see Table 1.

[c]Using CTaxR (percentages) divided by100 will not affect any estimated results, except that the regression coefficients associated with CTaxR will be, for example, -0.051 times 100 (instead of -0.051). See Tables 7 through 11.

[d]r.t. stands for "relative to," meaning host country is compared with home country by taking the ratio of host country figure to home country figure (as described in the right-most column).

[e]As noted in Table 16, relative data such as RelAP displayed there are Home (Japan) figure divided by Host figure; in every actual regression, however, their reciprocals such as RelAppPatent (i.e., Host divided by Home, as defined here) are used.

[f]The footnote immediately above applies here.

[g]The footnote immediately above applies here.

"Skipped/Missing" in Tables 7 through 10).

Three explanatory variables (RelAppPatent, RelpcNomGDP and RelPopul) in Table 5 are plotted for two years 2007 and 2012 in Figs. 2 through 4 (see Fig. 1 in Section 1 for CTaxR). Figs. 1-4 for the two selected years are readily seen to be consistent with the descriptive statistics in Table 5 for the whole sample period. In Fig. 2 the U.S.A. (country number 1) is,

Table 4 Descriptive Statistics: Dependent Variables

Panel(6) of Annual Data From 1//2007:01 To 27//2012:01

			Manufacturing[a]						
			LNumSubsid_						
	Mfg	Nonmfg	S1	S2	S3	S4	S5	S6	S7
Observations	162	162	140[b]	117	98	162	74	112	109
Sample Mean	4.788	5.217	2.043	1.764	1.428	2.772	0.915	1.662	1.854
P-value[c]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Variance[d]	2.007	1.202	1.476	1.951	1.055	1.963	0.594	1.524	1.504
Median	4.860	5.162	2.013	1.792	1.386	2.890	1.099	1.609	1.792
Skewness[e]	-0.085	0.200	0.617	0.831	0.430	-0.162	0.489	0.328	0.471
P-value	0.662	0.304	0.003	0.000	0.087	0.404	0.092	0.162	0.047
Kurtosis	-0.072	-0.427	0.136	0.645	0.032	-0.417	-0.436	-0.612	-0.339
P-value	0.854	0.278	0.749	0.167	0.951	0.290	0.465	0.200	0.485
Jarque-Bera	0.231	2.303	8.984	15.494	3.025	1.882	3.541	3.753	4.559
P-value	0.891	0.316	0.011	0.000	0.220	0.390	0.170	0.153	0.102
Minimum	1.609	2.833	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maximum	8.263	7.863	5.220	5.866	4.159	5.793	2.708	4.625	4.625

(Continued in next table)

[a]Sectors 1 through 16 are manufacturing sectors. For the numbering of the sectors see Table 1.

[b]This equals 162 (Total) minus 22 (Skipped/Missing), where the 22 missing data points correspond to NAs in Argentina, Italy, Spain, Switzerland, Russia and Austraila, under column "S1" in Table 16.

[c]The probability-value, with the null of mean=0.

[d]Computed by the usual formula for unbiased estimation involving the division by the sample size minus one (*RATS 7.0 Reference Manual*, p.441).

[e]For skewness, kurtosis and Jarque-Bera (1987) normality tests, see *RATS 7.0 Reference Manual*, pp.439-442: Their nulls are, respectively, sk=0, ku=0, and JB=0.

Table 4 (Continued)

	Manufacturing								
	LNumSubsid_								
	S8	S9	S10	S11	S12	S13	S14	S15	S16
Observations	108	126	137	138	140	139	155	154	159
Sample Mean	1.882	1.866	1.885	2.196	1.863	2.332	2.617	3.235	2.639
P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Variance	1.566	2.075	1.104	1.710	1.154	1.381	2.324	1.791	1.979
Median	2.079	2.197	1.609	2.197	1.946	2.398	2.944	3.401	2.565
Skewness	0.164	0.315	0.676	0.289	0.425	0.597	0.068	0.188	0.098
P-value	0.494	0.154	0.001	0.171	0.042	0.004	0.730	0.346	0.616
Kurtosis	-0.591	-0.789	0.508	-0.220	0.257	0.755	-1.019	-0.163	-0.170
P-value	0.225	0.079	0.237	0.607	0.546	0.077	0.011	0.686	0.668
Jarque-Bera	2.053	5.346	11.919	2.198	4.605	11.561	6.832	1.078	0.448
P-value	0.358	0.069	0.003	0.333	0.100	0.003	0.033	0.583	0.799
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maximum	4.844	5.421	4.883	5.656	4.844	5.724	5.984	6.273	6.395

(Continued on next page)

Table 4 (Continued)

	Non-manufacturing [a]								
	LNumSubsid_								
	S17	S18	S19	S20	S21	S22	S23	S24	S25
Observations	105	90	122	139	156	162	161	162	162
Sample Mean	1.055	1.393	1.913	2.294	2.852	4.575	2.148	3.089	2.514
P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Variance	0.748	1.692	1.592	1.604	1.239	1.176	1.528	1.543	2.041
Median	0.693	0.693	1.609	2.398	2.970	4.401	2.079	3.219	2.773
Skewness	0.482	0.604	-0.020	0.305	0.029	0.352	0.246	-0.075	-0.246
P-value	0.047	0.022	0.929	0.147	0.882	0.070	0.207	0.701	0.205
Kurtosis	-0.845	-0.971	-1.329	0.261	-0.591	-0.571	-0.766	0.055	-0.726
P-value	0.088	0.071	0.004	0.541	0.141	0.147	0.052	0.889	0.065
Jarque-Bera	7.187	8.997	8.980	2.543	2.295	5.546	5.556	0.171	5.194
P-value	0.028	0.011	0.011	0.280	0.317	0.062	0.062	0.918	0.075
Minimum	0.000	0.000	0.000	0.000	0.693	2.485	0.000	0.000	0.000
Maximum	2.890	4.263	4.143	5.628	5.521	7.176	5.187	5.986	5.434

[a]Sectors 17 through 25 are non-manufacturing sectors. For the numbering of the sectors see Table 1.

Table 5 Descriptive Statistics: Explanatory Variables[a]

Panel(6) of Annual Data From 1//2007:01 To 27//2012:01

	CTaxR	RelAppPatent	RelpcNomGDP	RelPopul
Observations	162	150[b]	162	162
Sample Mean	28.217	0.149	0.663	1.271
P-value	0.000	0.000	0.000	0.000
Variance	34.257	0.099	0.251	6.533
Median	29.755	0.038	0.698	0.474
Skewness	-0.303	3.852	0.295	3.043
P-value	0.119	0.000	0.128	0.000
Kurtosis	-0.424	16.025	-1.099	7.969
P-value	0.281	0.000	0.005	0.000
Jarque-Bera	3.685	1975.970	10.502	678.627
P-value	0.158	0.000	0.005	0.000
Minimum	16.500	0.000	0.027	0.033
Maximum	40.000	1.949	1.824	10.822

[a]See Table 4 for the remarks.

[b]12 skipped/missing data points here are those for China-HongKongSAR and Taiwan, six each: see NAs under column "RelAP" in Table 16, whose reciprocal is "RelAppPatent" here.

in terms of RelAppPatent, the only, more research-intense host country than Japan. Figs. 3 and 4 show that, based on RelpcNomGDP, there are 11 [6] host countries such as Switzerland and Australia (respectively, country numbers 24 and 26) providing more attractive market potential than Japan in 2007 [2012] and that, in terms of RelPopul, 6 host countries such as the U.S.A., China and India (respectively, country numbers 1, 6 and 15), in particular, appear far more attractive markets than Japan in each of 2007 and 2012. Section 3 will explore how these country factors (as proxied by RelAppPatent, RelpcNomGDP and RelPopul) may affect the location/country choice of Japanese multinationals.

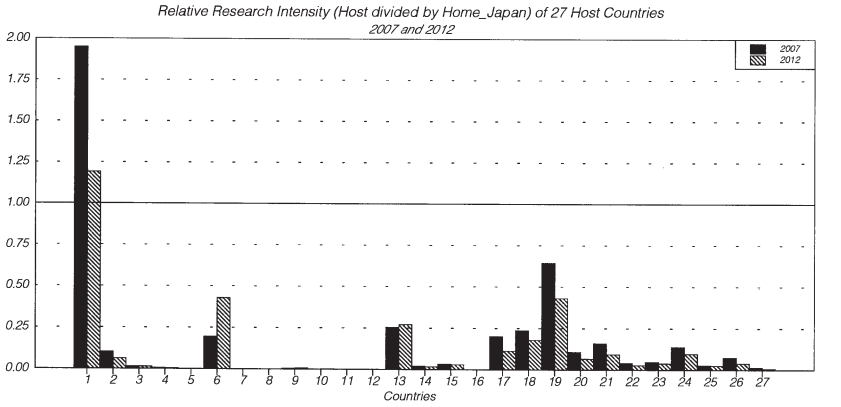

Figure 2 Relative Research Intensity (Host divided by Home_Japan) of 27 Host Countries (U.S.A. through New Zealand), for Years 2007 (black, filled bars) and 2012 (shaded bars). Note: A grid line is drawn at 1.0, above which a host country is more attractive with respect to "research intensity" than Japan; this applies to Figs. 3-4 as well. Data source: RelAP being compiled in Table 16 as part of the panel dataset (whose reciprocals, RelAppPatent, are here plotted); the country numbers along the horizontal axis in Table 1.

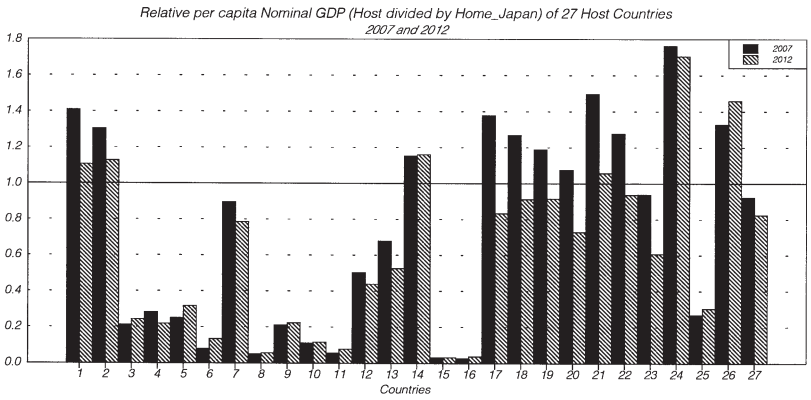

Figure 3 Relative per capita Nominal GDP (Host divided by Home_Japan) of 27 Host Countries (U.S.A. through New Zealand), for Years 2007 (black, filled bars) and 2012 (shaded bars). Data source: RelpcNGDP being compiled in Table 16 as part of the panel dataset (whose reciprocals, RelpcNomGDP, are here plotted); the country numbers along the horizontal axis in Table 1.

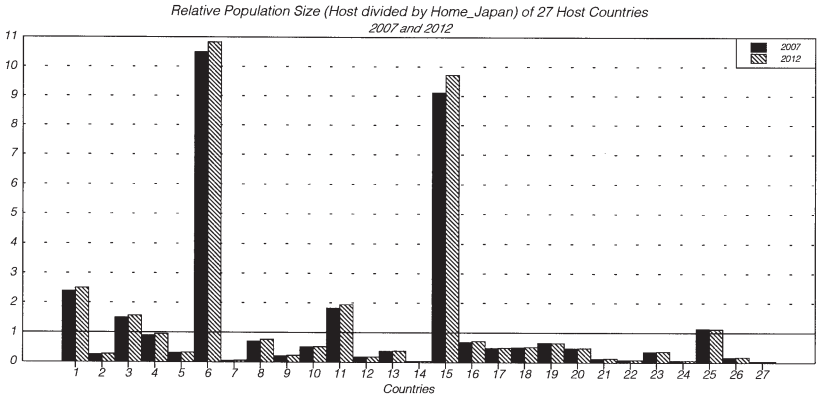

Figure 4 Relative Population Size (Host divided by Home_Japan) of 27 Host Countries (U.S.A. through New Zealand), for Years 2007 (black, filled bars) and 2012 (shaded bars). Data source: RelPop being compiled in Table 16 as part of the panel dataset (whose reciprocals, RelPopul, are here plotted); the country numbers along the horizontal axis in Table 1.

Table 6 shows that, for all the dependent variables, correlations among explanatory variables are consistently small enough to cause no serious multicolinearity problem for the estimation purposes. Some remarks are in order on the three correlations, though small in magnitude, whose signs are invariant across 25 industrial sectors:

(i) consistently positive (0.377 to 0.592) between CTaxR and RelAppPatent [implying that, as the corporate tax rate in the host country becomes greater, the number of applications for patent in the host county tends to be larger relative to that in Japan];

(ii) consistently positive (0.308 to 0.476) between RelAppPatent and RelpcNomGDP [implying that, as the per capita nominal GDP in the host country becomes greater relative to that in Japan, the number of applications for patent in the host county tends to be larger relative to that in Japan]; and

(iii) consistently negative (-0.431 to -0.294) between RelpcNomGDP and RelPopul [implying that, as the population in the host county becomes larger relative to that in Japan, the per capita nominal GDP in the host country tends to be smaller relative to that in Japan].

While the second and third signs coincide with our intuition, the first sign is not immdiately evident. The first (positive) sign would appear inconsistent with Karkinskya and Riedel (2012), who, using firm-level panel data set that enables a focus on "the number of patent applications filed by a multinational affiliate," infer that "the corporate tax rate (differential to other group members) exerts a negative effect on the number of patent applications filed by a multinational affiliate."[14] Our data set is, however, only industry-level and RelAppPatent involves only the (aggregate) number of patent applications filed by all firms and individuals (countries) (not just multinational affiliates) located/residing in the host country. Based on such aggregate data, the consistently positive sign of correlations (0.377 - 0.592) between CTaxR and RelAppPatent implies that more [less] patent applications relative to Japan tend to be filed in the host countries with higher [lower] host corporate tax rate (such as U.S.A. [Singapore]).[15]

Histograms and scatter diagrams as drawn in Figs. 5 through 7 (for

[14]In other words, "... For both reasons, MNEs (multinational enterprises) have an incentive to locate their patents at low-tax affiliates to minimize the corporate tax burden."

[15]See Table 16, where relative data displayed are Home (Japan) figure divided by Host figure. Note that their reciprocals (i.e., Host divided by Home) are used in all the remaining tables (Tables 3 through 11).

LNumSubsid_Mfg, LNumSubsid_Nonmfg and LNumSubsid_S1 are consistent with descriptive statistics and correlation matrices in Tables 4, 5 and 6; the same holds true with those histograms and scatter diagrams drawn for LNumSubsid_S2 through LNumSubsid_S25, which are not displayed in the paper due to the space limit.[16]

Note that, because of the differing sample size (as can be seen from Tables 4 and 16) and based on Table 6, the histograms and scatter diagrams displayed in the triangle below x_{1it} in Fig. 7 (for LNumSubsid_S1) and in those figures for LNumSubsid_S2, LNumSubsid_S3, LNumSubsid_S5 through LNumSubsid_S21 and LNumSubsid_S23 differ, though only slightly, from those drawn in the triangle below x_{1it} here in Fig. 5; those drawn in the triangle below x_{1it} in the remaining figures (Fig. 6 for LNumSubsid_Nonmfg and those for LNumSubsid_S4, LNumSubsid_S22, LNumSubsid_S24 and LNumSubsid_S25) are exactly the same as those drawn in the triangle below x_{1it} here in Fig. 5.

Further, the top-leftmost histograms in Figs. 5 through 7 (as well as those figures for S2 through S25) are readily seen to reflect Table 4 evidencing both *(i)* and *(ii)* at the beginning of Subsection 2.3.

[16] They will be available from the author on request.

Table 6 Correlation Matrices

Panel(6) of Annual Data From 1//2007:01 To 27//2012:01

Explanatory Variables	Dependent Variable LNumSubsid_Mfg	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.073	1.000		
RelAppPatent	0.372	0.377	1.000	
RelpcNomGDP	-0.358	-0.054	0.318	1.000
RelPopul	0.454	0.116	0.154	-0.400
	Nonmfg	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.046			
RelAppPatent	0.527	Same as those for LNumSubsid_Mfg[a]		
RelpcNomGDP	-0.020			
RelPopul	0.356			
	S1	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.075	1.000		
RelAppPatent	0.361	0.429	1.000	
RelpcNomGDP	-0.020	-0.054	0.318	1.000
RelPopul	0.356	0.116	0.154	-0.400
	S2	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.036	1.000		
RelAppPatent	0.229	0.515	1.000	
RelpcNomGDP	-0.521	0.109	0.393	1.000
RelPopul	0.558	0.095	0.163	-0.376
	S3	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.136	1.000		
RelAppPatent	0.187	0.556	1.000	
RelpcNomGDP	-0.311	0.137	0.405	1.000
RelPopul	0.613	0.010	0.237	-0.294
	S4	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.053			
RelAppPatent	0.420	Same as those for LNumSubsid_Mfg		
RelpcNomGDP	-0.210			
RelPopul	0.410			
	S5	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.148	1.000		
RelAppPatent	0.491	0.592	1.000	
RelpcNomGDP	0.111	0.065	0.418	1.000
RelPopul	0.420	0.162	0.144	-0.400
	S6	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.109	1.000		
RelAppPatent	0.380	0.542	1.000	
RelpcNomGDP	-0.264	0.291	0.395	1.000
RelPopul	0.539	0.034	0.187	-0.346
	S7	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.029	1.000		
RelAppPatent	0.291	0.507	1.000	
RelpcNomGDP	-0.436	0.027	0.476	1.000
RelPopul	0.459	0.181	0.104	-0.372

(Continued on next page)

[a]The reason is that the number of observations of LNumSubsid_Nonmfg is exactly equal to that of LNumSubsid_Mfg. (For the skipped/missing data points see row "Observations" in Table 4.)

Table 6 (Continued)

Explanatory Variables	Dependent Variable LNumSubsid_S8	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.165	1.000		
RelAppPatent	0.128	0.512	1.000	
RelpcNomGDP	-0.306	0.089	0.449	1.000
RelPopul	0.278	0.148	0.126	-0.358
	S9	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.190	1.000		
RelAppPatent	0.278	0.493	1.000	
RelpcNomGDP	-0.359	0.121	0.429	1.000
RelPopul	0.316	0.144	0.128	-0.388
	S10	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.007	1.000		
RelAppPatent	0.459	0.451	1.000	
RelpcNomGDP	-0.318	0.062	0.365	1.000
RelPopul	0.509	0.129	0.131	-0.409
	S11	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.079	1.000		
RelAppPatent	0.430	0.440	1.000	
RelpcNomGDP	-0.319	-0.052	0.348	1.000
RelPopul	0.441	0.156	0.129	-0.402
	S12	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.060	1.000		
RelAppPatent	0.489	0.428	1.000	
RelpcNomGDP	-0.296	-0.027	0.324	1.000
RelPopul	0.456	0.127	0.147	-0.406
	S13	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.166	1.000		
RelAppPatent	0.381	0.434	1.000	
RelpcNomGDP	-0.352	0.118	0.355	1.000
RelPopul	0.530	0.104	0.136	-0.418
	S14	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.078	1.000		
RelAppPatent	0.329	0.385	1.000	
RelpcNomGDP	-0.343	-0.030	0.332	1.000
RelPopul	0.329	0.115	0.146	-0.396
	S15	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.126	1.000		
RelAppPatent	0.392	0.399	1.000	
RelpcNomGDP	-0.364	0.132	0.364	1.000
RelPopul	0.535	0.082	0.150	-0.394
	S16	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.078	1.000		
RelAppPatent	0.325	0.387	1.000	
RelpcNomGDP	-0.252	0.024	0.336	1.000
RelPopul	0.366	0.102	0.154	-0.398

(Continued on next page)

Table 6 (Continued)

Explanatory ariables	Dependent Variable LNumSubsid_S17	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.264	1.000		
RelAppPatent	0.263	0.457	1.000	
RelpcNomGDP	-0.039	0.000	0.365	1.000
RelPopul	0.242	0.058	0.195	-0.360
Variables	S18	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.248	1.000		
RelAppPatent	0.410	0.549	1.000	
RelpcNomGDP	0.634	0.051	0.346	1.000
RelPopul	-0.147	0.038	0.227	-0.368
	S19	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.021	1.000		
RelAppPatent	0.153	0.483	1.000	
RelpcNomGDP	-0.442	0.060	0.404	1.000
RelPopul	0.308	0.172	0.124	-0.384
	S20	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.128	1.000		
RelAppPatent	0.505	0.432	1.000	
RelpcNomGDP	-0.206	0.081	0.333	1.000
RelPopul	0.462	0.114	0.140	-0.431
	S21	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.026	1.000		
RelAppPatent	0.362	0.412	1.000	
RelpcNomGDP	-0.295	-0.019	0.308	1.000
RelPopul	0.372	0.139	0.148	-0.419
	S22	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.029			
RelAppPatent	0.578	Same as those for LNumSubsid_Mfg		
RelpcNomGDP	0.113			
RelPopul	0.348			
	S23	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.076	1.000		
RelAppPatent	0.548	0.382	1.000	
RelpcNomGDP	0.100	-0.048	0.316	1.000
RelPopul	0.275	0.120	0.153	-0.403
	S24	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	0.026			
RelAppPatent	0.497	Same as those for LNumSubsid_Mfg		
RelpcNomGDP	-0.087			
RelPopul	0.365			
	S25	CTaxR	RelAppPatent	RelpcNomGDP
CTaxR	-0.035			
RelAppPatent	0.410	Same as those for LNumSubsid_Mfg		
RelpcNomGDP	-0.051			
RelPopul	0.215			

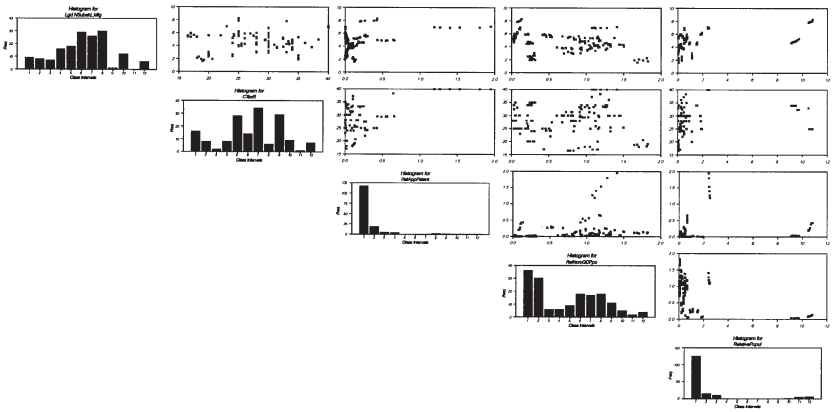

Figure 5 Histograms and scatter diagrams. From top left to bottom right: y_{it}=LNumSubsid_Mfg$_{it}$, x_{1it}=CTaxR$_{it}$, x_{2it}=RelAppPatent$_{it}$, x_{3it}=RelpcNomGDP$_{it}$, x_{4it}=RelativePopul$_{it}$, where y_{it} and $\boldsymbol{x}_{it}$=$(x_{1it}, ..., x_{4it})'$ are, respectively, dependent and explanatory variables (see Table 3).

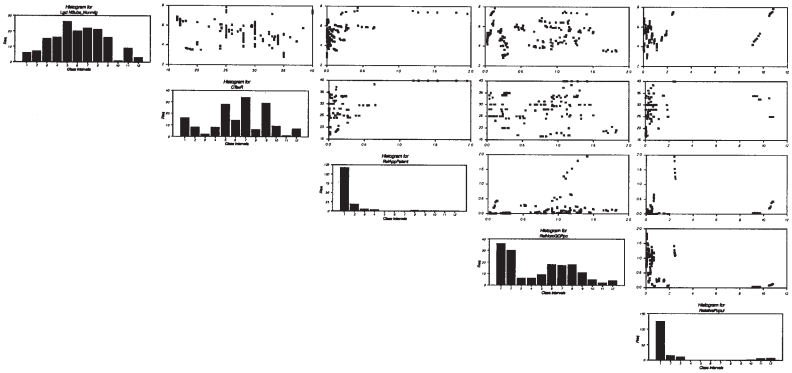

Figure 6 Histograms and scatter diagrams. From top left to bottom right: y_{it}=LNumSubsid_Nonmfg$_{it}$, x_{1it}=CTaxR$_{it}$, x_{2it}=RelAppPatent$_{it}$, x_{3it}=RelpcNomGDP$_{it}$, x_{4it}=RelativePopul$_{it}$

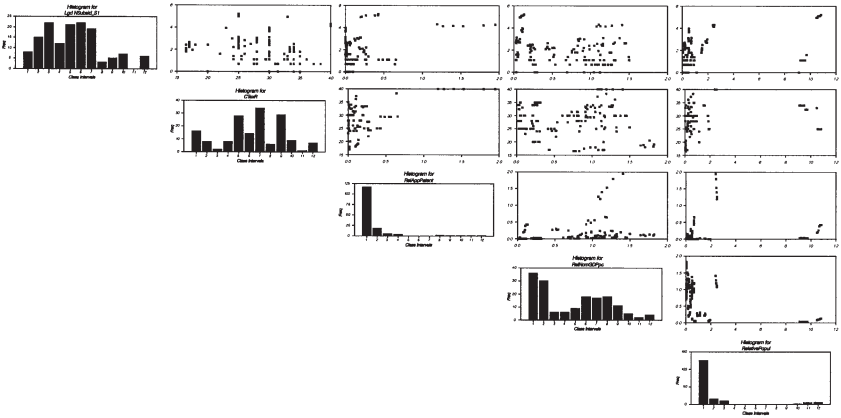

Figure 7 Histograms and scatter diagrams. From top left to bottom right: y_{it}=LNumSubsid_S1$_{it}$, x_{1it}=CTaxR$_{it}$, x_{2it}=RelAppPatent$_{it}$, x_{3it}=RelpcNomGDP$_{it}$, x_{4it}=RelativePopul$_{it}$

3 Estimated Results: Fixed-effects Models

Panel data econometric models as listed in Subsection 2.2 will be estimated with F tests performed to select model(s).[17]

3.1 Model with neither individual (country) nor time effects, (2)

Table 7 reports the estimated (constrained) models with neither individual (country) nor time effects (2).[18]

3.1.1 Manufacturing and non-manufacturing sectors

Explanatory variables Many explanatory variables turn out significant. In particular, the effect of host country corporate tax on location choice of the Japanese multinationals in each industrial sector is negative and statistically significant for every sector (including Mfg and Nonmfg) except S3 (Lumber-Pulp-Paper), S17 (AgricultureForestryFishery) and

[17]Recall *(i)* and *(ii)* as detailed at the beginning of Subsection 2.3.
[18]For the constrained model see Appendix A.1.

S18 (Mining). That is, as corporate tax rate is reduced in a foreign economy, the Japanese multinationals in all sectors but above exceptions are more likely to choose to locate their foreign subsidiaries in the country.

On the other hand, RelAppPatent (a host r.t. home[19] research-excellence/intensity factor) and RelPopul (a host r.t. home market-potential factor) have a statistically significant, positive effect on the location/country choice. That is, as the (relative) number of applications for patent or the (relative) population size grows in a foreign economy relative to Japan, the Japanese multinationals are more likely to choose to locate their foreign subsidiaries in the country. This holds true with every sector (including Mfg and Nonmfg) except several sectors such as S3 (Lumber-Pulp-Paper), S8 (NonferrousMetals), S9 (MetalProducts), S14 (MachineForInformationCommunication), S17 (AgricultureForestryFishery), S18 (Mining), S19 (Construction) and S25 (MiscellaneousNonmanufacturing).

Further, notice that RelpcNomGDP (a host r.t. home market-potential factor) has a statistically significant, *negative* effect on the location/country choice. That is, as the (relative) per capita nominal GDP is smaller in a foreign economy relative to Japan, the Japanese multinationals are more likely to choose to locate their foreign subsidiaries in the country. (Industries that this does not apply to include S5 (Oil-Coal), S17 (AgricultureForestryFishery), S22 (Wholesale) and S23 (Retail).) This, indeed, appears consistent with the Japanese business operations increasing in number and size in the Asian region (where RelpcNomGDP tends to be small), during the sample period.

F tests These results (including their statistical significance, in particular) for the constrained model, however, sharply contrast with the later results obtained for the (unconstrained) models with individual (country) and/or time effects.[20] Which models are more appropriate for each industrial sector, models with or without individual (country) and/or time effects, will be statistically checked and decided through F tests in the subsequent subsections.

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[19] r.t. stands for "relative to," meaning host country is compared with home country by taking the ratio of host country figure to home country figure (as described in the right-most column in Table 3).

[20] For unconstrained models (to be tested against the null of constrained model (2)) see Appendices A.3 through A.5.

Table 7 Model With Neither Effects, (2)

Linear Regression - Estimation by Least Squares
Panel(6) of Annual Data From 1//2007:01 To 27//2012:01

	Dependent Variables									
					Manufacturing[a]					
					LNumSubsid_					
	Mfg		Nonmfg		S1		S2		S3	
Usable Observations	150		150		128		105		86	
Total Observations	162		162		162		162		162	
Skipped/Missing	12[b]		12		34[c]		57		76	
Degrees of Freedom[d]	145		145		123		100		81	
$\bar{R}^{2}$ [e]	0.437		0.437		0.326		0.559		0.392	
Standard Err. of Estimate[f]	1.086		0.819		1.042		0.971		0.800	
Regression F(4,m)[g]	29.968		29.856		16.357		33.952		14.694	
P-value of F[h]	0.000		0.000		0.000		0.000		0.000	
Durbin-Watson Stat.	0.295		0.338		0.558		0.585		0.585	
Explanatory Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	6.514	0.000	6.858	0.000	4.192	0.000	3.830	0.000	0.812	0.176
CTaxR	-0.051[i]	0.007	-0.068	0.000	-0.075	0.000	-0.056	0.014	0.022	0.282
RelAppPatent	2.562	0.000	2.312	0.000	2.081	0.000	2.082	0.000	0.201	0.525
RelpcNomGDP	-1.296	0.000	-0.336	0.036	-0.676	0.004	-1.781	0.000	-0.384	0.058
RelPopul	0.112	0.005	0.094	0.002	0.093	0.016	0.139	0.001	0.209	0.000
Residuals										
Variance[j]	1.147		0.653		0.653		0.907		0.609	
Skewness	-0.895	0.000	-0.365	0.071	-0.365	0.071	-0.709	0.003	-0.607	0.024
Kurtosis	0.584	0.154	-0.387	0.344	-0.387	0.344	1.718	0.001	-0.257	0.640
Jarque-Bera	22.174	0.000	4.275	0.118	4.275	0.118	21.707	0.000	5.514	0.063
Studentized Range[k]	4.602		4.118		4.118		5.519		3.908	

(Continued on next page)

[a] Sectors 1 through 16 are manufacturing sectors. For the numbering of the sectors see Table 1.

[b] 12=2(Hong Kong and Taiwan)*6yrs: for the 12 missing data points see footnote *b* in Table 5. The present regression results using the input data set including Hong Kong and Taiwan are exactly the same as those obtained using the data set excluding the two countries. (For the latter results, see LocChoicePnlData-Revised2.xls and Output_excld.HK&Taiwan2.rtf or the MacRATS program, PDEcon_LocChoiceByJpnsMNEs_woRandomEffects2.prg.) This, too, holds true with all the subsequent regression results for models with only individual effects, with only time effaces and with both effects, Tables 8 through 11.

[c] 34=2(Hong Kong and Taiwan)*6yrs+22; for the 22 missing data points see footnote *b* in Table 4.

[d] The number of degrees of freedom for the residuals is equal to number of usable observations − number of constant term and exlanatory variables (=150−[1+4] for LNumSubsid_Mfg). The explanatory variables will, too, include dummies whose (slope) coefficients are non-zero: for example, see Table 8.

[e] The coefficient of determination corrected for degrees of freedom.

[f] The realized value of the estimator of the error term standard deviation (i.e., the residual standard deviation) = [Sum of Squared Residuals/Degrees of Freedom above]$^{\frac{1}{2}}$).

[g] This is an F to test the null that all regression coefficients = 0. Its degrees of freedom are 4 (=5-1) =the number of explanatory variables; m="Degrees of Freedom" as computed above.

[h] Right-sided P-value of the F above.

[i] Using CTaxR (percentages) divided by100, the estimated coefficients will be, for example, -0.051 times 100 (instead of -0.051). For CTaxR (percentages), see Table 3.

[j] See Table 4 for variance, skewness, kurtosis and Jarque-Bera here.

[k] Statistic to test the normality: The normality would be inferred if the statistic turns out approximately between 4.3 and 5.6 [4.44 and 5.68; 4.72 and 5.96] for "Usable Observations" equal to about 90 [100; 150].

Table 7 (Continued)

	Dependent Variables: Manufacturing LNumSubsid_									
	S4		S5		S6		S7		S8	
Usable Observations	150		64		104		97		96	
Total Observations	162		162		162		162		162	
Skipped/Missing	12		98		58		65		66	
Degrees of Freedom	145		59		99		92		91	
$\bar{R}^2$	0.365		0.372		0.522		0.629		0.281	
Standard Err. of Estimate	1.135		0.579		0.845		0.782		1.114	
Regression F(4,m)	22.369		10.327		29.116		41.746		10.274	
P-value of F	0.000		0.000		0.000		0.000		0.000	
Durbin-Watson Stat.	0.585		0.875		0.460		0.512		0.275	
Explanatory Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	4.302	0.000	1.520	0.002	4.095	0.000	5.175	0.000	5.128	0.000
CTaxR	-0.054	0.006	-0.032	0.054	-0.092	0.000	-0.100	0.000	-0.106	0.000
RelAppPatent	2.531	0.000	0.922	0.000	2.121	0.000	2.860	0.000	1.846	0.000
RelpcNomGDP	-0.853	0.000	0.077	0.691	-0.728	0.001	-1.999	0.000	-1.257	0.000
RelPopul	0.121	0.004	0.086	0.001	0.152	0.000	0.065	0.029	0.044	0.309
Residuals										
Variance	1.254		0.314		0.686		0.587		1.189	
Skewness	-0.924	0.000	-0.764	0.015	-0.502	0.040	0.126	0.618	0.124	0.626
Kurtosis	0.766	0.061	-0.199	0.759	0.085	0.864	-0.058	0.911	-0.827	0.111
Jarque-Bera	25.024	0.000	6.336	0.042	4.393	0.111	0.271	0.873	2.982	0.225
Studentized Range	4.484		3.965		4.671		4.757		3.899	

(Continued in next table)

Table 7 (Continued)

	Dependent Variables: Manufacturing LNumSubsid_									
	S9		S10		S11		S12		S13	
Usable Observations	114		125		126		128		127	
Total Observations	162		162		162		162		162	
Skipped/Missing	48		37		36		34		35	
Degrees of Freedom	109		120		121		123		122	
$\bar{R}^2$	0.535		0.618		0.511		0.555		0.630	
Standard Error of Estimate	1.016		0.654		0.940		0.734		0.738	
Regression F(4,m)	33.495		51.169		33.601		40.552		54.664	
P-value of F	0.000		0.000		0.000		0.000		0.000	
Durbin-Watson Stat.	0.583		0.626		0.407		0.551		0.702	
Explanatory Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	6.711	0.000	4.135	0.000	4.449	0.000	3.664	0.000	5.556	0.000
CTaxR	-0.153	0.000	-0.075	0.000	-0.072	0.000	-0.060	0.000	-0.110	0.000
RelAppPatent	3.282	0.000	2.334	0.000	2.797	0.000	2.402	0.000	2.424	0.000
RelpcNomGDP	-1.936	0.000	-0.965	0.000	-1.269	0.000	-0.955	0.000	-0.998	0.000
RelPopul	0.025	0.507	0.100	0.000	0.092	0.008	0.079	0.005	0.135	0.000
Residuals										
Variance	0.996		0.413		0.856		0.522		0.527	
Skewness	-0.349	0.133	0.181	0.415	-0.591	0.007	-0.417	0.057	0.528	0.016
Kurtosis	0.742	0.117	0.730	0.105	0.722	0.108	0.482	0.279	0.491	0.271
Jarque-Bera	4.929	0.085	3.460	0.177	10.080	0.006	4.949	0.084	7.170	0.028
Studentized Range	5.480		6.070		5.124		5.779		4.773	

(Continued on next page)

Table 7 (Continued)

	Dependent Variables									
	Manufacturing						Non-manufacturing[a]			
	LNumSubsid_									
	S14		S15		S16		S17		S18	
Usable Observations	143		142		147		97		84	
Total Observations	162		162		162		162		162	
Skipped/Missing	19		20		15		65		78	
Degrees of Freedom	138		137		142		92		79	
$\bar{R}^2$	0.425		0.499		0.329		0.099		0.432	
Standard Error of Estimate	1.149		0.948		1.164		0.825		0.980	
Regression F(4,m)	27.218		36.125		18.928		3.623		16.774	
P-value of F	0.000		0.000		0.000		0.009		0.000	
Durbin-Watson Stat.	0.371		0.321		0.292		0.611		0.489	
Explanatory Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	5.823	0.000	3.879	0.000	5.052	0.000	0.089	0.879	-0.729	0.353
CTaxR	-0.097	0.000	-0.013	0.443	-0.080	0.000	0.031	0.104	0.039	0.125
RelAppPatent	2.978	0.000	2.181	0.000	2.370	0.000	0.350	0.253	0.331	0.406
RelpcNomGDP	-1.562	0.000	-1.213	0.000	-1.012	0.000	-0.041	0.846	1.491	0.000
RelPopul	0.036	0.384	0.144	0.000	0.092	0.029	0.058	0.090	0.022	0.633
Residuals										
Variance	1.284		0.873		1.317		0.652		0.913	
Skewness	-0.637	0.002	-0.583	0.005	-0.902	0.000	0.426	0.092	-0.331	0.225
Kurtosis	0.351	0.403	0.838	0.047	0.698	0.092	0.147	0.776	-0.025	0.965
Jarque-Bera	10.407	0.005	12.188	0.002	22.899	0.000	3.021	0.221	1.531	0.465
Studentized Range	5.251		5.108		4.657		4.610		4.351	

(Continued in next table)

[a]Sectors 17 through 25 are non-manufacturing sectors. For the numbering of the sectors see Table 1.

Table 7 (Continued)

	Dependent Variables									
	Non-manufacturing									
	LNumSubsid_									
	S19		S20		S21		S22		S23	
Usable Observations	110		127		144		150		149	
Total Observations	162		162		162		162		162	
Skipped/Missing	52		35		18		12		13	
Degrees of Freedom	105		122		139		145		144	
$\bar{R}^2$	0.345		0.627		0.385		0.469		0.429	
Standard Error of Estimate	1.057		0.806		0.880		0.769		0.926	
Regression F(4,m)	15.374		53.927		23.411		33.838		28.745	
P-value of F	0.000		0.000		0.000		0.000		0.000	
Durbin-Watson Stat.	0.474		0.582		0.325		0.355		0.412	
Explanatory Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	4.105	0.000	5.745	0.000	4.815	0.000	5.738	0.000	4.006	0.000
CTaxR	-0.059	0.009	-0.124	0.000	-0.064	0.000	-0.060	0.000	-0.083	0.000
RelAppPatent	1.840	0.000	2.998	0.000	2.078	0.000	2.165	0.000	2.606	0.000
RelpcNomGDP	-1.580	0.000	-0.801	0.000	-0.904	0.000	0.010	0.944	-0.123	0.494
RelPopul	0.022	0.579	0.128	0.000	0.063	0.051	0.114	0.000	0.090	0.008
Residuals										
Variance	1.077		0.628		0.752		0.575		0.835	
Skewness	-0.456	0.054	-0.407	0.064	-0.171	0.407	-0.184	0.362	-0.247	0.222
Kurtosis	-0.224	0.642	0.129	0.773	-0.704	0.093	-0.243	0.554	-0.220	0.593
Jarque-Bera	4.051	0.132	3.599	0.165	3.675	0.159	1.217	0.544	1.821	0.402
Studentized Range	4.280		4.900		4.044		4.452		5.016	

(Continued on next page)

Table 7 (Continued)

	Dependent Variables			
	Non-manufacturing			
	LNumSubsid_			
	S24		S25	
Usable Observations	150		150	
Total Observations	162		162	
Skipped/Missing	12		12	
Degrees of Freedom	145		145	
$\bar{R}^2$	0.383		0.250	
Standard Error of Estimate	0.995		1.266	
Regression F(4,m)	24.134		13.399	
P-value of F	0.000		0.000	
Durbin-Watson Statistic	0.499		0.404	
Explanatory Variables	Coeff	P-value	Coeff	P-value
Constant	4.556	0.000	4.565	0.000
CTaxR	-0.058	0.001	-0.074	0.001
RelAppPatent	2.513	0.000	2.646	0.000
RelpcNomGDP	-0.526	0.007	-0.617	0.012
RelPopul	0.101	0.005	0.039	0.389
Residuals				
Variance	0.964		1.560	
Skewness	-0.805	0.000	-0.324	0.109
Kurtosis	0.501	0.222	-0.641	0.118
Jarque-Bera	17.773	0.000	5.193	0.075
Studentized Range	4.961		4.561	

3.2 Model with only individual (country) effects, (7)

We will next estimate model with only individual (country) effects, and in the subsequent subsections move on to model with only time effects and then to model with both individual (country) and time effects. All these are unconstrained models (as against constrained models in the previous subsection which incorporate neither individual (country) nor time effects).

Table 8 reports the estimated fixed-effects models with only individual (country) effects, (7). (See the table for the method of estimation employed by the present paper.) Comparing the table with Table 7 (for the model without either individual (country) or time effects), several remarks are in order.

3.2.1 Manufacturing sector

While R^2 has improved significantly, the residuals statistics such as Jaque-Bera have not improved but rather worsened for many sectors: S1 (Food), S3 (Lumber-Pulp-Paper), S6-S10 (Ceramics-SoilStone, Steel, NonferrousMetals, MetalProducts, GeneralPurposeMachine), S12-S14 (MachineForCommercialUse, ElectricalMachinery, MachineForInformation-Communication). The only exception, whose Jaque-Bera has improved, is S2 (Textile). The apparent non-normality of residuals observed across the manufacturing sector is indeed mainly due to kurtosis worsened for these sectors. It is not clear why, in the unconstrained model with only

individual (country) effects, kurtosis has behaved in a non-normal manner (as compared to that in the constrained model without either individual (country) or time effects).

Explanatory variables The statistical significance of explanatory variables depends on industrial sectors, and Japanese multinationals in different manufacturing sectors respond differently to host country tax rate.

The effect of host country corporate tax on location choice of the Japanese multinationals is negative and statistically significant for S6 (Ceramics-SoilStone), S9 (MetalProducts), S11 (MachineForProduction) and S16 (MiscellaneousManufacturing); it is still negative but insignficant for Mfg, S1 (Food), S4 (Chemical), S5 (Oil-Coal), S9 (MetalProducts), S12 (MachineForCommercialUse) and S15 (TransportationEquipment). Notice that the effect is positive and statistically significant for S13 (ElectricalMachinery): more Japanese multinationals in the sector are likely to operate (even) in higher-tax countries.

On the other hand, RelAppPatent has a statistically significant, positive effect on the location/country choice only for sectors S2 (Textile) and S8 (NonferrousMetals). RelPopul has a statistically significant, positive effect on the location/country choice for Mfg, S1 (Food), S2 (Textile), S4 (Chemical), S7-S12 (Steel, NonferrousMetals, MetalProducts, GeneralPurposeMachine, MachineForProduction, MachineForCommercialUse), S15 (TransportationEquipment) and S16 (MiscellaneousManufacturing).

Further, RelpcNomGDP has statistically significant, mixed (negative *and* positive) effects on the location/country choice: negative only for S8 (NonferrousMetals); positive for Mfg, S5 (Oil-Coal), S7 (Steel), S9-S11 (MetalProducts, GeneralPurposeMachine, MachineForProduction), and S13-S15 (ElectricalMachinery, MachineForInformationCommunication, TransportationEquipment). As noted earlier, the negative effect appears consistent with the Japanese business operations increasing in number and size in the Asian region (where RelpcNomGDP tends to be small), during the sample period. The positive effect detected here appears to apply to industrial sectors which operate more aggressively in more developed nations (where RelpcNomGDP tends to be large).

Again, these results (including their statistical significance, in particular) sharply contrast with the earlier results obtained for the (constrained) models with neither individual (country) nor time effects. Which models are more appropriate for each industrial sector, models with or

without individual (country) and/or time effects, will be statistically checked and decided through F tests immediately below.

Dummies and F tests The bottom panel of Table 8 tests the null of absence of individual (country) effects: tested is the null that coefficients on country dummies (dummies for locations/countries) are all equal (to some country-invariant constant). The null is rejected for every industrial sector, implying consistent presence of individual (i.e., country-specific) effects.

What are plausible country-specific effects that are unexplained by variables actually included in the model? A set of country characteristics or factors which are omitted in the present model will most likely constitute country-specific effects detected in Table 8. What the set would look like remains to be studied elsewhere.

3.2.2 Non-manufacturing sector

The same holds true with the non-manufacturing sector: Jaque-Bera has worsened for such sectors as S19 (Construction), S20 (InformationCommunication), S22 (Wholesale), S23 (Retail), and S25 (MiscellaneousNonmanufacturing), mainly due to kurtosis worsened for these sectors. The only exceptions, whose Jaque-Bera evidences residuals normality, are S17 (AgricultureForestryFishery), S18 (Mining) and S21 (Transportation).

Explanatory variables The effect of host country corporate tax on location choice of the Japanese multinationals is negative and statistically significant for Nonmfg, S18-S20 (Mining, Construction, InformationCommunication) and S22-S24 (Wholesale, Retail, Service); it is still negative but insignficant for S17 (AgricultureForestryFishery), S21 (Transportation), S25 (MiscellaneousNonmanufacturing). Notice that there is detected no positive effect, implying no non-manufacturing multnationals will likely to operate in a higher-tax host countries.

RelAppPatent has no statistically significant, positive effect on the location/country choice for any sectors; a positive but insignificant effect is, however, observed for S17 (AgricultureForestryFishery), S18 (Mining), S23 (Retail) and S25 (MiscellaneousNonmanufacturing). RelPopul has a statistically significant, positive effect on the location/country choice for Nonmfg and S19-S24 (Construction, InformationCommunication, Transportation, Wholesale, Retail, Service).

Notice further that RelpcNomGDP has statistically significant, mixed (negative *and* positive) effects on the location/country choice: negative for S17 (AgricultureForestryFishery), S24,(Service) and S25 (MiscellaneousNonmanufacturing); positive for S19 (Construction) and S21 (Transportation).[21]

Dummies and F tests The bottom panel of Table 8 shows again that the null is rejected for every non-manufacturing sector, implying consistent presence of individual (i.e., country-specific) effects.

Are plausible country-specific effects that are unexplained by variables actually included in the model for the non-manufacturing sectors different than those for the manufacturing sectors? Is the set of country characteristics or factors which are omitted in the present model for the non-manufacturing sectors different than that for the manufacturing sectors? These questions remain to be investigated elsewhere.

Table 8 Model With Only individual (Country) Effects, (7)[a]

Linear Regression - Estimation by Least Squares[b]
Panel(6) of Annual Data From 1//2007:01 To 27//2012:01

	Dependent Variables									
					Manufacturing[c]					
					LNumSubsid_					
	Mfg		Nonmfg		S1		S2		S3	
Usable Observations	150		150		128		105		86	
Total Observations	162		162		162		162		162	
Skipped/Missing	12		12		34		57		76	
Degrees of Freedom	121		121		100		82		65	
R^2	0.993		0.989		0.965		0.967		0.916	
Std. Err. of Est.	0.125		0.112		0.237		0.265		0.298	
Regr. F(28,121)[d]	705.258		497.332		F(27,100)[e] 130.614		F(22,82) 140.561		F(20,65) 47.051	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Stat.	1.460		1.993		1.960		1.608		1.784	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
CTaxR	-0.005	0.403	-0.023	0.000	-0.018	0.163	0.006	0.721	0.009	0.595
RelAppPatent	0.022	0.906	-0.102	0.537	0.000	1.000	0.765	0.058	0.242	0.632
RelpcNomGDP	0.371	0.005	-0.091	0.437	0.143	0.592	-0.163	0.617	0.208	0.761
RelPopul	1.022	0.000	1.817	0.000	1.556	0.000	1.959	0.012	0.969	0.328

(Continued on next page)

[a] See also Table 7.

[b] This is the method of estimation *(ii)* as described in Appendix A.3.

[c] Sectors 1 through 16 are manufacturing sectors. For the numbering of the sectors see Table 1.

[d] 28=4+25-1=the total number of 4 explanatory variables and 25 dummies (excluding two dummies for Hong Kong and Taiwan, for LNumSubsid_Mfg and LNumSubsid_Nonmfg) minus 1; 121=Degrees of Freedom above.

[e] 27=4+24-1=the total number of 4 explanatory variables and 24 dummies (excluding three dummies for Hong Kong, Taiwan and Switzerland, for LNumSubsid_S1) minus 1; 100=Degrees of Freedom above.

[21] Recall that the negative effect appears consistent with the Japanese business operations increasing in number and size in the Asian region (where RelpcNomGDP tends to be small), during the sample period. The positive effect detected here is likely to apply to industrial sectors which operate more aggressively in more developed nations (where RelpcNomGDP tends to be large).

Table 8 (Continued: Lower Panel)

	Dependent Variables									
					Manufacturing					
					LNumSubsid_					
	Mfg		Nonmfg		S1		S2		S3	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
USA (1)	4.192	0.000	4.153	0.000	0.943	0.465	-3.162	0.155	-1.271	0.646
Canada (2)	3.727	0.000	5.304	0.000	1.017	0.030	0.000	0.000	0.715	0.428
Brazil (3)	3.079	0.000	2.824	0.000	0.283	0.733	-1.285	0.371	-1.657	0.354
Mexico (4)	3.665	0.000	3.588	0.000	0.122	0.834	-1.292	0.196	0.000	0.000
Argentina (5)	1.869	0.000	3.335	0.000	0.446	0.373	0.000	0.000	0.000	0.000
ChinaExcldHK(6)	-2.811	0.224	-11.227	0.000	-11.047	0.014	-15.710	0.061	-6.781	0.526
ChinaHKSAR (7)	0.000[a]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	4.797	0.000	4.577	0.000	0.973	0.082	-0.964	0.266	-0.011	0.991
Malaysia (9)	5.743	0.000	5.760	0.000	2.471	0.000	1.318	0.008	1.837	0.001
Thailand (10)	6.347	0.000	6.042	0.000	3.510	0.000	2.478	0.001	1.437	0.085
Indonesia (11)	4.230	0.000	2.512	0.000	0.344	0.706	-0.526	0.747	-0.128	0.950
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	5.137	0.000	5.716	0.000	1.116	0.005	0.525	0.351	0.000	0.000
Singapore (14)	5.044	0.000	6.890	0.000	2.562	0.000	0.218	0.585	-0.431	0.572
India (15)	-4.513	0.030	-11.519	0.000	-13.061	0.001	-18.627	0.015	0.000	0.000
Vietnam (16)	4.962	0.000	4.187	0.000	2.175	0.000	1.183	0.132	1.052	0.267
U. K. (17)	4.513	0.000	5.852	0.000	2.594	0.000	0.873	0.193	-0.896	0.311
France (18)	3.831	0.000	4.549	0.000	1.616	0.002	-0.303	0.687	0.000	0.000
Germany (19)	4.031	0.000	5.566	0.000	0.408	0.453	-0.428	0.601	-0.099	0.925
Italy (20)	3.092	0.000	4.443	0.000	0.053	0.916	2.5E-04	0.9998	0.000	0.000
Netherlands (21)	3.588	0.000	6.019	0.000	1.069	0.010	-0.055	0.915	-0.614	0.444
Belgium (22)	3.209	0.000	5.007	0.000	0.882	0.058	0.000	0.000	0.000	0.000
Spain (23)	3.324	0.000	4.157	0.000	-0.138	0.778	0.000	0.000	0.000	0.000
Switzerland (24)	1.333	0.000	4.059	0.000	0.000	0.000	0.000	0.000	-0.633	0.578
Russia (25)	1.440	0.000	2.470	0.000	-1.444	0.016	0.000	0.000	-0.819	0.524
Australia (26)	3.831	0.000	6.096	0.000	2.651	0.000	-0.215	0.709	0.684	0.470
New Zealand (27)	2.868	0.000	4.550	0.000	1.896	0.000	-0.114	0.815	1.575	0.019
Residuals										
Variance	0.013		0.010		0.044		0.055		0.068	
Skewness	1.107	0.000	0.235	0.246	0.047	0.831	0.470	0.053	0.265	0.324
Kurtosis	4.375	0.000	3.840	0.000	1.895	0.000	0.329	0.505	2.464	0.000
Jarque-Bera	150.234	0.000	93.519	0.000	19.192	0.000	4.336	0.114	22.754	0.000
Studentized Range	6.923		7.802		6.808		5.041		7.001	
Inference: [b] Testing the null of absence of individual (country) effects[c]										
F(26,131) [d]	447.867	0.000	315.694	0.000	114.238	0.000	77.676	0.000	40.151	0.000
F Statistic [e]	F(24,121)		F(24,121)		F(23,116)		F(18,91)		F(16,81)	
	448.151	0.000	315.895	0.000	114.352	0.000	77.939	0.000	40.343	0.000

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[a] The reason for 0.000 is that ChinaHKSAR (Hong Kong) is being skipped due to no data available for one explanatory variable "RelAppPatent" for the whole six-year period. This applies to Taiwan as well. Some other countries such as Switzerland, too, will have such dummies since their dependent variable has no data available for the whole six-year period: see LNumSubsid_S1 for instance.

[b] Using CTaxR (percentages) divided by100 will lead to exactly the same inference results as those for CTaxR (percentages) here. This holds true, too, with Tables 9 and 10.

[c] Tested is the null that coefficients for country dummies are all equal (to some individual (country)-invariant constant).

[d] An F computed by (8) in Appendix A.3, with N=27 (the total number of countries under study).

[e] An F computed by (8) in Appendix A.3, for which the number of dummies whose coefficients are exactly zero in the table is subtracted from N since the corresponding countries have data unavailable for the whole six-year period and thus such countries as ChinaHKSAR, Taiwan, etc. are ignored/skipped in the regression. This apples to "F Statistic" at the end of the (continued) tables that follow.

Table 8 (Continued)

	Dependent Variables									
	Manufacturing									
	LNumSubsid_									
	S4		S5		S6		S7		S8	
Usable Obs.	150		64		104		97		96	
Total Observations	162		162		162		162		162	
Skipped/Missing	12		98		58		65		66	
Degrees of Freedom	121		48		80		76		75	
R^2	0.984		0.739		0.970		0.970		0.963	
Std. Err. of Est.	0.181		0.373		0.211		0.224		0.251	
Regression F Stat.	F(28,121) 326.749		F(15,48) 12.921		F(23,80) 147.290		F(20,76) 154.332		F(20,75) 126.103	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Stat.	1.662		1.851		1.837		1.555		1.518	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
CTaxR	-0.002	0.813	-0.005	0.875	-0.023	0.048	0.005	0.675	0.017	0.210
RelAppPatent	-0.170	0.520	-0.715	0.239	-0.186	0.562	0.007	0.985	0.958	0.017
RelpcNomGDP	0.238	0.206	1.256	0.063	-0.163	0.568	1.238	0.000	-0.847	0.040
RelPopul	0.676	0.029	0.660	0.557	0.946	0.157	1.419	0.000	1.538	0.004
USA (1)	3.418	0.001	0.111	0.975	2.337	0.209	-1.387	0.265	-1.973	0.210
Canada (2)	1.336	0.000	0.000	0.000	1.365	0.006	-1.973	0.000	0.407	0.472
Brazil (3)	1.283	0.037	-0.108	0.962	0.000	0.000	-1.238	0.127	-2.173	0.034
Mexico (4)	1.355	0.002	0.000	0.000	-0.164	0.833	-0.460	0.417	-0.552	0.426
Argentina (5)	0.026	0.939	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ChinaExcldHk (6)	-1.496	0.653	-4.299	0.726	-4.988	0.488	-10.879	0.011	-12.530	0.028
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	2.471	0.000	0.000	0.000	0.249	0.718	0.549	0.319	0.436	0.504
Malaysia (9)	3.666	0.000	0.396	0.644	3.109	0.000	1.465	0.000	2.558	0.000
Thailand (10)	4.146	0.000	0.750	0.530	3.066	0.000	2.617	0.000	2.438	0.000
Indonesia (11)	2.802	0.000	-0.715	0.777	1.064	0.441	0.059	0.946	-0.880	0.437
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	3.833	0.000	0.273	0.780	2.565	0.000	0.475	0.217	0.640	0.152
Singapore (14)	3.658	0.000	-0.113	0.884	2.090	0.000	0.385	0.308	2.483	0.000
India (15)	-3.281	0.269	-6.193	0.580	-7.135	0.277	-11.875	0.002	-14.732	0.004
Vietnam (16)	2.610	0.000	-0.404	0.761	2.107	0.001	1.110	0.023	0.652	0.261
U. K. (17)	2.673	0.000	-0.623	0.595	1.904	0.001	-1.691	0.001	-0.302	0.588
France (18)	2.750	0.000	0.000	0.000	0.733	0.222	-2.083	0.000	0.000	0.000
Germany (19)	2.711	0.000	0.000	0.000	2.019	0.003	-1.917	0.001	-1.192	0.067
Italy (20)	1.107	0.002	0.000	0.000	1.152	0.043	0.000	0.000	0.000	0.000
Netherlands (21)	2.187	0.000	0.000	0.000	0.000	0.000	-1.218	0.008	0.000	0.000
Belgium (22)	2.068	0.000	0.000	0.000	1.211	0.008	0.000	0.000	0.000	0.000
Spain (23)	2.205	0.000	0.000	0.000	0.461	0.344	0.000	0.000	-0.608	0.270
Switzerland (24)	0.317	0.328	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia (25)	-0.778	0.073	0.000	0.000	-0.552	0.520	0.000	0.000	0.000	0.000
Australia (26)	1.380	0.000	-0.886	0.420	1.973	0.000	0.000	0.000	2.600	0.000
New Zealand (27)	0.610	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Residuals										
Variance	0.026		0.106		0.034		0.040		0.050	
Skewness	0.036	0.857	0.371	0.237	0.950	0.000	0.185	0.464	-0.636	0.012
Kurtosis	2.958	0.000	1.510	0.020	3.642	0.000	1.746	0.001	0.901	0.082
Jarque-Bera	54.703	0.000	7.542	0.023	73.098	0.000	12.880	0.002	9.719	0.008
Studentized Range	7.384		5.044		7.119		6.521		5.175	

Inference: Testing the null of absence of individual (country) effects										
F Statistic	F(24,121)		F(11,56)		F(19,96)		F(16,81)		F(16,81)	
	233.814	0.000	9.994	0.000	95.576	0.000	69.774	0.000	115.702	0.000

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Table 8 (Continued)

	Dependent Variables									
	Manufacturing									
	LNumSubsid_									
	S9		S10		S11		S12		S13	
Usable Obs.	114		125		126		128		127	
Total Observations	162		162		162		162		162	
Skipped/Missing	48		37		36		34		35	
Degrees of Freedom	89		96		99		101		101	
$\bar{R}^2$	0.975		0.946		0.964		0.947		0.958	
Std. Err. of Est.	0.234		0.245		0.256		0.252		0.247	
Regression F Stat.	F(24,89) 187.545		F(28,96) 79.124		F(26,99) 128.462		F(26,101) 89.124		F(25,101) 117.063	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Stat.	1.831		1.728		1.874		2.078		2.009	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
CTaxR	-0.022	0.094	0.000	0.994	-0.036	0.007	-0.013	0.332	0.026	0.041
RelAppPatent	-0.335	0.344	-0.021	0.953	-0.337	0.378	-0.107	0.774	-0.042	0.908
RelpcNomGDP	0.776	0.014	0.560	0.047	0.808	0.011	-0.253	0.355	0.877	0.001
RelPopul	2.034	0.000	0.802	0.057	1.301	0.004	0.983	0.058	0.447	0.290
USA (1)	-0.925	0.475	1.141	0.388	2.037	0.142	2.321	0.136	0.837	0.531
Canada (2)	-0.771	0.111	0.540	0.251	1.328	0.009	1.329	0.008	-0.469	0.319
Brazil (3)	-1.504	0.074	0.070	0.934	0.551	0.534	0.592	0.552	-0.571	0.504
Mexico (4)	-0.699	0.236	0.397	0.501	0.835	0.177	0.599	0.377	0.286	0.630
Argentina (5)	0.000	0.000	0.309	0.563	0.616	0.272	0.000	0.000	-1.276	0.020
ChinaExcldHk (6)	-16.009	0.000	-3.984	0.380	-7.665	0.108	-5.511	0.324	-0.019	0.997
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	1.528	0.008	1.087	0.056	2.238	0.000	1.792	0.005	1.480	0.010
Malaysia (9)	2.981	0.000	1.749	0.000	3.134	0.000	2.389	0.000	1.779	0.000
Thailand (10)	3.410	0.000	2.761	0.000	4.282	0.000	2.715	0.000	3.044	0.000
Indonesia (11)	-0.425	0.640	0.938	0.314	1.234	0.206	0.004	0.997	0.968	0.303
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	1.711	0.000	2.048	0.000	3.600	0.000	2.442	0.000	1.540	0.000
Singapore (14)	2.271	0.000	1.363	0.000	2.410	0.000	2.483	0.000	1.366	0.000
India (15)	-17.915	0.000	-5.792	0.154	-8.881	0.038	-7.518	0.135	-2.672	0.513
Vietnam (16)	1.831	0.000	1.055	0.035	2.432	0.000	1.858	0.001	1.487	0.004
U. K. (17)	-0.109	0.822	1.249	0.008	2.243	0.000	2.766	0.000	0.412	0.379
France (18)	-0.608	0.272	0.350	0.508	1.074	0.056	1.980	0.001	-0.385	0.470
Germany (19)	-0.168	0.766	0.715	0.198	2.608	0.000	2.349	0.000	0.477	0.392
Italy (20)	-0.540	0.303	-0.115	0.818	1.289	0.016	0.756	0.164	-1.381	0.007
Netherlands (21)	0.000	0.000	0.240	0.565	-0.355	0.469	1.969	0.000	-0.422	0.308
Belgium (22)	0.000	0.000	-0.778	0.147	0.000	0.000	1.455	0.003	-1.089	0.021
Spain (23)	-0.646	0.169	0.706	0.118	0.491	0.299	0.400	0.411	-0.586	0.197
Switzerland (24)	0.000	0.000	-1.030	0.054	-0.545	0.297	1.131	0.018	0.000	0.000
Russia (25)	-2.070	0.001	-1.052	0.112	-0.956	0.126	-0.763	0.295	0.000	0.000
Australia (26)	-0.268	0.591	-0.535	0.248	0.903	0.071	0.707	0.139	-0.525	0.254
New Zealand (27)	-0.031	0.940	-0.539	0.271	0.000	0.000	0.000	0.000	0.000	0.000
Residuals										
Variance	0.043		0.046		0.052		0.051		0.049	
Skewness	-0.393	0.091	1.516	0.000	-1.230	0.000	0.018	0.935	0.442	0.044
Kurtosis	1.944	0.000	5.435	0.000	8.965	0.000	1.007	0.024	1.893	0.000
Jarque-Bera	20.898	0.000	201.713	0.000	453.735	0.000	5.412	0.067	23.107	0.000
Studentized Range	6.251		6.883		9.176		5.629		5.985	

Inference: Testing the null of absence of individual (country) effects										
F Statistic	F(20,101)		F(24,121)		F(22,111)		F(22,111)		F(21,106)	
	111.786	0.000	39.825	0.000	77.989	0.000	47.052	0.000	49.140	0.000

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Table 8 (Continued)

	Dependent Variables									
	Manufacturing						Non-manufacturing [a]			
	LNumSubsid_									
	S14		S15		S16		S17		S18	
Usable Obs.	143		142		147		97		84	
Total Observations	162		162		162		162		162	
Skipped/Missing	19		20		15		65		78	
Degrees of Freedom	115		114		118		75		65	
$\bar{R}^2$	0.974		0.986		0.980		0.925		0.947	
Std. Err. of Est.	0.243		0.156		0.199		0.237		0.298	
Regression F Stat.	F(27,115) 199.492		F(27,114) 381.650		F(28,118) 262.396		F(21,75) 57.706		F(18,65) 83.910	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	1.714		2.020		1.786		1.555		1.944	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
CTaxR	0.009	0.433	-0.005	0.486	-0.018	0.068	-0.001	0.972	-0.036	0.066
RelAppPatent	0.105	0.770	-0.073	0.750	0.199	0.495	0.129	0.726	0.110	0.813
RelpcNomGDP	0.904	0.001	0.719	0.000	0.029	0.890	-0.768	0.023	-0.311	0.428
RelPopul	-0.264	0.523	0.938	0.001	2.467	0.000	-0.106	0.881	0.864	0.389
USA (1)	3.420	0.009	2.884	0.001	-1.150	0.277	3.154	0.148	2.866	0.321
Canada (2)	-0.132	0.770	2.442	0.000	1.536	0.000	0.000	0.000	3.585	0.000
Brazil (3)	0.998	0.229	1.997	0.000	-1.449	0.033	2.511	0.076	0.746	0.688
Mexico (4)	2.255	0.000	2.726	0.000	0.354	0.447	0.000	0.000	0.888	0.471
Argentina (5)	-0.266	0.571	0.988	0.001	-0.158	0.675	0.841	0.233	0.000	0.000
ChinaExcldHk (6)	8.246	0.068	-3.834	0.183	-19.977	0.000	3.283	0.669	-7.364	0.497
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	3.851	0.000	3.358	0.000	1.998	0.000	1.146	0.192	2.256	0.044
Malaysia (9)	4.125	0.000	3.431	0.000	3.827	0.000	0.552	0.296	1.197	0.051
Thailand (10)	3.897	0.000	5.010	0.000	3.785	0.000	1.119	0.120	0.611	0.490
Indonesia (11)	3.798	0.000	2.975	0.000	0.015	0.984	2.221	0.157	-0.108	0.959
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	2.860	0.000	3.106	0.000	2.343	0.000	0.435	0.470	0.000	0.000
Singapore (14)	2.441	0.000	1.299	0.000	3.519	0.000	1.200	0.010	1.403	0.008
India (15)	3.822	0.341	-4.503	0.081	-20.744	0.000	1.054	0.880	-7.229	0.468
Vietnam (16)	3.295	0.000	3.303	0.000	2.460	0.000	1.392	0.076	0.000	0.000
U. K. (17)	2.112	0.000	2.617	0.000	2.112	0.000	1.019	0.206	3.627	0.000
France (18)	0.633	0.218	1.998	0.000	1.775	0.000	1.569	0.060	1.291	0.191
Germany (19)	1.939	0.000	1.460	0.000	1.081	0.014	0.000	0.000	0.000	0.000
Italy (20)	0.375	0.440	1.503	0.000	1.098	0.006	0.000	0.000	0.000	0.000
Netherlands (21)	0.227	0.569	1.187	0.000	2.727	0.000	1.461	0.016	3.899	0.000
Belgium (22)	0.122	0.786	1.319	0.000	2.010	0.000	0.000	0.000	0.000	0.000
Spain (23)	0.383	0.379	1.785	0.000	1.257	0.000	0.989	0.149	0.000	0.000
Switzerland (24)	-1.479	0.001	0.000	0.000	0.105	0.773	0.000	0.000	0.000	0.000
Russia (25)	0.424	0.469	0.565	0.133	-2.230	0.000	0.000	0.000	0.000	0.000
Australia (26)	-0.361	0.415	1.615	0.000	2.232	0.000	3.862	0.000	5.249	0.000
New Zealand (27)	0.000	0.000	-0.165	0.510	1.616	0.000	1.668	0.003	0.000	0.000
Residuals										
Variance	0.048		0.020		0.032		0.044		0.070	
Skewness	-0.365	0.078	1.413	0.000	0.619	0.002	-0.339	0.180	-0.145	0.594
Kurtosis	5.577	0.000	6.212	0.000	4.318	0.000	-0.224	0.665	0.707	0.205
Jarque-Bera	188.514	0.000	275.575	0.000	123.602	0.000	2.059	0.357	2.042	0.360
Studentized Range	8.563		7.638		7.831		4.487		5.810	
Inference: Testing the null of absence of individual (country) effects										
F Statistic	F(23,116)		F(23,116)		F(24,121)		F(17,86)		F(14,71)	
	129.823	0.000	219.279	0.000	202.993	0.000	69.927	0.000	61.393	0.000

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[a] Sectors 17 through 25 are non-manufacturing sectors. For the numbering of the sectors see Table 1.

Table 8 (Continued)

	Dependent Variables									
	Non-manufacturing									
	LNumSubsid_									
	S19		S20		S21		S22		S23	
Usable Obs.	110		127		144		150		149	
Total Observations	162		162		162		162		162	
Skipped/Missing	52		35		18		12		13	
Degrees of Freedom	85		100		116		121		120	
$\bar{R}^2$	0.949		0.966		0.982		0.981		0.956	
Std. Err. of Est.	0.295		0.242		0.149		0.145		0.258	
Regression F Stat.	F(24,85)	85.500	F(26,100)	140.326	F(27,116)	293.991	F(28,121)	275.798	F(28,120)	115.089
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	1.667		1.969		1.745		1.606		2.274	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
CTaxR	-0.032	0.048	-0.029	0.022	-0.003	0.727	-0.025	0.001	-0.039	0.002
RelAppPatent	-0.657	0.147	-0.123	0.730	-0.009	0.966	-0.006	0.977	0.152	0.687
RelpcNomGDP	1.752	0.000	-0.226	0.397	0.474	0.003	-0.024	0.875	-0.429	0.112
RelPopul	1.216	0.018	1.298	0.002	1.099	0.000	1.975	0.000	1.841	0.000
USA (1)	0.404	0.802	3.189	0.016	1.336	0.094	2.881	0.000	1.754	0.201
Canada (2)	-0.820	0.184	2.148	0.000	1.385	0.000	4.644	0.000	3.438	0.000
Brazil (3)	0.131	0.900	0.669	0.423	0.691	0.172	1.884	0.000	-0.542	0.533
Mexico (4)	0.203	0.779	-0.143	0.810	1.246	0.001	2.743	0.000	0.743	0.219
Argentina (5)	0.855	0.198	0.000	0.000	0.000	0.000	2.895	0.000	0.919	0.063
ChinaExcldHk (6)	-8.253	0.135	-7.711	0.088	-6.466	0.020	-13.593	0.000	-13.904	0.004
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	3.045	0.000	2.725	0.000	2.486	0.000	3.219	0.000	0.758	0.186
Malaysia (9)	3.457	0.000	2.786	0.000	3.272	0.000	5.024	0.000	3.392	0.000
Thailand (10)	3.904	0.000	3.259	0.000	3.639	0.000	5.351	0.000	3.581	0.000
Indonesia (11)	1.668	0.144	0.241	0.793	1.468	0.010	1.142	0.037	-0.500	0.604
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	1.007	0.042	3.430	0.000	2.227	0.000	5.118	0.000	3.574	0.000
Singapore (14)	1.420	0.003	3.859	0.000	3.727	0.000	6.288	0.000	4.466	0.000
India (15)	-8.743	0.077	-8.942	0.027	-7.804	0.002	-13.591	0.000	-14.817	0.001
Vietnam (16)	2.443	0.000	2.883	0.000	2.527	0.000	2.506	0.000	0.681	0.179
U. K. (17)	-0.581	0.332	3.652	0.000	2.601	0.000	4.949	0.000	3.853	0.000
France (18)	0.000	0.000	2.448	0.000	1.324	0.000	4.417	0.000	3.532	0.000
Germany (19)	-0.558	0.422	2.934	0.000	1.964	0.000	5.076	0.000	3.442	0.000
Italy (20)	-0.884	0.166	0.755	0.128	0.612	0.039	4.049	0.000	2.073	0.000
Netherlands (21)	-1.111	0.052	2.458	0.000	2.729	0.000	4.912	0.000	3.290	0.000
Belgium (22)	-1.238	0.079	1.761	0.000	1.378	0.000	4.661	0.000	2.412	0.000
Spain (23)	0.000	0.000	0.618	0.178	0.578	0.029	3.688	0.000	2.524	0.000
Switzerland (24)	0.000	0.000	1.526	0.003	-0.014	0.958	3.666	0.000	1.826	0.000
Russia (25)	-1.184	0.103	0.000	0.000	0.454	0.205	1.994	0.000	0.264	0.668
Australia (26)	-0.716	0.251	2.939	0.000	1.618	0.000	5.143	0.000	3.458	0.000
New Zealand (27)	0.000	0.000	1.888	0.000	0.688	0.003	3.917	0.000	2.918	0.000
Residuals										
Variance	0.068		0.046		0.018		0.017		0.054	
Skewness	-0.267	0.260	0.398	0.070	0.080	0.698	1.481	0.000	0.628	0.002
Kurtosis	1.296	0.007	1.306	0.003	0.752	0.072	15.934	0.000	3.851	0.000
Jarque-Bera	9.000	0.011	12.383	0.002	3.542	0.170	1641.616	0.000	101.856	0.000
Studentized Range	5.459		6.489		6.241		11.215		7.628	
Inference: Testing the null of absence of individual (country) effects										
F Statistic	F(20,101)		F(22,111)		F(23,116)		F(24,121)		F(24,121)	
	75.018	0.000	63.279	0.000	204.170	0.000	163.984	0.000	73.043	0.000

(Continued on next page)

Table 8 (Continued)

	Dependent Variables			
	Non-manufacturing			
	LNumSubsid_			
	S24		S25	
Usable Observations	150		150	
Total Observations	162		162	
Skipped/Missing	12		12	
Degrees of Freedom	121		121	
$\bar{R}^2$	0.944		0.957	
Standard Error of Estimate	0.299		0.305	
Regression F(28,m)	91.176		118.020	
P-value of F	0.000		0.000	
Durbin-Watson Statistic	1.963		1.675	
Explanatory Variables	Coeff	P-value	Coeff	P-value
CTaxR	-0.069	0.000	-0.001	0.931
RelAppPatent	-0.588	0.181	0.480	0.284
RelpcNomGDP	-0.875	0.006	-0.842	0.009
RelPopul	2.465	0.000	0.722	0.164
USA (1)	4.380	0.007	3.910	0.017
Canada (2)	5.336	0.000	3.312	0.000
Brazil (3)	1.409	0.164	1.917	0.064
Mexico (4)	2.652	0.000	2.369	0.001
Argentina (5)	3.169	0.000	0.048	0.934
ChinaExcldHk (6)	-18.662	0.001	-3.274	0.560
ChinaHongKongSAR (7)	0.000	0.000	0.000	0.000
Philippines (8)	3.789	0.000	2.819	0.000
Malaysia (9)	4.739	0.000	2.915	0.000
Thailand (10)	4.955	0.000	3.366	0.000
Indonesia (11)	0.579	0.604	2.034	0.076
Taiwan (12)	0.000	0.000	0.000	0.000
Korea, Republic of (13)	5.312	0.000	2.666	0.000
Singapore (14)	6.310	0.000	4.984	0.000
India (15)	-17.838	0.000	-5.074	0.312
Vietnam (16)	3.316	0.000	1.953	0.001
United Kingdom (17)	5.576	0.000	4.574	0.000
France (18)	5.181	0.000	1.423	0.026
Germany (19)	5.124	0.000	2.616	0.000
Italy (20)	4.270	0.000	1.240	0.040
Netherlands (21)	6.604	0.000	4.816	0.000
Belgium (22)	5.017	0.000	1.376	0.014
Spain (23)	3.580	0.000	1.330	0.014
Switzerland (24)	3.737	0.000	1.848	0.001
Russia (25)	-0.057	0.937	-0.224	0.758
Australia (26)	6.072	0.000	4.558	0.000
New Zealand (27)	4.046	0.000	2.277	0.000
Residuals				
Variance	0.073		0.075	
Skewness	-0.928	0.000	-0.251	0.214
Kurtosis	2.452	0.000	1.890	0.000
Jarque-Bera	59.077	0.000	23.910	0.000
Studentized Range	6.359		6.243	
Inference: Testing the null of absence of individual (country) effects				
F Statistic	F(24,121)		F(24,121)	
	61.843	0.000	99.171	0.000

3.3 Model with only time effects, (10)

The estimated results for fixed time-effects model, (10), are reported in Table 9. (See the table for the method of estimation employed by the present paper.)

3.3.1 Manufacturing sector

The residuals normality seems to be accepted for S1 (Food) and S6-S8 (Ceramics-SoilStone, Steel, NonferrousMetals, MetalProducts).

Explanatory variables The statistical significance of explanatory variables appears highly consistent, depending only slightly on industrial sectors. The effect of host country corporate tax on location choice of the Japanese multinationals is negative and statistically significant for all manufacturing sectors except for S3 (Lumber-Pulp-Paper) and S15 (TransportationEquipment). (Notice Table 9 is quite different from Table 8 with regard to the effect of host country corporate tax for manufacturing sectors.)

RelAppPatent has a statistically significant, positive effect on the location/country choice for all manufacturing sectors except for S3 (Lumber-Pulp-Paper) only. RelPopul has a statistically significant, positive effect on the location/country choice for all manufacturing sectors except for S8 (NonferrousMetals), S9 (MetalProducts) and S14 (MachineForInformationCommunication).

RelpcNomGDP has a statistically significant, negative effect on the location/country choice for all manufacturing sectors except for S5 (Oil-Coal) only. Again, the negative effect appears consistent with the Japanese business operations increasing in number and size in the Asian region (where RelpcNomGDP tends to be small), during the sample period.

These results (including their statistical significance, in particular) sharply contrast with the earlier results obtained for the (constrained) models with neither individual (country) nor time effects.

Dummies and F tests The bottom panel of the table tests the null of absence of time effects: tested is the null that coefficients on time dummies (dummies for time periods) are all equal (to some time-invariant constant). The test fails to reject, for every manufacturing sector but S13 (ElectricalMachinery), the null of the absence of time effects. This, however, does *not* necessarily imply that there would be, too, detected no time effects in the model with both effects being considered, to which we will later turn.

3.3.2 Non-manufacturing sector

The residuals normality seems to be accepted for most of the non-manufacturing sectors, Nonmfg and S17-S23 (AgricultureForestryFishery, Mining, Construction, InformationCommunication, Transportation, Wholesale, Retail).

Explanatory variables The statistical significance of explanatory variables appears highly consistent, depending only slightly on industrial sectors. The effect of host country corporate tax on location choice of the Japanese multinationals is negative and statistically significant for all non-manufacturing sectors except for S17 (AgricultureForestryFishery) and S18 (Mining). (For non-manufacturing sectors, too, Table 9 is so different from Table 8 with regard to the effect of the corporate tax.)

RelAppPatent has a statistically significant, positive effect on the location/country choice for all manufacturing sectors except for S17 (AgricultureForestryFishery) and S18 (Mining). RelPopul has a statistically significant, positive effect on the location/country choice for all manufacturing sectors except for S18 (Mining), S19 (Construction) and S25 (MiscellaneousNonmanufacturing).

RelpcNomGDP has a statistically significant, negative effect on the location/country choice for all manufacturing sectors except for S18 (Mining), S22 (Wholesale) and S23 (Retail).

These results (including their statistical significance, in particular) sharply contrast with the earlier results obtained for the (constrained) models with neither individual (country) nor time effects.

Dummies and F tests The bottom panel of the table tests the null of absence of time effects: tested is the null that coefficients on time dummies are all equal (to some time-invariant constant).The test fails to reject, for every non-manufacturing sector but S24 (Service), the null of the absence of time effects. Again, however, this does *not* necessarily imply that there would be, too, detected no time effects in the model with both effects being considered, to which we are now ready to turn.

Table 9 Model With Only Time Effects, (10)

Linear Regression - Estimation by Least Squares[a]
Panel(5) of Annual Data From 1//1997 To 18//2001

	Dependent Variables									
					Manufacturing[b]					
					LNumSubsid_					
	Mfg		Nonmfg		S1		S2		S3	
Usable Obs.	150		150		128		105		86	
Total Observations	162		162		162		162		162	
Skipped/Missing	12		12		34		57		76	
Degrees of Freedom	140		140		118		95		76	
$\bar{R}^2$	0.423		0.423		0.299		0.557		0.357	
Std. Err. of Est.	1.100		0.829		1.063		0.973		0.822	
Reg. F(9,m)[c]	13.127		13.127		7.007		15.555		6.249	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	0.289		0.319		0.552		0.562		0.512	
Expl. Variables[d]	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
CTaxR	-0.053	0.006	-0.065	0.000	-0.075	0.001	-0.062	0.008	0.018	0.390
RelAppPatent	2.589	0.000	2.298	0.000	2.081	0.000	2.125	0.000	0.224	0.495
RelpcNomGDP	-1.321	0.000	-0.322	0.049	-0.675	0.005	-1.838	0.000	-0.391	0.063
RelPopul	0.111	0.006	0.095	0.002	0.093	0.019	0.139	0.001	0.207	0.000
FY2007 (1)	6.793	0.000	6.682	0.000	4.223	0.000	4.341	0.000	1.043	0.144
FY2008 (2)	6.627	0.000	6.733	0.000	4.134	0.000	4.260	0.000	0.840	0.211
FY2009 (3)	6.494	0.000	6.719	0.000	4.149	0.000	3.987	0.000	0.962	0.148
FY2010 (4)	6.491	0.000	6.749	0.000	4.211	0.000	3.771	0.000	0.866	0.193
FY2011 (5)	6.586	0.000	6.801	0.000	4.158	0.000	3.832	0.000	0.883	0.185
FY2012 (6)	6.665	0.000	6.943	0.000	4.244	0.000	4.102	0.000	0.853	0.178
Residuals										
Variance	1.136		0.646		1.049		0.864		0.604	
Skewness	-0.932	0.000	-0.339	0.094	-0.225	0.304	-0.685	0.005	-0.578	0.031
Kurtosis	0.624	0.128	-0.401	0.327	-0.288	0.517	1.304	0.008	-0.370	0.501
Jarque-Bera	24.140	0.000	3.874	0.144	1.526	0.466	15.653	0.000	5.286	0.071
Studentized Range	4.646		4.101		4.672		5.341		4.017	
Inference: Testing the null of absence of time effects[e]										
F(5,152)[f]	0.286	0.920	0.330	0.894	0.050	0.998	1.490	0.196	0.254	0.937
F Statistic[g]	F(5,140)		F(5,140)		F(5,134)		F(5,104)		F(5,92)	
	0.263	0.933	0.304	0.910	0.044	0.999	1.019	0.410	0.154	0.978

(Continued on next page)

[a] This is the method of estimation *(ii)* as described in Appendix A.4.

[b] Sectors 1 through 16 are manufacturing sectors. For the numbering of the sectors see Table 1.

[c] See Table 7.

[d] Explanatory Variables. Also listed below are time-dummy variables FY2007 (1) through FY2012 (6).

[e] Tested is the null that coefficients for time dummies are all equal (to some time-invariant constant).

[f] An F computed by (11) in Appendix A.4, with N=27 (the total number of countries under study).

[g] An F computed by (11) in Appendix A.4, for which the number of dummies whose coefficients are exactly zero in the table is subtracted from N since the corresponding countries have data unavailable for the whole six-year period and thus such countries as ChinaHKSAR, Taiwan, etc. are ignored/skipped in the regression. This apples to "F Statistic" at the end of the tables that follow.

Table 9 (Continued)

	Dependent Variables: Manufacturing LNumSubsid_									
	S4		S5		S6		S7		S8	
Usable Obs.	150		64		104		97		96	
Total Observations	162		162		162		162		162	
Skipped/Missing	12		98		58		65		66	
Degrees of Freedom	140		54		94		87		86	
$\bar{R}^2$	0.347		0.352		0.514		0.635		0.255	
Std. Err. of Est.	1.151		0.588		0.852		0.777		1.134	
Regression F(9,m)	9.798		4.805		13.083		19.532		4.614	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	0.268		0.820		0.450		0.484		0.250	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
CTaxR	-0.056	0.006	-0.034	0.046	-0.097	0.000	-0.112	0.000	-0.113	0.000
RelAppPatent	2.553	0.000	0.934	0.000	2.128	0.000	2.966	0.000	1.886	0.000
RelpcNomGDP	-0.872	0.000	0.057	0.771	-0.748	0.001	-2.074	0.000	-1.285	0.000
RelPopul	0.119	0.005	0.088	0.001	0.153	0.000	0.063	0.033	0.046	0.291
FY2007 (1)	4.509	0.000	1.687	0.003	4.457	0.000	5.919	0.000	5.679	0.000
FY2008 (2)	4.376	0.000	1.825	0.001	4.441	0.000	5.653	0.000	5.405	0.000
FY2009 (3)	4.228	0.000	1.474	0.005	4.273	0.000	5.336	0.000	5.310	0.000
FY2010 (4)	4.259	0.000	1.422	0.008	4.190	0.000	5.337	0.000	5.326	0.000
FY2011 (5)	4.368	0.000	1.539	0.004	4.018	0.000	5.419	0.000	5.159	0.000
FY2012 (6)	4.457	0.000	1.583	0.002	4.181	0.000	5.464	0.000	5.236	0.000
Residuals										
Variance	1.245		0.297		0.663		0.547		1.164	
Skewness	-0.960	0.000	-0.702	0.025	-0.497	0.041	0.156	0.536	0.194	0.444
Kurtosis	0.842	0.040	-0.302	0.641	0.073	0.883	0.129	0.802	-0.720	0.165
Jarque-Bera	27.464	0.000	5.494	0.064	4.310	0.116	0.463	0.793	2.677	0.262
Studentized Range	4.639		4.040		4.934		4.929		4.128	
Inference: Testing the null of absence of time effects										
F Statistic	F(5,140)		F(5,62)		F(5,110)		F(5,92)		F(5,92)	
	0.221	0.953	0.734	0.601	0.771	0.573	1.343	0.253	0.397	0.850

(Continued in next table)

Table 9 (Continued)

	Dependent Variables: Manufacturing LNumSubsid_									
	S9		S10		S11		S12		S13	
Usable Obs.	114		125		126		128		127	
Total Observations	162		162		162		162		162	
Skipped/Missing	48		37		36		34		35	
Degrees of Freedom	104		115		116		118		117	
$\bar{R}^2$	0.524		0.608		0.491		0.555		0.643	
Std. Err. of Est.	1.027		0.662		0.959		0.734		0.724	
Regression F(9,m)	14.844		22.412		14.400		18.584		26.267	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	0.578		0.603		0.402		0.471		0.658	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
CTaxR	-0.161	0.000	-0.079	0.000	-0.074	0.000	-0.061	0.000	-0.120	0.000
RelAppPatent	3.321	0.000	2.374	0.000	2.812	0.000	2.424	0.000	2.489	0.000
RelpcNomGDP	-1.960	0.000	-0.996	0.000	-1.285	0.000	-0.974	0.000	-1.043	0.000
RelPopul	0.024	0.528	0.099	0.000	0.091	0.010	0.080	0.005	0.133	0.000
FY2007 (1)	7.231	0.000	4.405	0.000	4.568	0.000	3.868	0.000	6.237	0.000
FY2008 (2)	7.093	0.000	4.322	0.000	4.598	0.000	3.463	0.000	5.949	0.000
FY2009 (3)	6.870	0.000	4.234	0.000	4.493	0.000	3.597	0.000	5.740	0.000
FY2010 (4)	6.928	0.000	4.180	0.000	4.474	0.000	3.634	0.000	5.657	0.000
FY2011 (5)	6.763	0.000	4.157	0.000	4.449	0.000	3.726	0.000	5.666	0.000
FY2012 (6)	6.836	0.000	4.254	0.000	4.510	0.000	3.867	0.000	5.827	0.000
Residuals										
Variance	0.972		0.406		0.853		0.500		0.487	
Skewness	-0.372	0.109	-0.010	0.963	-0.593	0.007	-0.414	0.059	0.443	0.044
Kurtosis	0.783	0.098	1.200	0.008	0.680	0.130	0.381	0.392	0.899	0.044
Jarque-Bera	5.543	0.063	7.507	0.023	9.820	0.007	4.439	0.109	8.435	0.015
Studentized Range	5.367		6.324		5.151		5.554		5.579	
Inference: Testing the null of absence of time effects										
F Statistic	F(5,116)		F(5,140)		F(5,128)		F(5,128)		F(5,122)	
	0.577	0.718	0.500	0.776	0.079	0.995	1.089	0.370	1.994	0.084

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Table 9 (Continued)

Dependent Variables

	Manufacturing						Non-manufacturing[a]			
	LNumSubsid_									
	S14		S15		S16		S17		S18	
Usable Obs.	143		142		147		97		84	
Total Observations	162		162		162		162		162	
Skipped/Missing	19		20		15		65		78	
Degrees of Freedom	133		132		137		87		74	
$\bar{R}^2$	0.431		0.486		0.308		0.059		0.410	
Std. Err. of Est.	1.143		0.960		1.182		0.843		0.998	
Regression F(9,m)	12.970		15.843		8.225		1.673		7.412	
P-value of F	0.000		0.000		0.000		0.108		0.000	
D-W Statistic	0.298		0.321		0.287		0.626		0.446	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
CTaxR	-0.107	0.000	-0.013	0.454	-0.082	0.000	0.033	0.095	0.045	0.089
RelAppPatent	3.050	0.000	2.191	0.000	2.385	0.000	0.326	0.298	0.292	0.473
RelpcNomGDP	-1.634	0.000	-1.222	0.000	-1.022	0.000	-0.015	0.945	1.534	0.000
RelPopul	0.032	0.437	0.142	0.000	0.092	0.033	0.060	0.091	0.023	0.635
FY2007 (1)	6.635	0.000	3.977	0.000	5.238	0.000	-0.105	0.875	-1.133	0.204
FY2008 (2)	6.244	0.000	3.861	0.000	5.161	0.000	-0.061	0.925	-1.119	0.199
FY2009 (3)	5.955	0.000	3.763	0.000	5.112	0.000	0.181	0.775	-0.878	0.299
FY2010 (4)	5.916	0.000	3.763	0.000	5.036	0.000	0.095	0.882	-0.818	0.330
FY2011 (5)	5.992	0.000	3.946	0.000	5.022	0.000	-0.002	0.998	-0.909	0.277
FY2012 (6)	6.026	0.000	4.031	0.000	5.190	0.000	-0.001	0.999	-0.682	0.410
Residuals										
Variance	1.223		0.862		1.311		0.643		0.888	
Skewness	-0.799	0.000	-0.558	0.007	-0.929	0.000	0.437	0.084	-0.473	0.082
Kurtosis	0.476	0.257	0.762	0.071	0.734	0.076	0.199	0.699	0.172	0.758
Jarque-Bera	16.567	0.000	10.809	0.004	24.424	0.000	3.244	0.197	3.231	0.199
Studentized Range	4.848		5.017		4.765		4.889		4.372	
Inference: Testing the null of absence of time effects										
F Statistic	F(5,134)		F(5,134)		F(5,140)		F(5,98)		F(5,80)	
	1.329	0.256	0.332	0.893	0.130	0.985	0.263	0.932	0.451	0.811

(Continued in next table)

[a]Sectors 17 through 25 are non-manufacturing sectors. For the numbering of the sectors see Table 1.

Table 9 (Continued)

Dependent Variables

	Non-manufacturing									
	LNumSubsid_									
	S19		S20		S21		S22		S23	
Usable Obs.	110		127		144		150		149	
Total Observations	162		162		162		162		162	
Skipped/Missing	52		35		18		12		13	
Degrees of Freedom	100		117		134		140		139	
$\bar{R}^2$	0.334		0.617		0.372		0.458		0.417	
Std. Err. of Est.	1.066		0.816		0.889		0.776		0.936	
Regression F(9,m)	7.086		23.572		10.403		15.016		12.741	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	0.458		0.544		0.316		0.328		0.395	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
CTaxR	-0.070	0.004	-0.125	0.000	-0.067	0.000	-0.057	0.000	-0.080	0.000
RelAppPatent	1.921	0.000	3.013	0.000	2.109	0.000	2.143	0.000	2.600	0.000
RelpcNomGDP	-1.642	0.000	-0.824	0.000	-0.932	0.000	0.033	0.829	-0.115	0.532
RelPopul	0.020	0.616	0.127	0.000	0.061	0.060	0.115	0.000	0.090	0.008
FY2007 (1)	4.776	0.000	5.842	0.000	5.109	0.000	5.481	0.000	3.887	0.000
FY2008 (2)	4.590	0.000	5.846	0.000	5.045	0.000	5.552	0.000	3.906	0.000
FY2009 (3)	4.289	0.000	5.713	0.000	4.862	0.000	5.581	0.000	3.840	0.000
FY2010 (4)	4.289	0.000	5.682	0.000	4.834	0.000	5.630	0.000	3.842	0.000
FY2011 (5)	4.253	0.000	5.653	0.000	4.833	0.000	5.663	0.000	3.983	0.000
FY2012 (6)	4.351	0.000	5.927	0.000	4.961	0.000	5.794	0.000	4.158	0.000
Residuals										
Variance	1.042		0.618		0.741		0.566		0.823	
Skewness	-0.414	0.080	-0.418	0.058	-0.211	0.306	-0.109	0.588	-0.226	0.265
Kurtosis	-0.196	0.685	0.035	0.937	-0.712	0.089	-0.205	0.617	-0.232	0.573
Jarque-Bera	3.320	0.190	3.697	0.157	4.115	0.128	0.562	0.755	1.600	0.449
Studentized Range	4.327		4.808		4.083		4.609		4.935	
Inference: Testing the null of absence of time effects										
F Statistic	F(5,116)		F(5,128)		F(5,134)		F(5,140)		F(5,140)	
	0.761	0.580	0.417	0.836	0.401	0.848	0.461	0.805	0.412	0.840

(Continued on next page)

Table 9 (Continued)

	Dependent Variables			
	Non-manufacturing			
	LNumSubsid_			
	S24		S25	
Usable Observations	150		150	
Total Observations	162		162	
Skipped/Missing	12		12	
Degrees of Freedom	140		140	
$\bar{R}^2$	0.411		0.230	
Standard Error of Estimate	0.973		1.283	
Regression F(9,m)	12.534		5.932	
P-value of F	0.000		0.000	
Durbin-Watson Statistic	0.368		0.392	
Explanatory Variables	Coeff	P-value	Coeff	P-value
CTaxR	-0.047	0.006	-0.073	0.001
RelAppPatent	2.439	0.000	2.646	0.000
RelpcNomGDP	-0.453	0.019	-0.616	0.015
RelPopul	0.105	0.003	0.039	0.401
FY2007 (1)	3.658	0.000	4.499	0.000
FY2008 (2)	4.055	0.000	4.544	0.000
FY2009 (3)	4.191	0.000	4.333	0.000
FY2010 (4)	4.215	0.000	4.474	0.000
FY2011 (5)	4.392	0.000	4.565	0.000
FY2012 (6)	4.545	0.000	4.718	0.000
Residuals				
Variance	0.889		1.547	
Skewness	-0.644	0.001	-0.299	0.139
Kurtosis	-0.027	0.947	-0.691	0.092
Jarque-Bera	10.370	0.006	5.219	0.074
Studentized Range	4.321		4.411	
Inference: Testing the null of absence of time effects				
F Statistic	F(5,140)		F(5,140)	
	2.353	0.044	0.240	0.944

3.4 Model with both individual (country) and time effects, (12)

The estimated results for fixed both-effects model, (12), are reported in Table 10. (See the table for the method of estimation employed by the present paper.)

3.4.1 Manufacturing sector

Interestingly, the remark made on R^2 and the residuals normality for Table 8 (as compared to those for Table 7) in subsection 3.2.1 applies here to Table 10, too; the only exception here is S5 (Oil-Coal), whose Jaque-Bera has improved. It is not clear why, again in the model with both effects here (just as in the individual (country)-effects only model), kurtosis has behaved in a non-normal manner; apparently, including dummies (especially, country dummies) works to worsen kurtosis.

Explanatory variables As will be documented later in "Dummies and F tests," it will be Table 10 (rather than Tables 7, 8 and 9) that is to be further studied with regard to the effects of host country corporate

tax as well as other country factors, for manufacturing sectors.

(i) The effect of host country corporate tax on location choice of the Japanese multinationals is statistically significant only for two manufacturing sectors: negative effect for S10 (GeneralPurposeMachine) and positive effect for S13 (ElectricalMachinery). For all other sectors, however, the effects are statistically insignificant and their signs are mixed.[22]

Based on -0.027, the estimated coefficient associated with CTaxR for LNumSubsid_S10, in Table 10, we readily compute as follows:[23] (logged) LNumSubsid_S10=0.027 $\Rightarrow$ (unlogged) NumSubsid_S10= exp(0.027) = 1.027. Thus, as corporate tax rate is reduced by 1% in a foreign economy , the Japanese multinationals in S10 (GeneralPurposeMachine) are likely to choose to locate another (1.027 to be exact) foreign subsidiary in the country. On the other hand, based on 0.025, the estimated coefficient associated with CTaxR for LNumSubsid_S13, in Table 10, we readily compute as follows: (logged) LNumSubsid_S13=0.025 $\Rightarrow$ (unlogged) NumSubsid_S13= exp(0.025)=1.025. Therefore, the Japanese multinationals in S13 (ElectricalMachinery) are likely to choose to locate another (1.025 to be exact) foreign subsidiary in a country whose tax is raised by 1%.

Why opposite signs are observed for the two sectors (with insignificant effects for all other sectors) remains to be studied. Simply contrasting Figs. 8 vs. 9 and Figs. 10 vs. 11 is not rigorous enough and they only show that throughout the sample period both sectors have more subsidiaries in China (with low corporate tax rate of 25%) than the U.S. (with high corporate tax rate of 40%) and that both sectors have fewer subsidiaries in Singapore (with lowest corporate tax rate of 17-18%) than China and U.S.[24] A further investigation of varying effects of corporate taxation on the location choice may require a comprehensive set of firm-level (rather than aggregated, sector-level) data, which is, currently, not

[22]Notice that the statistical significance of CTaxR here sharply contrasts with that for each of three preceding models of neither-effect, individual-effects only and time-effects only: contrast, with respect to the statistical significance of CTaxR, Table 10 with Tables 7-9. CTaxR is statistically significant for: all sectors (with negative sign for both S10 and S13) but three, S3, S17 and S18, in Table 7; Nonmfg, S6, S9, S11, S13, S16, S18-S20 and S22-S24 (with positive sign for S13) in Table 8; and all sectors (with negative sign for both S10 and S13) but only two, S3 and S15, in Table 9.

[23]Based on Eq. (12) in Appendix A.5, as CTaxR increases [decreases] by one unit (i.e., 1%), (logged) LNumSubsid_S10 decreases [increases] by 0.027. (For logged and unlogged data here, see Table 3.)

[24]For global corporate tax rates see Table 16. Also, for the statistical significance of CTaxR detected in the previous models/tables, see the earlier footnote.

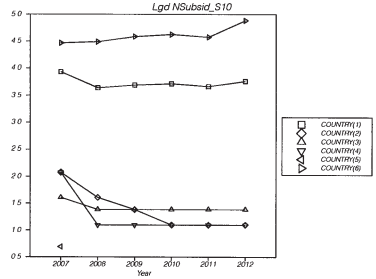

Figure 8 Time Variations of LNumSubsid_S10 by Country, including USA (1), whose CTaxR is highest among twenty-seven countries studied, and ChinaExcldHK (6)

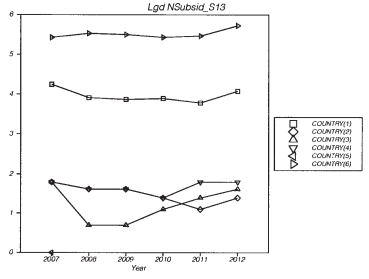

Figure 9 Time Variations of LNumSubsid_S13 by Country, including USA (1), whose CTaxR is highest among twenty-seven countries studied, and ChinaExcldHK (6)

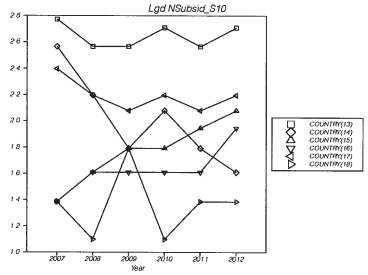

Figure 10 Time Variations of LNumSubsid_S10 by Country, including Singapore (14) whose CTaxR is lowest among twenty–seven countries studied

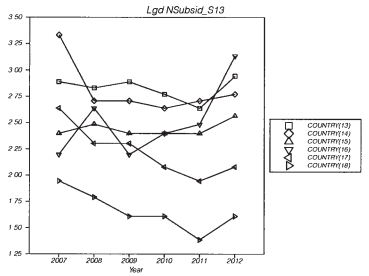

Figure 11 Time Variations of LNumSubsid_S13 by Country, including Singapore (14) whose CTaxR is lowest among twenty–seven countries studied

readily available in an electronic form to the author for Japanese multinationals.

We find that the remaining explanatory variables (RelAppPatent, RelPopul and RelpcNomGDP) turn out statistically significant for many sectors whose CTaxR is found not statistically significant. Such country factors/characteristics appear to be more critical (than CTaxR) for those

sectors as documented below.

(ii) RelAppPatent has a statistically significant, positive effect on the location/country choice only for two manufacturing sectors, S2 (Textile) and S8 (NonferrousMetals). That is, as the degree of research-excellence/intensity in a foreign economy relative to that in Japan is higher (that is, as RelAppPatent increases by one),[25] the Japanese multinationals in the two sectors are likely to locate more foreign subsidiaries in the country.[26] (Notice that for the two sectors above CTaxR is not statistically significant.) Why the effects of RelAppPatent turn out statistically insignificant for all other manufacturing sectors will, again, require a further investigation using a comprehensive set of firm-level data for Japanese multinationals.

(iii) RelPopul has a statistically significant, positive effect on the location/country choice for several manufacturing sectors including Mfg, S1 (Food), S3 (Lumber-Pulp-Paper), S7-S10 (Steel, NonferrousMetals, MetalProducts, GeneralPurposeMachine), S15 (TransportationEquipment) and S16 (MiscellaneousManufacturing). That is, as the market potential as measured by population in a foreign economy relative to that in Japan is higher (that is, as RelPopul increases by one),[27] the Japanese multinationals in those sectors are likely to locate more foreign subsidiaries in the country.[28] (Notice that for all those sectors listed above except for S10, CTaxR is statistically insignificant.)

(iv) RelpcNomGDP has a statistically significant, positive effect on the location/country choice for several manufacturing sectors, Mfg, S7 (Steel), S9 (MetalProducts), S11 (MachineForProduction), S13 (ElectricalMachinery) and S15 (TransportationEquipment), whereas it has a statistically significant, negative effect for only one manufacturing sector, S8 (NonferrousMetals). That is, the Japanese multinationals in Mfg through S15 listed immediately above are likely to locate more foreign

[25]For the descriptive statistics of RelAppPatent see Table 5: its sample mean, minimum and maximum are, respectively, 0.149, 0.0 and 1.949.

[26]Based on 1.115, the estimated coefficient associated with RelAppPatent for LNumSubsid_S2, in Table 10, for example, we readily compute as follows: (logged) LNumSubsid_S2=1.115 $\Rightarrow$ (unlogged) NumSubsid_S2= exp(1.115) = 3.050. Thus, for S2, "more" here means "three (3.050 to be exact) more."

[27]For the descriptive statistics of RelPopul see Table 5: its sample mean, minimum and maximum are, respectively, 1.271, 0.033 and 10.822.

[28]Based on 1.585, the estimated coefficient associated with RelPopul for LNumSubsid_S10, in Table 10, for example, we readily compute as follows: (logged) LNumSubsid_S10=1.585 $\Rightarrow$ (unlogged) NumSubsid_Mfg= exp(1.585) = 4.879. Thus, for Mfg, "more" here means "four (4.879 to be exact) more."

subsidiaries in a country whose market potential as measured by per capita nominal GDP in the foreign economy relative to that in Japan is higher (that is, in a country whose RelpcNomGDP increases by one).[29] On the other hand, as the market potential as measured by per capita nominal GDP in a foreign economy relative to that in Japan is lower (that is, as RelpcNomGDP decreases by one), the Japanese multinationals in S8 (NonferrousMetals) are likely to locate more foreign subsidiaries in the country.[30] (Notice that for all those sectors listed above except for S13, CTaxR is statistically insignificant.)

The positive [negative] effect detected here appears to apply to manufacturing sectors operating more aggressively in more [less] developed nations (where RelpcNomGDP tends to be large [small]).

All these results (including their statistical significance, in particular) sharply contrast with the earlier results obtained for the (constrained) models with neither individual (country) nor time effects.

Dummies and F tests Notice in Table 10 that there is at least one time-specific dummy which turns out significant, in all sectors except for S5 (Oil-Coal), S7 (Steel) and S8 (NonferrousMetals) for which *all* time dummies are statistically insignificant. As shown in the second test (where tested is the null that coefficients for time dummies are all equal to zero, with "zero" corresponding to the slope coefficients on the dummies deleted)[31] in the Inference panel of Table 10, this has indeed resulted in the presence (for the former industries) and absence (for the latter) of time effects in the both effects model. (This is in sharp contrast with failure to reject the null of absence of time effects in the model with only time effects, as reported for Table 9 in subsection 3.3.1.)

The presence (for the former set of industrial sectors) of time effects might be partially due to appreciation of Japanese yen against U.S. dollar during the period from 2008 through 2012 (as compared to the yen

[29] Based on 1.216, the estimated coefficient associated with RelpcNomGDP for LNumSubsid_S7, in Table 10, for example, we readily compute as follows: (logged) LNumSubsid_S7=1.216 $\Rightarrow$ (unlogged) NumSubsid_S7= exp(1.216) = 3.374. Thus, for S7, "more" here means "three (3.374 to be exact) more." For the descriptive statistics of RelpcNomGDP see Table 5: its sample mean, minimum and maximum are, respectively, 0.663, 0.027 and 1.824.

[30] Based on -0.788, the estimated coefficient associated with RelpcNomGDP for LNumSubsid_S8, in Table 10, we readily compute as follows: (logged) LNumSubsid_S8=0.788 $\Rightarrow$ (unlogged) NumSubsid_S8= exp(0.788) = 2.199. Thus, "more" here means "two (2.199 to be exact) more."

[31] See Appendix A.5.

exchange rate in 2007 whose time dummy is set equal to zero).

The positive [negative] sign of statistically significant time effects implies that the number of Japanese subsidiaries abroad increases [decreases] in those year(s) as compared to that in 2007. The sign varies across sectors as well as over time, but in 2012 it is positive for all manufacturing sectors (including Mfg), except for S10 (GeneralPurposeMachine) and S14 (MachineForInformationCommunication): in almost all manufacturing sectors the number of Japanese subsidiaries abroad significantly increased in 2012 as compared to that in 2007.

Notice further from the first and third tests in the Inference panel of Table 10[32] that, for every manufacturing sector (without any exceptions), the two null hypotheses are strongly rejected, implying, in particular, that both effects are present.[33]

Remarks on the sign of statistically significant individual (country) effects are now in order: the positive [negative] sign of statistically significant country effects implies that the number of Japanese subsidiaries abroad increases [decreases] as compared to that in ChinaExcldHK (whose country dummy is set equal to zero). Statistically significant individual (country) effects are detected for such manufacturing sectors as Mfg, S7-S10 (Steel, NonferrousMetals, MetalProducts, GeneralPurposeMachine), S12 (MachineForCommercialUse), S15 (TransportationEquipment) and S16 (MiscellaneousManufacturing); their signs are *all* positive, except that India is the only host country for which the sign is negative for almost all manufacturing sectors including Mfg. See Section 4 for details.

3.4.2 Non-manufacturing sector

The remark made on R^2 and the residuals normality for Table 8 (as compared to those for Table 7) in subsection 3.2.2 applies here to the non-manufacturing sector in Table 10, too. It is not clear why, again in the model with both effects here (just as in the individual (country)-effects only model), kurtosis has behaved in a non-normal manner (except for that in two non-manufacturing sectors, S17 (AgricultureForestryFishery)

[32]Tested are, respectively, the null that coefficients for both country dummies and time dummies are all equal to zero and the null that coefficients for country dummies are all equal to zero.

[33]Recall, however, from the second test summarized above that no time effects are detected for S5 (Oil-Coal), S7 (Steel) and S8 (NonferrousMetals) for which *all* time dummies are statistically insignificant.

and S18 (Mining)); apparently, including dummies (especially, country dummies) works to worsen kurtosis.

Explanatory variables As will be documented later in "Dummies and F tests," it will be Table 10 (rather than Tables 7, 8 and 9) that is to be further studied with regard to the effects of host country corporate tax as well as other country factors, for non-manufacturing sectors, too.

(i) The effect of host country corporate tax on location choice of the Japanese multinationals is statistically significant for four non-manufacturing sectors: negative for S18 (Mining), S19 (Construction) and S23 (Retail); positive for S25 (MiscellaneousNonmanufacturing). For all other sectors, however, the effects are statistically insignificant and their signs are mixed.[34]

As corporate tax rate is cut by 1% in a foreign economy (that is, as CTaxR decreases by one), the Japanese multinationals in S18 (Mining), S19 (Construction) and S23 (Retail) are likely to choose to locate another foreign subsidiary in the country.[35] On the other hand, the Japanese multinationals in S25 (MiscellaneousNonmanufacturing) are likely to choose to locate another foreign subsidiary in a country whose tax is raised by 1% (that is, in a country whose CTaxR increases by one).[36]

Why opposite signs are observed here (with insignificant effects for all other sectors) is again a question requiring a further study based on a comprehensive set of firm-level data.

(ii) RelAppPatent has a statistically significant, positive effect on the location/country choice only for one non-manufacturing sector, S25 (MiscellaneousNonmanufacturing). That is, as the degree of research-excellence/intensity in a foreign economy relative to that in Japan is higher (that is, as RelAppPatent increases by one), the Japanese multinationals in S25 (MiscellaneousNonmanufacturing) are likely to locate more foreign subsidiaries in the country.[37] (Notice that for the sector

[34] For the statistical significance of CTaxR in the previous models/tables, see the first footnote for *(i)* in Subsection 3.4.1.

[35] "another" here for S23, for example, means "1.025 to be exact, for S23" computed based on the estimated coefficient associated with CTaxR for LNumSubsid_S23 in Table 10.

[36] "another" here means "1.026 to be exact" computed based on the estimated coefficient associated with CTaxR for LNumSubsid_S25 in Table 10.

[37] Based on 0.881, the estimated coefficient associated with RelAppPatent for LNumSubsid_S25, in Table 10, for example, we readily compute as follows: (logged)

here CTaxR is not statistically significant.) Why the effects of RelAppPatent turn out statistically insignificant for all other non-manufacturing sectors will, again, require a further investigation using a comprehensive set of firm-level data for Japanese multinationals.

(iii) RelPopul has a statistically significant, positive effect on the location/country choice for several non-manufacturing sectors including Nonmfg, S19 (Construction) and S21-S24 (Transportation, Wholesale, Retail, Service). That is, as the market potential as measured by population in a foreign economy relative to that in Japan is higher (that is, as RelPopul increases by one), the Japanese multinationals in those sectors are likely to locate more foreign subsidiaries in the country.[38] (Notice that for all those sectors listed above except for S19 and S23, CTaxR is statistically insignificant.)

(iv) RelpcNomGDP has a statistically significant, positive effect on the location/country choice for several non-manufacturing sectors, Nonmfg, S19 (Construction), S21 (Transportation) and S22 (Wholesale), whereas it has a statistically significant, negative effect for only one non-manufacturing sector, S25 (MiscellaneousNonmanufacturing). That is, the Japanese multinationals in Nonmfg through S22 listed immediately above are likely to locate more foreign subsidiaries in a country whose market potential as measured by per capita nominal GDP in the foreign economy relative to that in Japan is higher (that is, in a country whose RelpcNomGDP increases by one).[39] On the other hand, as the market potential as measured by per capita nominal GDP in a foreign economy relative to that in Japan is lower (that is, as RelpcNomGDP decreases by one), the Japanese multinationals in S25 (Miscellaneous-Nonmanufacturing) are likely to locate more foreign subsidiaries in the country.[40] (Notice that for all those sectors listed above except for S19,

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LNumSubsid_S25=0.881 ⇒ (unlogged) NumSubsid_S25= exp(0.881) = 2.413. Thus, "more" here means "two (2.413 to be exact) more."

[38]Based on 1.381, the estimated coefficient associated with RelPopul for LNumSubsid_S23, in Table 10, for example, we readily compute as follows: (logged) LNumSubsid_S23=1.381 ⇒ (unlogged) NumSubsid_S23= exp(1.381) = 3.979. Thus, for S23, "more" here means "nearly four (3.979 to be exact) more."

[39]Based on 1.723, the estimated coefficient associated with RelpcNomGDP for LNumSubsid_S19, in Table 10, we readily compute as follows: (logged) LNumSubsid_S19=1.723 ⇒ (unlogged) NumSubsid_S19= exp(1.723) = 5.601. Thus, for S19, "more" here means "five (5.601 to be exact) more."

[40]Based on −0.660, the estimated coefficient associated with RelpcNomGDP for LNumSubsid_S25, in Table 10, for example, we readily compute as follows: (logged) LNumSubsid_S25=0.660 ⇒ (unlogged) NumSubsid_S25= exp(0.660) = 1.9348. Thus,

CTaxR is statistically insignificant.) The positive [negative] effect detected here appears, again, to apply to non-manufacturing sectors operating more aggressively in more [less] developed nations (where RelpcNomGDP tends to be large [small]).

All these results (including their statistical significance, in particular) sharply contrast with the earlier results obtained for the (constrained) models with neither individual (country) nor time effects.

Dummies and F tests Notice in Table 10 that there is at least one time-specific dummy which turns out significant, in all sectors except for S17-S19 (AgricultureForestryFishery, Mining, Construction) and S21 (Transportation) for which *all* time dummies are statistically insignificant. As shown in the second test (where tested is the null that coefficients for time dummies are all equal to zero, with "zero" corresponding to the slope coefficients on the dummies deleted)[41] in the Inference panel of Table 10, this has indeed resulted in the presence (for the former industries) and absence (for the latter) of time effects in the both effects model. (This is in sharp contrast with failure to reject the null of absence of time effects in the model with only time effects, as reported for Table 9 in subsection 3.3.1.)

The sign of statistically significant time effects varies across sectors as well as over time, but it is positive throughout the period from 2008 to 2012 for several non-manufacturing sectors (including Nonmfg, S20 (InformationCommunication), S22 (Wholesale) and S24 (Service)).

Notice further from the first and third tests in the Inference panel of Table 10 that, for every non-manufacturing sector (without any exceptions), the two null hypotheses are strongly rejected, implying, in particular, that both effects are present.[42]

Finally, statistically significant individual (country) effects are detected for such non-manufacturing sectors as Nonmfg, S19 (Construction) and S21-S23 (Transportation, Wholesale, Retail); their signs are *all* positive, except that India is the only country for which the sign is negative for all non-manufacturing sectors but S18 (Mining). See Section 4 for details.

"more" here means "nearly two (1.935 to be exact) more."

[41] See Appendix A.5.

[42] Recall, however, from the second test summarized above that no time effects are detected for S17-S19 (AgricultureForestryFishery, Mining, Construction) and S21 (Transportation) for which *all* time dummies are statistically insignificant.

Table 10 Model With Both Individual (Country) and Time Effects, (12)

Linear Regression - Estimation by Least Squares[a]
Panel(6) of Annual Data From 1//2007:01 To 27//2012:01

	Dependent Variables									
					Manufacturing[b]					
					LNumSubsid_					
	Mfg		Nonmfg		S1		S2		S3	
Usable Obs.	150		150		128		105		86	
Total Observations	162		162		162		162		162	
Skipped/Missing	12		12		34		57		76	
Degrees of Freedom	116		116		95		77		60	
$\bar{R}^2$	0.994		0.996		0.968		0.974		0.920	
Std. Err. of Est.	0.113		0.070		0.226		0.237		0.291	
Regression F(33,116)	735.597		1096.508		F(32,95) 121.744		F(27,77) 144.023		F(25,60) 39.881	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	1.488		1.614		1.980		1.717		1.843	
Expl. Variables[c]	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	-0.406	0.856	-4.650	0.001	-4.659	0.313	-0.444	0.957	-16.019	0.171
CTaxR	-0.001	0.886	0.000	0.983	0.003	0.813	0.020	0.212	-0.012	0.538
RelAppPatent	0.160	0.345	0.106	0.310	0.195	0.570	1.115	0.003	-0.097	0.859
RelpcNomGDP	0.363	0.008	0.278	0.001	0.478	0.110	-0.026	0.936	0.335	0.653
RelPopul	0.783	0.000	1.115	0.000	0.885	0.045	0.470	0.543	1.917	0.083
USA (1)	4.830	0.008	8.654	0.000	5.591	0.136	-0.436	0.946	13.852	0.131
Canada (2)	4.082	0.069	8.795	0.000	4.682	0.312	0.000	0.000	17.233	0.132
Brazil (3)	3.726	0.056	7.489	0.000	5.058	0.208	0.824	0.907	13.817	0.168
Mexico (4)	4.188	0.044	7.946	0.000	4.598	0.282	-0.153	0.984	0.000	0.000
Argentina (5)	2.225	0.311	7.116	0.000	4.495	0.321	0.000	0.000	0.000	0.000
ChinaExcldHK (6)[d]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	5.263	0.013	8.807	0.000	5.327	0.221	0.018	0.998	16.189	0.138
Malaysia (9)	6.114	0.006	9.717	0.000	6.558	0.152	1.608	0.842	18.370	0.110
Thailand (10)	6.777	0.002	10.171	0.000	7.765	0.082	3.185	0.683	17.765	0.111
Indonesia (11)	4.989	0.008	7.647	0.000	5.558	0.149	2.230	0.742	14.885	0.123
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	5.515	0.013	9.620	0.000	5.159	0.255	0.922	0.908	0.000	0.000
Singapore (14)	5.410	0.019	10.568	0.000	6.389	0.176	0.221	0.979	16.008	0.171
India (15)	-1.989	0.000	-1.241	0.000	-2.915	0.000	-4.554	0.000	0.000	0.000
Vietnam (16)	5.444	0.011	8.533	0.000	6.633	0.129	2.202	0.774	17.165	0.117

(Continued on next page)

[a] This is the method of estimation *(ii)* as described in Appendix A.5.

[b] Sectors 1 through 16 are manufacturing sectors. For the numbering of the sectors see Table 1.

[c] Explanatory Variables. Also listed below are all country- and time-dummy variables USA (1) through FY2012 (6), of which ChinaHKSAR (Hong Kong) and Taiwan will be in effect exlcluded. See the footnote right below.

[d] The corresponding dummy is deleted (and thus its coefficient is assigned zero): see Appendix A.5. The reason for deleting ChinaExcldHK (chosen as a reference country) in particular is that we are studying the presence of (unobserved) country-specific effects (location advantages) in foreign countries as compared to country 6 (ChinaExcldHK) whose CTaxR is relatively lower (see Table 16). Recall that ChinaHKSAR (7)'s dummy has zero-valued coefficient for a different reason: see the footnote for ChinaHKSAR (7) in Table 8. Note also the footnote for "12" in the Skipped/Missing row and under the LNumSubsid_Mfg column in Table 7.

Table 10 (Continued: Lower Panel)

	Dependent Variables									
					Manufacturing					
					LNumSubsid_					
	Mfg		Nonmfg		S1		S2		S3	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
U. K. (17)	4.924	0.025	9.623	0.000	6.520	0.150	1.368	0.862	15.341	0.171
France (18)	4.216	0.054	8.162	0.000	5.400	0.233	0.115	0.988	0.000	0.000
Germany (19)	4.414	0.041	9.282	0.000	4.288	0.336	0.126	0.987	16.219	0.142
Italy (20)	3.489	0.111	8.149	0.000	3.916	0.386	0.449	0.955	0.000	0.000
Netherlands (21)	3.930	0.084	9.494	0.000	4.715	0.315	-0.086	0.992	15.970	0.169
Belgium (22)	3.516	0.122	8.337	0.000	4.396	0.350	0.000	0.000	0.000	0.000
Spain (23)	3.707	0.093	7.882	0.000	3.730	0.413	0.000	0.000	0.000	0.000
Switzerland (24)	1.691	0.461	7.467	0.000	0.000	0.000	0.000	0.000	15.680	0.179
Russia (25)	2.044	0.312	7.132	0.000	3.219	0.442	0.000	0.000	14.764	0.158
Australia (26)	4.178	0.066	9.515	0.000	6.206	0.187	-0.213	0.979	17.209	0.136
New Zealand (27)	3.181	0.162	8.056	0.000	5.567	0.237	-0.189	0.982	18.303	0.118
FY2007 (1)[a]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2008 (2)	-0.074	0.028	0.123	0.000	-0.009	0.906	0.009	0.922	-0.198	0.085
FY2009 (3)	-0.064	0.096	0.169	0.000	0.074	0.415	0.026	0.792	-0.143	0.274
FY2010 (4)	-0.057	0.154	0.197	0.000	0.163	0.086	0.001	0.988	-0.271	0.047
FY2011 (5)	-0.013	0.757	0.225	0.000	0.151	0.129	0.117	0.266	-0.379	0.010
FY2012 (6)	0.089	0.045	0.371	0.000	0.307	0.005	0.395	0.001	-0.244	0.117
Residuals										
Variance	0.010		0.004		0.038		0.042		0.060	
Skewness	0.647	0.001	0.267	0.186	-0.257	0.241	-0.312	0.198	-0.273	0.310
Kurtosis	5.059	0.000	3.357	0.000	1.438	0.001	1.484	0.003	3.841	0.000
Jarque-Bera	170.450	0.000	72.238	0.000	12.428	0.002	11.337	0.003	53.927	0.000
Studentized Range	7.817		8.232		6.561		6.083		7.373	
Inference:										
Testing the null of absence of both individual (country) and time effects (null model with no such effects)[b]										
F(31,126)[c]	463.790	0.000	693.421	0.000	107.392	0.000	84.707	0.000	37.431	0.000
F Statistic[d]	F(29,116)		F(29,116)		F(28,111)		F(23,86)		F(21,76)	
	456.428	0.000	682.414	0.000	104.744	0.000	77.925	0.000	33.328	0.000
Testing the null of absence of time effects (null model with individual (country) effects only)[e]										
F(5,126)[f]	7.070	0.000	42.733	0.000	3.990	0.002	8.326	0.000	3.485	0.006
F Statistic[g]	F(5,116)		F(5,116)		F(5,111)		F(5,86)		F(5,76)	
	6.508	0.000	39.342	0.000	3.515	0.005	5.683	0.000	2.102	0.074
Testing the null of absence of individual (country) effects (null model with time effects only)[h]										
F(26,126)[i]	547.789	0.000	817.830	0.000	127.825	0.000	96.052	0.000	44.219	0.000
F Statistic[j]	F(24,116)		F(24,116)		F(23,111)		F(18,86)		F(16,76)	
	546.340	0.000	815.666	0.000	127.300	0.000	94.700	0.000	43.341	0.000

(Continued on next page)

[a] The corresponding dummy is deleted (and thus its coefficient is assigned zero): see Appendix A.5. The reason for deleting FY2007 in particular is that in (calendar year) 2007 Japanese yen was cheapest against both U.S. dollar and Euro during the six-year sample period, 2007-2012.

[b] Tested is the null that coeffs for both country dummies and time dummies are all equal to zero, with "zero" corresponding to the slope coefficients on the dummies deleted. See Appendix A.5.

[c] An F computed by (14) in Appendix A.5, with N=27 (the total number of countries under study).

[d] An F computed by (14) in Appendix A.5, for which the number of dummies whose coefficients are exactly zero in the table is subtracted from N since the corresponding countries have data unavailable for the whole six-year period and thus such countries as ChinaHKSAR, Taiwan, etc. are ignored/skipped in the regression. This apples to "F Statistic" at the end of the tables that follow.

[e] Tested is the null that coeffs for time dummies are all equal to zero, with "zero" corresponding to the slope coefficients on the dummies deleted. See Appendix A.5.

[f] An F computed by (15) in Appendix A.5, with N=27 (the total number of countries under study).

[g] An F computed by (15) in Appendix A.5, for which the number of dummies whose coefficients are exactly zero in the table is subtracted from N since the corresponding countries have data unavailable for the whole six-year period and thus such countries as ChinaHKSAR, Taiwan, etc. are ignored/skipped in the regression. This apples to "F Statistic" at the end of the tables that follow.

[h] Tested is the null that coeffs for country dummies are all equal to zero.

[i] An F computed by (16) in Appendix A.5, with N=27 (the total number of countries under study).

[j] An F computed by (16) in Appendix A.5, for which the number of dummies whose coefficients are exactly zero in the table is subtracted from N since the corresponding countries have data unavailable for the whole six-year period and thus such countries as ChinaHKSAR, Taiwan, etc. are ignored/skipped in the regression. This apples to "F Statistic" at the end of the tables that follow.

Table 10 (Continued)

	Dependent Variables: Manufacturing LNumSubsid_									
	S4		S5		S6		S7		S8	
Usable Obs.	150		64		104		97		96	
Total Observations	162		162		162		162		162	
Skipped/Missing	12		98		58		65		66	
Degrees of Freedom	116		43		75		71		70	
$\bar{R}^2$	0.986		0.738		0.972		0.971		0.963	
Std. Err. of Est.	0.167		0.374		0.203		0.217		0.252	
Regression F Stat.	F(33,116) 325.022		F(20,43) 9.867		F(28,75) 130.181		F(25,71) 131.485		F(25,70) 100.785	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	1.753		1.800		1.756		1.609		1.414	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	2.042	0.538	-0.696	0.960	2.318	0.767	-7.577	0.100	-12.092	0.056
CTaxR	0.006	0.545	-0.001	0.969	-0.015	0.223	0.016	0.293	0.018	0.248
RelAppPatent	0.038	0.878	-0.563	0.383	-0.027	0.933	0.191	0.583	0.946	0.024
RelpcNomGDP	0.215	0.280	0.927	0.209	-0.120	0.697	1.216	0.001	-0.788	0.079
RelPopul	0.319	0.308	0.309	0.810	0.230	0.755	1.075	0.015	1.494	0.013
USA (1)	1.651	0.533	1.666	0.876	1.100	0.858	6.326	0.094	10.132	0.044
Canada (2)	-0.842	0.798	0.000	0.000	-1.130	0.883	5.346	0.249	12.408	0.047
Brazil (3)	-0.473	0.868	1.058	0.928	0.000	0.000	6.480	0.107	9.935	0.068
Mexico (4)	-0.576	0.850	0.000	0.000	-2.121	0.767	7.103	0.097	11.534	0.047
Argentina (5)	-2.166	0.503	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ChinaExcldHk (6)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	0.447	0.885	0.000	0.000	-1.852	0.799	8.015	0.066	12.522	0.035
Malaysia (9)	1.510	0.643	1.124	0.933	0.679	0.929	8.823	0.055	14.617	0.020
Thailand (10)	2.071	0.513	1.541	0.906	0.830	0.911	10.043	0.025	14.514	0.017
Indonesia (11)	1.224	0.655	0.543	0.962	-0.185	0.977	7.969	0.039	11.260	0.032
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	1.691	0.600	1.129	0.932	0.197	0.979	7.852	0.084	12.691	0.039
Singapore (14)	1.514	0.652	0.868	0.950	-0.449	0.954	7.778	0.100	14.488	0.024
India (15)	-2.225	0.000	-2.275	0.106	-2.925	0.000	-1.447	0.012	-2.261	0.002
Vietnam (16)	0.618	0.842	0.328	0.980	0.022	0.998	8.625	0.049	12.743	0.032
U. K. (17)	0.582	0.856	0.429	0.974	-0.410	0.956	5.708	0.207	11.722	0.055
France (18)	0.613	0.848	0.000	0.000	-1.622	0.829	5.181	0.253	0.000	0.000
Germany (19)	0.573	0.856	0.000	0.000	-0.266	0.971	5.451	0.222	10.840	0.071
Italy (20)	-1.011	0.753	0.000	0.000	-1.192	0.874	0.000	0.000	0.000	0.000
Netherlands (21)	-0.001	1.000	0.000	0.000	0.000	0.000	6.112	0.194	0.000	0.000
Belgium (22)	-0.186	0.956	0.000	0.000	-1.484	0.849	0.000	0.000	0.000	0.000
Spain (23)	0.066	0.984	0.000	0.000	-1.959	0.797	0.000	0.000	11.358	0.066
Switzerland (24)	-1.834	0.588	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia (25)	-2.580	0.387	0.000	0.000	-2.363	0.737	0.000	0.000	0.000	0.000
Australia (26)	-0.804	0.809	0.177	0.990	-0.574	0.941	0.000	0.000	14.588	0.021
New Zealand (27)	-1.633	0.625	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2007 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2008 (2)	-0.043	0.384	0.182	0.296	0.049	0.526	0.010	0.899	0.001	0.991
FY2009 (3)	-0.088	0.121	-0.124	0.519	0.030	0.731	-0.024	0.804	0.030	0.779
FY2010 (4)	-0.046	0.436	-0.062	0.738	0.024	0.790	-0.061	0.549	0.043	0.689
FY2011 (5)	0.033	0.580	0.028	0.887	0.033	0.724	0.076	0.482	-0.101	0.367
FY2012 (6)	0.142	0.030	0.144	0.509	0.218	0.034	0.179	0.129	0.082	0.495
Residuals										
Variance	0.022		0.096		0.030		0.035		0.047	
Skewness	-0.317	0.117	0.284	0.365	0.406	0.096	0.037	0.883	-0.636	0.012
Kurtosis	4.136	0.000	0.921	0.155	2.254	0.000	1.380	0.007	0.807	0.120
Jarque-Bera	109.411	0.000	3.123	0.210	24.876	0.000	7.715	0.021	9.081	0.011
Studentized Range	8.134		4.862		6.686		6.272		5.025	
Inference:										
Testing the null of absence of both individual (country) and time effects (null model with with no such effects)										
F Statitic	F(29,116) 227.189	0.000	F(16,51) 7.291	0.000	F(24,91) 82.621	0.000	F(21,76) 57.187	0.000	F(21,76) 88.613	0.000
Testing the null of absence of time effects (null model with individual (country) effects only)										
F Statitic	F(5,116) 5.103	0.000	F(5,51) 1.117	0.363	F(5,91) 2.626	0.029	F(5,76) 2.076	0.078	F(5,76) 1.039	0.401
Testing the null of absence of individual (country) effects (null model with time effects only)										
F Statitic	F(24,116) 272.332	0.000	F(11,51) 9.754	0.000	F(19,91) 100.669	0.000	F(16,76) 69.628	0.000	F(16,76) 113.750	0.000

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Table 10 (Continued)

	Dependent Variables: Manufacturing LNumSubsid_									
	S9		S10		S11		S12		S13	
Usable Obs.	114		125		126		128		127	
Total Observations	162		162		162		162		162	
Skipped/Missing	48		37		36		34		35	
Degrees of Freedom	84		91		94		96		96	
R^2	0.976		0.959		0.970		0.966		0.964	
Std. Err. of Est.	0.229		0.214		0.234		0.203		0.230	
Regression F Stat.	F(29,84) 162.459		F(33,91) 88.611		F(31,94) 129.906		F(31,96) 117.602		F(30,96) 113.151	
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	1.878		1.690		1.829		2.303		2.098	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	-10.591	0.026	-11.199	0.012	0.090	0.985	7.626	0.126	1.588	0.737
CTaxR	-0.005	0.719	-0.027	0.034	-0.010	0.476	0.006	0.618	0.025	0.056
RelAppPatent	-0.198	0.576	-0.140	0.666	-0.234	0.513	0.202	0.507	0.091	0.793
RelpcNomGDP	1.100	0.001	-0.033	0.905	1.494	0.000	0.235	0.360	0.765	0.010
RelPopul	1.462	0.001	1.585	0.000	0.468	0.302	-0.315	0.498	0.305	0.495
USA (1)	9.642	0.012	12.706	0.001	1.626	0.672	-3.983	0.311	-0.338	0.929
Canada (2)	8.904	0.060	13.379	0.003	-0.484	0.919	-7.174	0.145	-1.775	0.707
Brazil (3)	9.159	0.026	11.442	0.003	0.351	0.932	-5.856	0.170	-1.788	0.661
Mexico (4)	9.705	0.027	12.107	0.004	0.267	0.951	-6.539	0.151	-1.022	0.814
Argentina (5)	0.000	0.000	12.342	0.005	-0.746	0.874	0.000	0.000	-2.757	0.550
ChinaExcldHk (6)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	11.836	0.008	12.910	0.002	1.565	0.726	-5.553	0.230	0.128	0.977
Malaysia (9)	13.051	0.006	13.901	0.002	2.093	0.657	-5.582	0.252	0.365	0.938
Thailand (10)	13.629	0.003	14.706	0.001	3.472	0.448	-4.876	0.302	1.665	0.712
Indonesia (11)	10.612	0.007	11.751	0.002	1.628	0.681	-5.774	0.159	-0.224	0.954
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	11.738	0.012	14.289	0.001	2.451	0.599	-5.557	0.249	0.150	0.974
Singapore (14)	12.078	0.013	13.981	0.002	0.813	0.867	-6.018	0.230	0.016	0.997
India (15)	-2.673	0.000	-0.725	0.177	-2.360	0.000	-3.556	0.000	-2.794	0.000
Vietnam (16)	12.224	0.007	12.741	0.003	1.896	0.672	-5.415	0.243	0.122	0.978
U. K. (17)	9.800	0.034	13.736	0.002	0.809	0.862	-5.332	0.266	-0.894	0.846
France (18)	9.183	0.046	13.026	0.003	-0.555	0.905	-6.250	0.192	-1.680	0.715
Germany (19)	9.714	0.033	13.229	0.002	1.158	0.801	-5.734	0.225	-0.850	0.852
Italy (20)	9.296	0.044	12.437	0.005	-0.203	0.965	-7.372	0.125	-2.686	0.560
Netherlands (21)	0.000	0.000	13.111	0.004	-2.221	0.646	-6.679	0.181	-1.744	0.716
Belgium (22)	0.000	0.000	12.019	0.008	0.000	0.000	-7.292	0.144	-2.417	0.614
Spain (23)	9.233	0.047	13.218	0.003	-0.955	0.839	-7.849	0.106	-1.918	0.679
Switzerland (24)	0.000	0.000	11.732	0.011	-2.654	0.589	-7.707	0.128	0.000	0.000
Russia (25)	8.499	0.048	10.061	0.012	-1.256	0.771	-7.393	0.098	0.000	0.000
Australia (26)	9.345	0.051	12.418	0.006	-1.045	0.828	-8.036	0.107	-1.823	0.702
New Zealand (27)	9.652	0.045	12.057	0.008	0.000	0.000	0.000	0.000	0.000	0.000
FY2007 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2008 (2)	0.071	0.378	-0.313	0.000	0.241	0.002	-0.232	0.001	-0.154	0.040
FY2009 (3)	0.154	0.089	-0.346	0.000	0.363	0.000	0.089	0.233	-0.139	0.106
FY2010 (4)	0.201	0.031	-0.410	0.000	0.434	0.000	-0.004	0.962	-0.179	0.050
FY2011 (5)	0.172	0.075	-0.484	0.000	0.402	0.000	0.155	0.053	-0.163	0.084
FY2012 (6)	0.286	0.006	-0.395	0.000	0.426	0.000	0.338	0.000	0.068	0.502
Residuals										
Variance	0.039		0.034		0.041		0.031		0.040	
Skewness	-0.260	0.263	0.476	0.032	-0.318	0.150	0.473	0.031	0.040	0.855
Kurtosis	1.688	0.000	1.399	0.002	3.670	0.000	1.818	0.000	1.155	0.010
Jarque-Bera	14.822	0.001	14.918	0.001	72.821	0.000	22.394	0.000	7.096	0.029
Studentized Range	5.987		5.899		7.781		6.089		5.585	

Inference:

Testing the null of absence of both individual (country) and time effects (null model with no such effects)										
F Statistic	F(25,96)		F(29,116)		F(27,106)		F(27,106)		F(26,101)	
	94.499	0.000	44.985	0.000	77.617	0.000	62.064	0.000	46.699	0.000
Testing the null of absence of time effects (null model with individual (country) effects only)										
F Statistic	F(5,96)		F(5,116)		F(5,106)		F(5,106)		F(5,101)	
	2.052	0.078	8.726	0.000	5.556	0.000	13.311	0.000	4.302	0.001
Testing the null of absence of individual (country) effects (null model with time effects only)										
F Statistic	F(20,96)		F(24,116)		F(22,106)		F(22,106)		F(21,101)	
	115.142	0.000	53.318	0.000	94.951	0.000	72.864	0.000	53.086	0.000

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Table 10 (Continued)

	Dependent Variables									
	Manufacturing						Non-manufacturing[a]			
	LNumSubsid_									
	S14		S15		S16		S17		S18	
Usable Obs.	143		142		147		97		84	
Total Observations	162		162		162		162		162	
Skipped/Missing	19		20		15		65		78	
Degrees of Freedom	110		109		113		70		60	
$\bar{R}^2$	0.978		0.988		0.982		0.925		0.947	
Std. Err. of Est.	0.226		0.149		0.193		0.238		0.298	
Regression F stat.	F(32,110)	195.492	F(32,109)	351.644	F(33,113)	236.112	F(26,70)	46.331	F(23,60)	65.831
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	1.713		2.086		1.664		1.587		1.910	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	4.488	0.323	-0.350	0.907	-16.874	0.000	4.759	0.574	-7.837	0.532
CTaxR	-0.010	0.432	0.002	0.793	-0.009	0.409	0.010	0.569	-0.034	0.097
RelAppPatent	0.096	0.777	0.055	0.807	0.275	0.342	0.136	0.718	0.147	0.758
RelpcNomGDP	0.439	0.109	0.843	0.000	0.219	0.344	-0.483	0.194	-0.462	0.298
RelPopul	0.165	0.700	0.584	0.040	2.143	0.000	-0.283	0.719	0.913	0.438
USA (1)	-0.521	0.885	3.424	0.155	15.747	0.000	-2.052	0.752	10.730	0.274
Canada (2)	-3.344	0.457	2.468	0.407	17.925	0.000	0.000	0.000	11.618	0.345
Brazil (3)	-3.128	0.423	2.570	0.320	15.504	0.000	-2.505	0.726	8.577	0.424
Mexico (4)	-1.711	0.681	3.124	0.257	17.157	0.000	0.000	0.000	8.757	0.444
Argentina (5)	-3.836	0.386	1.122	0.701	16.387	0.000	-4.410	0.586	0.000	0.000
ChinaExcldHk (6)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	-0.065	0.988	3.692	0.189	18.750	0.000	-3.933	0.613	10.102	0.386
Malaysia (9)	0.381	0.932	3.612	0.222	20.439	0.000	-4.603	0.576	9.102	0.458
Thailand (10)	0.042	0.992	5.285	0.066	20.484	0.000	-3.982	0.617	8.481	0.476
Indonesia (11)	-0.691	0.853	3.747	0.132	17.177	0.000	-2.609	0.705	7.710	0.454
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	-0.807	0.855	3.272	0.263	18.928	0.000	-4.773	0.556	0.000	0.000
Singapore (14)	-0.963	0.834	1.363	0.654	19.972	0.000	-4.147	0.622	9.463	0.452
India (15)	-3.790	0.000	-1.117	0.003	-1.197	0.012	-2.502	0.004	0.072	0.950
Vietnam (16)	-0.726	0.864	3.671	0.192	19.256	0.000	-3.624	0.643	0.000	0.000
U. K. (17)	-1.336	0.761	2.758	0.344	18.629	0.000	-4.353	0.588	11.629	0.334
France (18)	-2.676	0.542	2.086	0.473	18.228	0.000	-3.862	0.629	9.292	0.439
Germany (19)	-1.495	0.730	1.580	0.581	17.585	0.000	0.000	0.000	0.000	0.000
Italy (20)	-3.025	0.491	1.626	0.576	17.594	0.000	0.000	0.000	0.000	0.000
Netherlands (21)	-2.980	0.514	1.188	0.694	19.098	0.000	-4.006	0.631	11.967	0.338
Belgium (22)	-2.983	0.514	1.273	0.674	18.330	0.000	0.000	0.000	0.000	0.000
Spain (23)	-3.064	0.490	1.903	0.516	17.759	0.000	-4.347	0.592	0.000	0.000
Switzerland (24)	-4.568	0.324	0.000	0.000	16.401	0.000	0.000	0.000	0.000	0.000
Russia (25)	-3.761	0.357	1.087	0.687	14.700	0.000	0.000	0.000	0.000	0.000
Australia (26)	-3.494	0.443	1.607	0.594	18.580	0.000	-1.651	0.842	13.318	0.285
New Zealand (27)	0.000	0.000	-0.131	0.965	18.016	0.000	-3.728	0.656	0.000	0.000
FY2007 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2008 (2)	-0.246	0.000	-0.043	0.333	0.015	0.802	0.012	0.894	-0.128	0.283
FY2009 (3)	-0.324	0.000	0.005	0.919	0.074	0.271	0.142	0.158	-0.127	0.341
FY2010 (4)	-0.331	0.000	0.013	0.811	0.078	0.265	0.167	0.101	-0.094	0.494
FY2011 (5)	-0.298	0.000	0.045	0.422	0.019	0.793	0.102	0.332	-0.204	0.158
FY2012 (6)	-0.270	0.003	0.146	0.016	0.192	0.013	0.098	0.385	0.006	0.967
Residuals										
Variance	0.040		0.017		0.029		0.041		0.064	
Skewness	-0.923	0.000	1.124	0.000	0.353	0.083	-0.246	0.330	-0.162	0.552
Kurtosis	5.257	0.000	5.952	0.000	2.925	0.000	-0.157	0.761	0.231	0.679
Jarque-Bera	184.951	0.000	239.465	0.000	55.466	0.000	1.077	0.584	0.553	0.758
Studentized Range	7.798		7.755		7.408		4.833		5.218	
Inference:										
Testing the null of absence of both individual (country) and time effects (null model with with no such effects)										
F Statistic	F(28,111)		F(28,111)		F(29,116)		F(22,81)		F(19,66)	
	124.277	0.000	197.139	0.000	178.504	0.000	54.235	0.000	45.805	0.000
Testing the null of absence of time effects (null model with individual (country) effects only)										
F Statistic	F(5,111)		F(5,111)		F(5,116)		F(5,81)		F(5,66)	
	4.656	0.001	3.120	0.011	2.453	0.038	0.992	0.428	1.088	0.375
Testing the null of absence of individual (country) effects (null model with time effects only)										
F Statistic	F(23,111)		F(23,111)		F(24,116)		F(17,81)		F(14,66)	
	143.918	0.000	237.001	0.000	214.673	0.000	69.193	0.000	60.329	0.000

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[a]Sectors 17 through 25 are non-manufacturing sectors. For the numbering of the sectors see Table 1.

Table 10 (Continued)

	Dependent Variables: Non-manufacturing LNumSubsid_									
	S19		S20		S21		S22		S23	
Usable Obs.	110		127		144		150		149	
Total Observations	162		162		162		162		162	
Skipped/Missing	52		35		18		12		13	
Degrees of Freedom	80		95		111		116		115	
$\bar{R}^2$	0.948		0.980		0.984		0.987		0.961	
Std. Err. of Est.	0.298		0.187		0.143		0.120		0.243	
Regression F Stat.	F(29,80)	69.315	F(31,95)	198.840	F(32,111)	272.502	F(33,116)	347.073	F(33,115)	110.540
P-value of F	0.000		0.000		0.000		0.000		0.000	
D-W Statistic	1.640		1.487		1.645		1.405		2.318	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	-9.215	0.136	1.181	0.756	-6.475	0.025	-7.078	0.003	-9.526	0.051
CTaxR	-0.035	0.052	0.002	0.835	-0.003	0.694	-0.002	0.777	-0.025	0.062
RelAppPatent	-0.696	0.142	0.168	0.553	0.020	0.927	0.179	0.318	0.415	0.254
RelpcNomGDP	1.723	0.000	0.236	0.327	0.397	0.024	0.382	0.008	-0.430	0.143
RelPopul	1.323	0.025	0.350	0.331	1.102	0.000	1.279	0.000	1.381	0.003
USA (1)	9.661	0.053	1.843	0.548	7.885	0.001	9.777	0.000	11.371	0.004
Canada (2)	8.579	0.162	-0.551	0.885	7.973	0.006	10.512	0.000	12.552	0.010
Brazil (3)	9.377	0.079	-0.476	0.885	7.207	0.004	8.951	0.000	9.132	0.030
Mexico (4)	9.495	0.095	-1.773	0.613	7.762	0.004	9.507	0.000	10.210	0.023
Argentina (5)	10.194	0.094	0.000	0.000	0.000	0.000	9.083	0.000	10.010	0.036
ChinaExcldHk (6)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	12.362	0.034	0.985	0.782	8.989	0.001	9.863	0.000	10.101	0.027
Malaysia (9)	12.810	0.037	0.680	0.856	9.785	0.001	11.391	0.000	12.586	0.009
Thailand (10)	13.234	0.026	1.384	0.704	10.146	0.000	11.892	0.000	12.867	0.006
Indonesia (11)	10.846	0.035	-0.277	0.930	7.967	0.001	8.683	0.000	9.435	0.020
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	10.361	0.086	1.262	0.734	8.757	0.002	11.425	0.000	12.780	0.008
Singapore (14)	10.789	0.086	1.407	0.716	10.305	0.001	12.345	0.000	13.682	0.006
India (15)	-0.344	0.644	-2.510	0.000	-1.327	0.000	-0.944	0.001	-1.509	0.011
Vietnam (16)	11.741	0.044	1.298	0.716	9.026	0.001	9.266	0.000	10.088	0.028
U. K. (17)	8.780	0.143	1.323	0.721	9.171	0.001	11.103	0.000	13.100	0.006
France (18)	0.000	0.000	-0.090	0.981	7.903	0.005	10.412	0.000	12.695	0.008
Germany (19)	8.814	0.137	0.529	0.885	8.528	0.002	11.182	0.000	12.616	0.007
Italy (20)	8.509	0.156	-1.679	0.651	7.179	0.011	10.140	0.000	11.268	0.018
Netherlands (21)	8.286	0.183	-0.260	0.946	9.323	0.002	10.761	0.000	12.414	0.012
Belgium (22)	8.135	0.191	-1.156	0.765	7.965	0.007	10.370	0.000	11.419	0.021
Spain (23)	0.000	0.000	-1.730	0.644	7.136	0.012	9.802	0.000	11.703	0.015
Switzerland (24)	0.000	0.000	-1.576	0.688	6.611	0.025	9.432	0.000	11.010	0.028
Russia (25)	8.062	0.148	0.000	0.000	6.967	0.007	9.060	0.000	9.929	0.024
Australia (26)	8.689	0.162	0.148	0.969	8.219	0.005	10.933	0.000	12.570	0.011
New Zealand (27)	0.000	0.000	-0.803	0.835	7.251	0.013	9.812	0.000	11.965	0.016
FY2007 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2008 (2)	-0.081	0.444	0.196	0.002	0.033	0.438	0.123	0.001	0.094	0.197
FY2009 (3)	-0.025	0.837	0.235	0.001	-0.022	0.660	0.183	0.000	-0.002	0.977
FY2010 (4)	-0.074	0.547	0.238	0.002	-0.043	0.407	0.225	0.000	-0.015	0.861
FY2011 (5)	-0.154	0.229	0.202	0.011	-0.082	0.131	0.235	0.000	0.110	0.225
FY2012 (6)	-0.017	0.898	0.606	0.000	0.065	0.263	0.362	0.000	0.266	0.007
Residuals										
Variance	0.065		0.026		0.016		0.011		0.046	
Skewness	-0.391	0.098	0.038	0.863	0.117	0.570	1.757	0.000	0.640	0.002
Kurtosis	1.555	0.001	1.878	0.000	1.138	0.007	18.135	0.000	3.280	0.000
Jarque-Bera	13.890	0.001	18.698	0.000	8.098	0.017	2132.746	0.000	76.932	0.000
Studentized Range	5.795		6.963		6.784		11.316		7.137	
Inference:										
Testing the null of absence of both individual (country) and time effects (null model with with no such effects)										
F Statistic	F(25,96)		F(27,106)		F(28,111)		F(29,116)		F(29,116)	
	59.430	0.000	89.517	0.000	184.476	0.000	202.337	0.000	68.774	0.000
Testing the null of absence of time effects (null model with individual (country) effects only)										
F Statistic	F(5,96)		F(5,106)		F(5,111)		F(5,116)		F(5,116)	
	0.753	0.586	16.062	0.000	3.239	0.009	12.496	0.000	4.053	0.002
Testing the null of absence of individual (country) effects (null model with time effects only)										
F Statistic	F(20,96)		F(22,106)		F(23,111)		F(24,116)		F(24,116)	
	71.776	0.000	108.022	0.000	221.201	0.000	240.451	0.000	81.825	0.000

(Continued on next page)

Table 10 (Continued)

	Dependent Variables			
	Non-manufacturing			
	LNumSubsid_			
	S24		S25	
Usable Observations	150		150	
Total Observations	162		162	
Skipped/Missing	12		12	
Degrees of Freedom	116		116	
$\bar{R}^2$	0.978		0.965	
Standard Error of Estimate	0.188		0.274	
Regression F(33,m)	200.665		125.248	
P-value of F	0.000		0.000	
Durbin-Watson Statistic	1.835		1.660	
Explanatory Variables	Coeff	P-value	Coeff	P-value
Constant	-1.695	0.651	5.405	0.321
CTaxR	-0.003	0.804	0.026	0.094
RelAppPatent	-0.127	0.651	0.881	0.033
RelpcNomGDP	0.303	0.179	-0.660	0.045
RelPopul	0.626	0.077	-0.189	0.712
USA (1)	5.193	0.084	-1.343	0.757
Canada (2)	3.445	0.354	-3.103	0.565
Brazil (3)	2.767	0.391	-3.229	0.490
Mexico (4)	3.237	0.347	-3.190	0.523
Argentina (5)	2.194	0.548	-6.230	0.241
ChinaExcldHk (6)	0.000	0.000	0.000	0.000
ChinaHongKongSAR (7)	0.000	0.000	0.000	0.000
Philippines (8)	4.060	0.246	-2.951	0.561
Malaysia (9)	4.298	0.244	-3.184	0.551
Thailand (10)	4.965	0.166	-2.527	0.626
Indonesia (11)	3.246	0.294	-2.572	0.567
Taiwan (12)	0.000	0.000	0.000	0.000
Korea, Republic of (13)	4.687	0.199	-3.439	0.516
Singapore (14)	4.998	0.188	-1.239	0.822
India (15)	-1.716	0.000	-2.994	0.000
Vietnam (16)	3.928	0.263	-3.690	0.469
United Kingdom (17)	4.479	0.218	-1.545	0.769
France (18)	3.624	0.318	-4.865	0.356
Germany (19)	3.888	0.278	-3.604	0.488
Italy (20)	2.991	0.410	-4.969	0.346
Netherlands (21)	4.684	0.215	-1.605	0.769
Belgium (22)	2.694	0.475	-5.247	0.339
Spain (23)	2.386	0.514	-4.892	0.358
Switzerland (24)	1.584	0.678	-4.542	0.413
Russia (25)	1.365	0.685	-5.403	0.270
Australia (26)	3.966	0.292	-1.901	0.727
New Zealand (27)	2.271	0.547	-4.218	0.442
FY2007 (1)	0.000	0.000	0.000	0.000
FY2008 (2)	0.454	0.000	0.153	0.059
FY2009 (3)	0.645	0.000	-0.004	0.964
FY2010 (4)	0.670	0.000	0.152	0.117
FY2011 (5)	0.811	0.000	0.267	0.008
FY2012 (6)	0.967	0.000	0.445	0.000
Residuals				
Variance	0.028		0.058	
Skewness	-0.720	0.000	-0.468	0.021
Kurtosis	3.293	0.000	1.820	0.000
Jarque-Bera	80.766	0.000	26.172	0.000
Studentized Range	7.253		6.419	
Inference:				
Testing the null of absence of both individual (country) and time effects (null model with no such effects)				
F Statistic	F(29,116)		F(29,116)	
	135.482	0.000	102.981	0.000
Testing the null of absence of time effects (null model with individual (country)effects only)				
F Statistic	F(5,116)		F(5,116)	
	37.781	0.000	6.819	0.000
Testing the null of absence of individual (country) effects (null model with time effects only)				
F Statistic	F(24,116)		F(24,116)	
	150.643	0.000	123.336	0.000

4 Effects on location choice, unexplained by four explanatory variables included

We now explore the individual (country) and time effects on the location choice as detected through dummies in Table 10, which are briefly remarked on in "Dummies and F tests" in the previous subsections 3.4.1 and 3.4.2; they are effects unexplained by the four explanatory variables included (CTaxR, RelAppPatent, RelpcNomGDP and RelPopul).[43] Note that, because of their unobservable nature, those effects detected as possible determinants of location choice of Japanese multinationals are more likely related to the internalization theory than the location theory.[44] And yet, location advantages will enable the firms to benefit more from basing their operations (such as research, production, and distribution activities) in a host foreign country as well than from producing only in the home country to export to the foreign market (Kojima 2004, p.38). Those location advantages, which will likely result in possible substitutive relationship between FDI and exporting by Japanese firms, may include the import restrictions imposed by the host countries, voluntary export restraints in the home country, government induced incentives encouraging FDI activity, and so on.

One of the null hypotheses rejected across all industrial sectors (including Mfg and Nonmfg) in the bottom panel of Table 10 is that coefficients on both individual (country) dummies and time dummies are *all* equal to *zero* with "zero" corresponding to the dummies being deleted;[45] assigned "zero" here are the dummies for country 6 (ChinaExcldHK) and for time period 1 (FY/CY2007) when the Japanese yen was cheaper against both U.S. dollar and Euro than in the remaining fiscal years of the sample period.[46] Country 6 and time period 1 as such are considered, respectively, as a reference country and reference fiscal year to be contrasted with the remainder.

China has been chosen as a reference country to study the presence of (unobserved) country-specific effects (location advantages) in foreign countries as compared to country 6 (ChinaExcldHK).

Further, to compare with the results for country 6 (ChinaExcldHK),

[43] See Appendix A.2 on omitted variables problem. See also Approach C in Kojima (2004, Appendix B).

[44] See Kojima (2004, pp.38-40).

[45] See Appendix A.5.

[46] See Table 2.

country 14 (Singapore) will be also considered as another reference country, for Singapore's CTaxR is lowest among 27 host countries studied. See Table 11, whose coefficient estimates are exactly the same as those in Table 10 except for the constant and the country dummies.[47]

4.1 Respective effects: Statistically significant country- and time-specific effects in Table 10

Statistically significant respective effects (that is, effects by country and by time, separately) are observed for several industrial sectors.

4.1.1 Country-specific effects

Manufacturing sector *(i)* The positive [negative] sign of statistically significant country effects implies that the number of Japanese subsidiaries chosen to be located in those countries increases [decreases] as compared to that in ChinaExcldHK (whose country dummy is set equal to zero).[48] Statistically significant individual (country) effects are detected for such manufacturing sectors as Mfg, S7-S10 (Steel, NonferrousMetals, MetalProducts, GeneralPurposeMachine), S12 (MachineForCommercialUse), S15 (TransportationEquipment) and S16 (MiscellaneousManufacturing); their signs are *all positive*, except that India is the only host country for which the sign is negative for almost all manufacturing sectors including Mfg. The corresponding host countries with positive effects for each of those sectors are as follows:

For Mfg: USA, Canada, Brazil, Mexico, Philippines, Malaysia, Thailand, Indonesia, Korea, Republic of, Singapore, Vietnam, United Kingdom, France, Germany, Netherlands, Spain, Australia.

S7 (Steel): USA, Mexico, Philippines, Malaysia, Thailand, Indonesia, Korea, Republic of, Singapore, Vietnam.

S8 (NonferrousMetals): USA, Canada, Brazil, Mexico, Philippines, Malaysia, Thailand, Indonesia, Korea, Republic of, Singapore, Vietnam, United Kingdom, Germany, Spain, Australia.

S9 (MetalProducts): USA, Canada, Brazil, Mexico, Philippines, Malaysia, Thailand, Indonesia, Korea, Republic of, Singapore, Vietnam, United Kingdom, France, Germany, Italy, Spain, Russia, Australia, New Zealand.

[47] We will notice later that the coefficient on country 6 (ChinaExcldHK) dummy in Table 11 is exactly the negative of that on country 14 (Singapore) dummy in Table 10.

[48] See *(iv)* in Appendix A.5 for interpreting the sign of each effect/dummy this way.

S10 (GeneralPurposeMachine): USA, Canada, Brazil, Mexico, Argentina, Philippines, Malaysia, Thailand, Indonesia, Korea, Republic of, Singapore, Vietnam, United Kingdom, France, Germany, Italy, Netherlands, Belgium, Spain, Switzerland, Russia, Australia, New Zealand.

S12 (MachineForCommercialUse): Russia.

S15 (TransportationEquipment): Thailand.

S16 (MiscellaneousManufacturing): Same as those for S10.

What positive country effects may be plausible here that are unobservable and unexplained by the four explanatory variables already included? Such possible effects would be due to those country characteristics omitted in the model that are *not* present in country 6 (ChinaExcldHK): they could be such location advantages (that exist in those countries listed above but not in ChinaExcldHK) as listed earlier.

Why, for S12 (MachineForCommercialUse) and S15 (TransportationEquipment), the country effects turn out statistically significant for only one country (respectively, Russia and Thailand) will, again, require a further investigation using a comprehensive set of firm-level data for Japanese multinationals.

(ii) Assigned zero in Table 11 is the coefficient on dummy for country 14 (Singapore), whose CTaxR is lowest among 27 host countries studied. The coefficient estimates in the table are exactly the same as those in Table 10, the results for country 6 (ChinaExcldHK), except for the constant and the country dummies. Notice that the coefficient on country 6 (ChinaExcldHK) dummy in Table 11 is exactly the negative of that on country 14 (Singapore) dummy in Table 10. Comparing the two tables with respect to the country dummies for S10 (GeneralPurposeMachine) in particular, whose CTaxR is statistically significant negative,[49] we find in Table 11 that most countries have statistically significant, *negative* effects as follows:

S10 (GeneralPurposeMachine): Canada, Brazil, Mexico, Argentina, ChinaExcldHK, Philippines, Indonesia, India, Vietnam, France, Germany, Italy, Netherlands, Belgium, Spain, Switzerland, Russia, Australia, New Zealand.[50] (*Positive* effects are observed only for Thailand.)

What negative country effects may be plausible here that are unobservable and unexplained by the four explanatory variables already included? Such possible effects would be due to those country character-

[49] See the first footnote for *(i)* in Subsection 3.4.1.

[50] Notice that those host countries listed here have positive country dummies in Table 10 for which country 6 (ChinaExcldHK) is a reference country.

istics omitted in the model that are *not* present in those countries listed above: they could be such location advantages (that exist in Singapore but not in those countries listed above) as the import restrictions imposed by Singapore, voluntary export restraints in the home country, government induced incentives encouraging FDI activity in Singapore, and so on.

Why, for S10 (GeneralPurposeMachine), the country effects turn out statistically significant positive for only one country (Thailand) will, again, require a further investigation using a comprehensive set of firm-level data for Japanese multinationals.

Non-manufacturing sector *(i)* Statistically significant individual (country) effects are detected for such non-manufacturing sectors as Nonmfg, S19 (Construction) and S21-S23 (Transportation, Wholesale, Retail); their signs are *all positive*, except that India is the only country for which the sign is negative for all non-manufacturing sectors but S18 (Mining). The corresponding countries with positive effects for each of those sectors are as follows:

Nonmfg: Same as those for S10.

S19 (Construction): USA, Brazil, Mexico, Argentina, Philippines, Malaysia, Thailand, Indonesia, Korea, Republic of, Singapore, Vietnam.

S21 (Transportation): Same as those for S10 but excluding Argentina.

S22 (Wholesale), S23 (Retail): Same as those for S10.

Those positive country effects that may be plausible here and are unobservable and unexplained by the four explanatory variables already included would be due to those country characteristics omitted in the model that are *not* present in country 6 (ChinaExcldHK), as listed earlier.

(ii) Comparing the two tables, Table 11[51] and Table 10, with respect to the country dummies for S23 (Retail) in particular, whose CTaxR is statistically significant negative,[52] we find in Table 11 that most host countries have statistically significant, *negative* effects as follows:

S23 (Retail): U.S.A., Canada, Brazil, Mexico, Argentina, ChinaExcldHK, Philippines, Malyasia, Thailand, Indonesia, Republic of Korea, India, Vietnam, U.K., France, Germany, Italy, Netherlands, Belgium,

[51] Recall that assigned zero in Table 11 is the coefficient on dummy for country 14 (Singapore), whose CTaxR is lowest among 27 host countries studied.

[52] See the first footnote for *(i)* in Subsection 3.4.1.

Spain, Switzerland, Russia, Australia, New Zealand.[53]

Those negative country effects that may be plausible here and are unobservable and unexplained by the four explanatory variables already included would be due to those country characteristics omitted in the model that are *not* present in those countries listed above, as given earlier.

Table 11 Model With Both Individual (Country) and Time Effects, (12), with Zero-valued Coefficient on Singapore's Dummy[a]

Linear Regression - Estimation by Least Squares
Panel(6) of Annual Data From 1//2007:01 To 27//2012:01

	Dependent Variables									
	Manufacturing									
	Mfg		Nonmfg		LNumSubsid_ S1		S2		S3	
Expl. Variables[b]	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	5.004	0.000	5.918	0.000	1.730	0.000	-0.222	0.648	-0.011	0.990
CTaxR	-0.001	0.886	0.000	0.983	0.003	0.813	0.020	0.212	-0.012	0.538
RelAppPatent	0.160	0.345	0.106	0.310	0.195	0.570	1.115	0.003	-0.097	0.859
RelpcNomGDP	0.363	0.008	0.278	0.001	0.478	0.110	-0.026	0.936	0.335	0.653
RelPopul	0.783	0.000	1.115	0.000	0.885	0.045	0.470	0.543	1.917	0.083
USA (1)	-0.580	0.316	-1.914	0.000	-0.798	0.499	-0.657	0.738	-2.156	0.426
Canada (2)	-1.329	0.000	-1.772	0.000	-1.707	0.000	0.000	0.000	1.224	0.007
Brazil (3)	-1.685	0.000	-3.079	0.000	-1.331	0.090	0.602	0.641	-2.191	0.230
Mexico (4)	-1.222	0.000	-2.622	0.000	-1.791	0.001	-0.375	0.660	0.000	0.000
Argentina (5)	-3.186	0.000	-3.452	0.000	-1.895	0.000	0.000	0.000	0.000	0.000
ChinaExcldHk (6)[c]	-5.410	0.019	-10.568	0.000	-6.389	0.176	-0.221	0.979	-16.008	0.171
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	-0.148	0.549	-1.761	0.000	-1.063	0.043	-0.204	0.785	0.181	0.878
Malaysia (9)	0.704	0.000	-0.851	0.000	0.169	0.610	1.387	0.001	2.362	0.003
Thailand (10)	1.366	0.000	-0.397	0.002	1.375	0.002	2.964	0.000	1.757	0.080
Indonesia (11)	-0.421	0.344	-2.921	0.000	-0.831	0.372	2.009	0.196	-1.123	0.606
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	0.104	0.494	-0.948	0.000	-1.230	0.000	0.700	0.101	0.000	0.000
Singapore (14)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
India (15)	-7.399	0.000	-11.809	0.000	-9.305	0.028	-4.775	0.523	0.000	0.000
Vietnam (16)	0.034	0.884	-2.035	0.000	0.243	0.623	1.980	0.006	1.156	0.305
U. K. (17)	-0.486	0.000	-0.945	0.000	0.131	0.640	1.146	0.009	-0.667	0.317
France (18)	-1.194	0.000	-2.406	0.000	-0.990	0.004	-0.106	0.827	0.000	0.000
Germany (19)	-0.997	0.000	-1.286	0.000	-2.101	0.000	-0.096	0.871	0.211	0.797
Italy (20)	-1.921	0.000	-2.419	0.000	-2.474	0.000	0.228	0.624	0.000	0.000
Netherlands (21)	-1.480	0.000	-1.073	0.000	-1.675	0.000	-0.307	0.134	-0.038	0.915
Belgium (22)	-1.895	0.000	-2.230	0.000	-1.993	0.000	0.000	0.000	0.000	0.000
Spain (23)	-1.704	0.000	-2.686	0.000	-2.659	0.000	0.000	0.000	0.000	0.000
Switzerland (24)	-3.720	0.000	-3.100	0.000	0.000	0.000	0.000	0.000	-0.328	0.539
Russia (25)	-3.367	0.000	-3.435	0.000	-3.170	0.000	0.000	0.000	-1.244	0.363
Australia (26)	-1.232	0.000	-1.053	0.000	-0.184	0.449	-0.435	0.092	1.200	0.002
New Zealand (27)	-2.230	0.000	-2.512	0.000	-0.822	0.001	-0.411	0.122	2.294	0.000
FY2007 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2008 (2)	-0.074	0.028	0.123	0.000	-0.009	0.906	0.009	0.922	-0.198	0.085
FY2009 (3)	-0.064	0.096	0.169	0.000	0.074	0.415	0.026	0.792	-0.143	0.274
FY2010 (4)	-0.057	0.154	0.197	0.000	0.163	0.086	0.001	0.988	-0.271	0.047
FY2011 (5)	-0.013	0.757	0.225	0.000	0.151	0.129	0.117	0.266	-0.379	0.010
FY2012 (6)	0.089	0.045	0.371	0.000	0.307	0.005	0.395	0.001	-0.244	0.117

(Continued on next page)

[a] The coefficient estimates in the table are exactly the same as those in Table 10, the results for country 6 (ChinaExcldHK), except for the constant and the country dummies.

[b] Explanatory Variables. See the footnote for "Expl. Variables" in Table 10.

[c] Notice that the coefficient on country 6 (ChinaExcldHK) dummy here in the table is exactly the negative of that on country 14 (Singapore) dummy in Table 10.

[53] Notice that those countries listed here have positive country dummies in Table 10 for which country 6 (ChinaExcldHK) is a reference country.

Table 11 (Continued)

	Dependent Variables									
	Manufacturing LNumSubsid_									
	S4		S5		S6		S7		S8	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	3.556	0.000	0.172	0.852	1.869	0.000	0.201	0.698	2.396	0.000
CTaxR	0.006	0.545	-0.001	0.969	-0.015	0.223	0.016	0.293	0.018	0.248
RelAppPatent	0.038	0.878	-0.563	0.383	-0.027	0.933	0.191	0.583	0.946	0.024
RelpcNomGDP	0.215	0.280	0.927	0.209	-0.120	0.697	1.216	0.001	-0.788	0.079
RelPopul	0.319	0.308	0.309	0.810	0.230	0.755	1.075	0.015	1.494	0.013
USA (1)	0.137	0.872	0.799	0.812	1.548	0.396	-1.452	0.217	-4.356	0.006
Canada (2)	-2.356	0.000	0.000	0.000	-0.682	0.012	-2.432	0.000	-2.080	0.000
Brazil (3)	-1.987	0.000	0.191	0.931	0.000	0.000	-1.297	0.109	-4.553	0.000
Mexico (4)	-2.090	0.000	0.000	0.000	-1.673	0.032	-0.674	0.239	-2.954	0.000
Argentina (5)	-3.680	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ChinaExcldHk (6)	-1.514	0.652	-0.868	0.950	0.449	0.954	-7.778	0.100	-14.488	0.024
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	-1.067	0.004	0.000	0.000	-1.404	0.044	0.237	0.678	-1.966	0.007
Malaysia (9)	-0.004	0.987	0.257	0.757	1.127	0.003	1.045	0.008	0.129	0.785
Thailand (10)	0.557	0.068	0.673	0.555	1.278	0.021	2.265	0.000	0.026	0.966
Indonesia (11)	-0.290	0.659	-0.325	0.900	0.263	0.856	0.191	0.842	-3.228	0.010
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	0.177	0.431	0.261	0.744	0.645	0.096	0.074	0.833	-1.797	0.000
Singapore (14)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
India (15)	-3.739	0.210	-3.142	0.800	-2.476	0.728	-9.225	0.029	-16.749	0.004
Vietnam (16)	-0.896	0.010	-0.539	0.682	0.470	0.472	0.847	0.124	-1.745	0.011
U. K. (17)	-0.932	0.000	-0.439	0.560	0.038	0.921	-2.070	0.000	-2.766	0.000
France (18)	-0.901	0.000	0.000	0.000	-1.174	0.007	-2.597	0.000	0.000	0.000
Germany (19)	-0.941	0.001	0.000	0.000	0.182	0.730	-2.327	0.000	-3.648	0.000
Italy (20)	-2.526	0.000	0.000	0.000	-0.744	0.071	0.000	0.000	0.000	0.000
Netherlands (21)	-1.515	0.000	0.000	0.000	0.000	0.000	-1.666	0.000	0.000	0.000
Belgium (22)	-1.700	0.000	0.000	0.000	-1.036	0.000	0.000	0.000	0.000	0.000
Spain (23)	-1.448	0.000	0.000	0.000	-1.510	0.000	0.000	0.000	-3.130	0.000
Switzerland (24)	-3.348	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia (25)	-4.094	0.000	0.000	0.000	-1.915	0.031	0.000	0.000	0.000	0.000
Australia (26)	-2.318	0.000	-0.690	0.142	-0.125	0.556	0.000	0.000	0.100	0.683
New Zealand (27)	-3.147	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2007 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2008 (2)	-0.043	0.384	0.182	0.296	0.049	0.526	0.010	0.899	0.001	0.991
FY2009 (3)	-0.088	0.121	-0.124	0.519	0.030	0.731	-0.024	0.804	0.030	0.779
FY2010 (4)	-0.046	0.436	-0.062	0.738	0.024	0.790	-0.061	0.549	0.043	0.689
FY2011 (5)	0.033	0.580	0.028	0.887	0.033	0.724	0.076	0.482	-0.101	0.367
FY2012 (6)	0.142	0.030	0.144	0.509	0.218	0.034	0.179	0.129	0.082	0.495

(Continued in next table)

	Manufacturing LNumSubsid_									
	S9		S10		S11		S12		S13	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	1.487	0.002	2.782	0.000	0.903	0.051	1.608	0.000	1.604	0.000
CTaxR	-0.005	0.719	-0.027	0.034	-0.010	0.476	0.006	0.618	0.025	0.056
RelAppPatent	-0.198	0.576	-0.140	0.666	-0.234	0.513	0.202	0.507	0.091	0.793
RelpcNomGDP	1.100	0.001	-0.033	0.905	1.494	0.000	0.235	0.360	0.765	0.010
RelPopul	1.462	0.001	1.585	0.000	0.468	0.302	-0.315	0.498	0.305	0.495
USA (1)	-2.436	0.047	-1.275	0.259	0.812	0.508	2.035	0.100	-0.354	0.770
Canada (2)	-3.174	0.000	-0.602	0.009	-1.298	0.000	-1.156	0.000	-1.791	0.000
Brazil (3)	-2.919	0.001	-2.538	0.001	-0.462	0.572	0.163	0.840	-1.804	0.026
Mexico (4)	-2.373	0.000	-1.873	0.000	-0.546	0.338	-0.520	0.336	-1.038	0.062
Argentina (5)	0.000	0.000	-1.638	0.000	-1.559	0.001	0.000	0.000	-2.773	0.000
ChinaExcldHk (6)	-12.078	0.013	-13.981	0.002	-0.813	0.867	6.018	0.230	-0.016	0.997
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	-0.242	0.667	-1.071	0.034	0.752	0.179	0.465	0.358	0.112	0.833
Malaysia (9)	0.973	0.009	-0.079	0.803	1.279	0.001	0.436	0.147	0.349	0.297
Thailand (10)	1.551	0.002	0.725	0.086	2.659	0.000	1.142	0.007	1.649	0.000
Indonesia (11)	-1.466	0.128	-2.229	0.014	0.815	0.401	0.245	0.800	-0.240	0.802
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	-0.340	0.324	0.309	0.314	1.638	0.000	0.462	0.126	0.134	0.678
Singapore (14)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
India (15)	-14.751	0.001	-14.705	0.000	-3.173	0.462	2.462	0.581	-2.810	0.511
Vietnam (16)	0.146	0.783	-1.239	0.010	1.083	0.043	0.603	0.208	0.106	0.833
U. K. (17)	-2.278	0.000	-0.244	0.359	-0.004	0.988	0.686	0.015	-0.910	0.002
France (18)	-2.895	0.000	-0.954	0.003	-1.368	0.000	-0.232	0.470	-1.696	0.000
Germany (19)	-2.364	0.000	-0.752	0.048	0.345	0.404	0.285	0.467	-0.866	0.033
Italy (20)	-2.782	0.000	-1.543	0.000	-1.016	0.003	-1.354	0.000	-2.702	0.000
Netherlands (21)	0.000	0.000	-0.869	0.000	-3.035	0.000	-0.661	0.000	-1.761	0.000
Belgium (22)	0.000	0.000	-1.962	0.000	0.000	0.000	-1.274	0.000	-2.433	0.000
Spain (23)	-2.845	0.000	-0.762	0.005	-1.768	0.000	-1.831	0.000	-1.934	0.000
Switzerland (24)	0.000	0.000	-2.249	0.000	-3.468	0.000	-1.689	0.000	0.000	0.000
Russia (25)	-3.580	0.000	-3.919	0.000	-2.069	0.001	-1.375	0.030	0.000	0.000
Australia (26)	-2.733	0.000	-1.563	0.000	-1.859	0.000	-2.018	0.000	-1.839	0.000
New Zealand (27)	-2.426	0.000	-1.923	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2007 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2008 (2)	0.071	0.378	-0.313	0.000	0.241	0.002	-0.232	0.001	-0.154	0.040
FY2009 (3)	0.154	0.089	-0.346	0.000	0.363	0.000	0.089	0.233	-0.139	0.106
FY2010 (4)	0.201	0.031	-0.410	0.000	0.434	0.000	-0.004	0.962	-0.179	0.050
FY2011 (5)	0.172	0.075	-0.484	0.000	0.402	0.000	0.155	0.053	-0.163	0.084
FY2012 (6)	0.286	0.006	-0.395	0.000	0.426	0.000	0.338	0.000	0.068	0.502

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Table 11 (Continued)

	Dependent Variables									
	Manufacturing						Non-manufacturing			
	LNumSubsid_									
	S14		S15		S16		S17		S18	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	3.525	0.000	1.012	0.000	3.098	0.000	0.612	0.292	1.626	0.013
CTaxR	-0.010	0.432	0.002	0.793	-0.009	0.409	0.010	0.569	-0.034	0.097
RelAppPatent	0.096	0.777	0.055	0.807	0.275	0.342	0.136	0.718	0.147	0.758
RelpcNomGDP	0.439	0.109	0.843	0.000	0.219	0.344	-0.483	0.194	-0.462	0.298
RelPopul	0.165	0.700	0.584	0.040	2.143	0.000	-0.283	0.719	0.913	0.438
USA (1)	0.441	0.705	2.061	0.008	-4.225	0.000	2.095	0.313	1.267	0.667
Canada (2)	-2.382	0.000	1.105	0.000	-2.047	0.000	0.000	0.000	2.155	0.000
Brazil (3)	-2.165	0.005	1.208	0.018	-4.468	0.000	1.641	0.219	-0.886	0.645
Mexico (4)	-0.748	0.150	1.762	0.000	-2.815	0.000	0.000	0.000	-0.706	0.564
Argentina (5)	-2.873	0.000	-0.241	0.333	-3.585	0.000	-0.264	0.620	0.000	0.000
ChinaExcldHk (6)	0.963	0.834	-1.363	0.654	-19.972	0.000	4.147	0.622	-9.463	0.452
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	0.898	0.074	2.329	0.000	-1.222	0.004	0.214	0.783	0.640	0.555
Malaysia (9)	1.343	0.000	2.249	0.000	0.467	0.082	-0.456	0.295	-0.361	0.508
Thailand (10)	1.004	0.017	3.922	0.000	0.512	0.148	0.165	0.789	-0.982	0.248
Indonesia (11)	0.271	0.763	2.385	0.000	-2.795	0.000	1.538	0.330	-1.753	0.451
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	0.156	0.612	1.910	0.000	-1.044	0.000	-0.626	0.158	0.000	0.000
Singapore (14)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
India (15)	-2.827	0.488	-2.480	0.358	-21.169	0.000	1.645	0.829	-9.390	0.414
Vietnam (16)	0.236	0.616	2.308	0.000	-0.716	0.075	0.523	0.471	0.000	0.000
U. K. (17)	-0.373	0.175	1.395	0.000	-1.343	0.000	-0.207	0.675	2.166	0.001
France (18)	-1.713	0.000	0.723	0.001	-1.744	0.000	0.285	0.594	-0.170	0.807
Germany (19)	-0.532	0.173	0.218	0.398	-2.387	0.000	0.000	0.000	0.000	0.000
Italy (20)	-2.062	0.000	0.263	0.196	-2.379	0.000	0.000	0.000	0.000	0.000
Netherlands (21)	-2.018	0.000	-0.174	0.128	-0.874	0.000	0.140	0.542	2.504	0.000
Belgium (22)	-2.021	0.000	-0.090	0.576	-1.643	0.000	0.000	0.000	0.000	0.000
Spain (23)	-2.101	0.000	0.540	0.003	-2.213	0.000	-0.200	0.633	0.000	0.000
Switzerland (24)	-3.605	0.000	0.000	0.000	-3.571	0.000	0.000	0.000	0.000	0.000
Russia (25)	-2.798	0.000	-0.275	0.468	-5.272	0.000	0.000	0.000	0.000	0.000
Australia (26)	-2.532	0.000	0.244	0.074	-1.392	0.000	2.496	0.000	3.856	0.000
New Zealand (27)	0.000	0.000	-1.493	0.000	-1.956	0.000	0.419	0.129	0.000	0.000
FY2007 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2008 (2)	-0.246	0.000	-0.043	0.333	0.015	0.802	0.012	0.894	-0.128	0.283
FY2009 (3)	-0.324	0.000	0.005	0.919	0.074	0.271	0.142	0.158	-0.127	0.341
FY2010 (4)	-0.331	0.000	0.013	0.811	0.078	0.265	0.167	0.101	-0.094	0.494
FY2011 (5)	-0.298	0.000	0.045	0.422	0.019	0.793	0.102	0.332	-0.204	0.158
FY2012 (6)	-0.270	0.003	0.146	0.016	0.192	0.013	0.098	0.385	0.006	0.967

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	Non-manufacturing									
	LNumSubsid_									
	S19		S20		S21		S22		S23	
Expl. Variables	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	1.573	0.011	2.587	0.000	3.830	0.000	5.267	0.000	4.156	0.000
CTaxR	-0.035	0.052	0.002	0.835	-0.003	0.694	-0.002	0.777	-0.025	0.062
RelAppPatent	-0.696	0.142	0.168	0.553	0.020	0.927	0.179	0.318	0.415	0.254
RelpcNomGDP	1.723	0.000	0.236	0.327	0.397	0.024	0.382	0.008	-0.430	0.143
RelPopul	1.323	0.025	0.350	0.331	1.102	0.000	1.279	0.000	1.381	0.003
USA (1)	-1.127	0.475	0.436	0.655	-2.420	0.001	-2.567	0.000	-2.311	0.065
Canada (2)	-2.209	0.000	-1.958	0.000	-2.332	0.000	-1.833	0.000	-1.129	0.000
Brazil (3)	-1.412	0.183	-1.883	0.004	-3.097	0.000	-3.393	0.000	-4.550	0.000
Mexico (4)	-1.294	0.083	-3.180	0.000	-2.543	0.000	-2.837	0.000	-3.472	0.000
Argentina (5)	-0.595	0.344	0.000	0.000	0.000	0.000	-3.261	0.000	-3.672	0.000
ChinaExcldHk (6)	-10.789	0.086	-1.407	0.716	-10.305	0.001	-12.345	0.000	-13.682	0.006
ChinaHKSAR (7)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Philippines (8)	1.573	0.035	-0.421	0.327	-1.316	0.000	-2.482	0.000	-3.581	0.000
Malaysia (9)	2.021	0.000	-0.726	0.009	-0.519	0.010	-0.954	0.000	-1.096	0.001
Thailand (10)	2.445	0.000	-0.022	0.950	-0.158	0.545	-0.453	0.039	-0.814	0.068
Indonesia (11)	0.057	0.964	-1.684	0.030	-2.338	0.000	-3.662	0.000	-4.247	0.000
Taiwan (12)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	-0.428	0.347	-0.145	0.582	-1.547	0.000	-0.919	0.000	-0.902	0.007
Singapore (14)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
India (15)	-11.133	0.047	-3.917	0.256	-11.632	0.000	-13.289	0.000	-15.190	0.001
Vietnam (16)	0.952	0.173	-0.109	0.789	-1.279	0.000	-3.079	0.000	-3.593	0.000
U. K. (17)	-2.009	0.000	-0.083	0.717	-1.133	0.000	-1.242	0.000	-0.582	0.048
France (18)	0.000	0.000	-1.496	0.000	-2.402	0.000	-1.933	0.000	-0.986	0.004
Germany (19)	-1.974	0.000	-0.878	0.008	-1.777	0.000	-1.163	0.000	-1.066	0.011
Italy (20)	-2.280	0.000	-3.086	0.000	-3.125	0.000	-2.204	0.000	-2.414	0.000
Netherlands (21)	-2.503	0.000	-1.667	0.000	-0.982	0.000	-1.584	0.000	-1.268	0.000
Belgium (22)	-2.654	0.000	-2.563	0.000	-2.339	0.000	-1.975	0.000	-2.263	0.000
Spain (23)	0.000	0.000	-3.137	0.000	-3.168	0.000	-2.542	0.000	-1.978	0.000
Switzerland (24)	0.000	0.000	-2.983	0.000	-3.693	0.000	-2.913	0.000	-2.672	0.000
Russia (25)	-2.727	0.001	0.000	0.000	-3.338	0.000	-3.285	0.000	-3.753	0.000
Australia (26)	-2.100	0.000	-1.259	0.000	-2.085	0.000	-1.412	0.000	-1.112	0.000
New Zealand (27)	0.000	0.000	-2.210	0.000	-3.054	0.000	-2.533	0.000	-1.717	0.000
FY2007 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FY2008 (2)	-0.081	0.444	0.196	0.002	0.033	0.438	0.123	0.001	0.094	0.197
FY2009 (3)	-0.025	0.837	0.235	0.001	-0.022	0.660	0.183	0.000	-0.002	0.977
FY2010 (4)	-0.074	0.547	0.238	0.002	-0.043	0.407	0.225	0.000	-0.015	0.861
FY2011 (5)	-0.154	0.229	0.202	0.011	-0.082	0.131	0.235	0.000	0.110	0.225
FY2012 (6)	-0.017	0.898	0.606	0.000	0.065	0.263	0.362	0.000	0.266	0.007

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Table 11 (Continued)

	Dependent Variables			
	Non-manufacturing			
	LNumSubsid_			
	S24		S25	
Explanatory Variables	Coeff	P-value	Coeff	P-value
Constant	3.303	0.000	4.166	0.000
CTaxR	-0.003	0.804	0.026	0.094
RelAppPatent	-0.127	0.651	0.881	0.033
RelpcNomGDP	0.303	0.179	-0.660	0.045
RelPopul	0.626	0.077	-0.189	0.712
USA (1)	0.195	0.839	-0.104	0.941
Canada (2)	-1.552	0.000	-1.864	0.000
Brazil (3)	-2.231	0.000	-1.990	0.030
Mexico (4)	-1.761	0.000	-1.951	0.002
Argentina (5)	-2.804	0.000	-4.991	0.000
ChinaExcldHk (6)	-4.998	0.188	1.239	0.822
ChinaHKSAR (7)	0.000	0.000	0.000	0.000
Philippines (8)	-0.938	0.024	-1.712	0.005
Malaysia (9)	-0.700	0.008	-1.945	0.000
Thailand (10)	-0.032	0.925	-1.288	0.011
Indonesia (11)	-1.752	0.019	-1.333	0.217
Taiwan (12)	0.000	0.000	0.000	0.000
Korea, Rep. of (13)	-0.311	0.222	-2.200	0.000
Singapore (14)	0.000	0.000	0.000	0.000
India (15)	-6.714	0.047	-1.755	0.719
Vietnam (16)	-1.069	0.007	-2.452	0.000
U. K. (17)	-0.519	0.023	-0.306	0.353
France (18)	-1.374	0.000	-3.626	0.000
Germany (19)	-1.109	0.001	-2.365	0.000
Italy (20)	-2.007	0.000	-3.730	0.000
Netherlands (21)	-0.313	0.031	-0.366	0.082
Belgium (22)	-2.303	0.000	-4.008	0.000
Spain (23)	-2.612	0.000	-3.653	0.000
Switzerland (24)	-3.414	0.000	-3.303	0.000
Russia (25)	-3.632	0.000	-4.165	0.000
Australia (26)	-1.031	0.000	-0.662	0.009
New Zealand (27)	-2.727	0.000	-2.979	0.000
FY2007 (1)	0.000	0.000	0.000	0.000
FY2008 (2)	0.454	0.000	0.153	0.059
FY2009 (3)	0.645	0.000	-0.004	0.964
FY2010 (4)	0.670	0.000	0.152	0.117
FY2011 (5)	0.811	0.000	0.267	0.008
FY2012 (6)	0.967	0.000	0.445	0.000

4.1.2 Time-specific effects

Manufacturing sector Notice in Table 10 that there is at least one time-specific dummy which turns out significant, for all sectors (immediately below) but S5 (Oil-Coal) and S7-S8 (Steel, NonferrousMetals) for which *all* time dummies are statistically insignificant:

Mfg: 2008-2009(both −), 2012(+).
S1 (Food): 2010, 2012(both +).
S2 (Textile): 2012(+).
S3 (Lumber-Pulp-Paper): 2008, 2010-2011(all −).
S4 (Chemical): 2012(+).
S6 (Ceramics-SoilStone): 2012(+).
S9 (MetalProducts): 2009-2012(all +).
S10 (GeneralPurposeMachine): 2008-2012(all −).
S11 (MachineForProduction): 2008-2012(all +).
S12 (MachineForCommercialUse): 2008(−), 2011-2012(both +).
S13 (ElectricalMachinery): 2008, 2010-2011(all −).
S14 (MachineForInformationCommunication): 2008-2012(all −).
S15 (TransportationEquipment): 2012(+).

S16 (MiscellaneousManufacturing): 2012(+).

The presence (for the immediately above set of industrial sectors) of time effects might be partially due to appreciation of Japanese yen against U.S. dollar during the period from 2008 through 2012 (as compared to the yen exchange rate in 2007 whose time dummy is set equal to zero).[54]

The positive [negative] sign of statistically significant time effects implies that the number of Japanese subsidiaries located abroad increases [decreases] in those year(s) as compared to that in 2007. The sign varies across sectors as well as over time, but *in 2012* it is positive for all manufacturing sectors (including Mfg), except for S10 (GeneralPurposeMachine) and 14 (MachineForInformationCommunication): in almost all manufacturing sectors the number of Japanese subsidiaries abroad significantly increased in 2012 as compared to that in 2007.

Why, for S5 (Oil-Coal) and S7-S8 (Steel, NonferrousMetals), all time dummies turn out statistically insignificant will require a further investigation using a comprehensive set of firm-level data for Japanese multinationals.

Non-manufacturing sector Notice in Table 10 that there is at least one time-specific dummy which turns out significant, for all sectors (immediately below) but S17-S19 (AgricultureForestryFishery, Mining, Construction) and S21 (Transportation) for which *all* time dummies are statistically insignificant:

Nonmfg: 2008-2012(all +).

S20 (InformationCommunication): Same as those for Nonmfg.

S22 (Wholesale): Same as those for Nonmfg.

S23 (Retail): 2012(+).

S24 (Service): Same as those for Nonmfg.

S25 (MiscellaneousNonmanufacturing): 2008, 2011-2012(all +).

The sign of statistically significant time effects is positive *throughout* the period from 2008 to 2012 for all the non-manufacturing sectors listed above, except for S23 (Retail) and S25 (MiscellaneousNonmanufacturing): in those non-manufacturing sectors the number of Japanese subsidiaries abroad significantly increased every year as compared to that in 2007.

Why, for S17-S19 (AgricultureForestryFishery, Mining, Construction) and S21 (Transportation), all time dummies turn out statistically in-

[54] See Table 2.

significant will, again, require a further investigation using a comprehensive set of firm-level data for Japanese multinationals.

4.2 Combined effects in each model in Table 10

Now, the coefficients on dummies, USA (1) through New Zealand (27) and FY2007 (1) through FY2012 (6), in Table 10 are added up following Table 15 in Appendix A.5, to indicate a magnitude of country- and time-specific *combined* effects unexplained by the four explanatory variables included.

4.2.1 Manufacturing sector: LNumSubsid_S10 (GeneralPurposeMachine) and Figs. 12-17 and 18-22

The combined effects computed are plotted in Figs. 12-17 for LNumSubsid_S10 (GeneralPurposeMachine), whose CTaxR is statistically significant negative,[55] and will be interpreted in a way summarized as "Interpretation of the test results" in Appendix A.3.[56]

First, Fig. 12 charts *cross-sectional* variations of the combined effects for each of 6 fiscal years: for *every* fiscal year, those host countries with statistically significant dummies in Table 10 are above or below the reference country 6 (ChinaExcldHK). To be specific, well *above* the reference country 6 are USA, Canada, Brazil, Mexico, Argentina, Philippines, Malaysia, Thailand, Indonesia, Korea, Republic of, Singapore, Vietnam, United Kingdom, France, Germany, Italy, Netherlands, Belgium, Spain, Switzerland, Russia, Australia and New Zealand, all of which have statistically significant positive dummies.[57] Somewhat (but not statistically significantly) *below* the reference country 6 is India.[58]

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[55] See the first footnote for *(i)* in Subsection 3.4.1.

[56] Recall that, in the preceding subsection 4.1, the respective effects were interpreted based on *(iv)* of Appendix A.5.

The reason for relying, for the combined effect, on "Interpretation of the test results" in Appendix A.3 rather than that in Appendix A.5 lies in the difference between the two appendices as highlighted in bold.

As in Kojima (2009, Subsection 4.2.2), the combined effect computed for a reference country is taken as "some individual-invariant, common constant coefficient on their dummies" as expressed in "Interpretation of the test results" in Appendix A.3. (An interval of certain length rather than a specific value is considered by Kojima 2004, Subsections 4.2.1 and 4.2.2.)

[57] See Subsection 4.1.1.

[58] See Table 10. Also, note two countries are excluded due to missing data and thus should be disregarded in Figs. 12-22: ChinaHongKongSAR (7) and Taiwan (12).

Next, Figs. 13-17 charting *time series* variations of the combined effects of each of 27 host countries suggests, first, that located above country 6 are all the remaining countries but India (15) in Fig. 15. This coincides with Fig. 12. Second, what applies to *every* country is that there is present a *downward* trend in the combined effects; this is consistent with the time-specific effects observed earlier. We could infer that, in terms of LNumSubsid_S10 (GeneralPurposeMachine), the Japanese business entry into the world market became *less* active over time even during the sample period from 2007 through 2012 when the Japanese yen did sharply appreciate (see Table 2).

This is evidenced, too, by Figs. 18-22 which draw time series plots of LNumSubsid_S10 (GeneralPurposeMachine) and show that its downward trend is present in many countries.

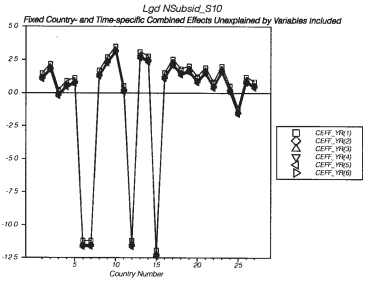

Figure 12 LNumSubsid_S10: Variations across Countries in Country- and Time-specific Combined Effects Unexplained by Variables Included (Fixed-effects Model With Both Effects in Table 10). Note: see Table 1 for country numbers; country 6 (ChinaExcldHK) is a reference country; and two countries, 7 and 12 (ChinaHongKongSAR and Taiwan), are excluded due to missing data and thus should be disregarded in Figs. 12-22.

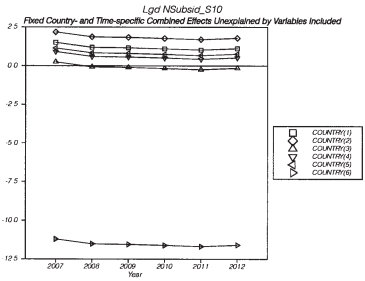

Figure 13 LNumSubsid_S10: Time Variations in Country- and Time-specific Combined Effects Unexplained by Variables Included (Fixed-effects Model With Both Effects in Table 10). See Note in Fig. 12.

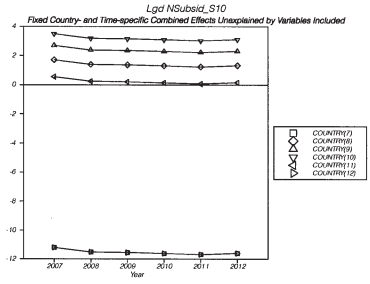

Figure 14 LNumSubsid_S10. See Fig. 13.

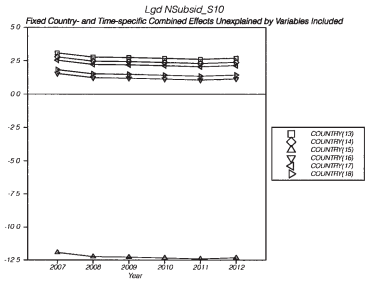

Figure 15 LNumSubsid_S10. See Fig. 13.

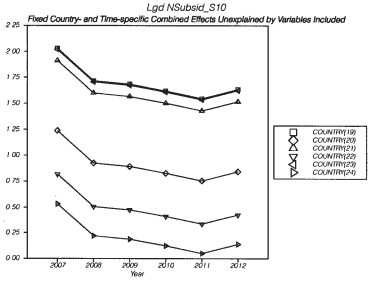

Figure 16 LNumSubsid_S10. See Fig. 13.

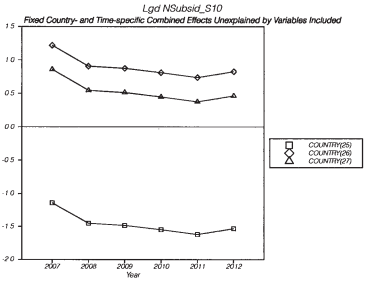

Figure 17 LNumSubsid_S10. See Fig. 13.

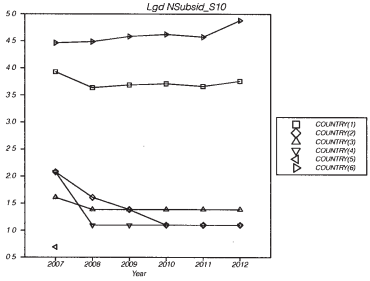

Figure 18 Time Variations of LNumSubsid_S10 by Country

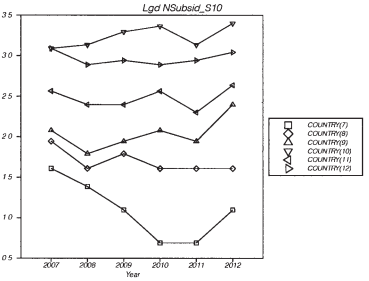

Figure 19 Time Variations of LNumSubsid_S10 by Country

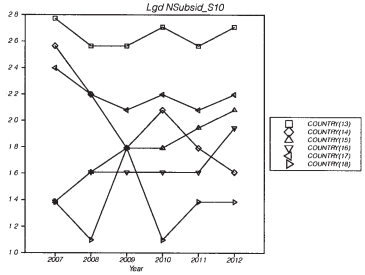

Figure 20 Time Variations of LNumSubsid_S10 by Country

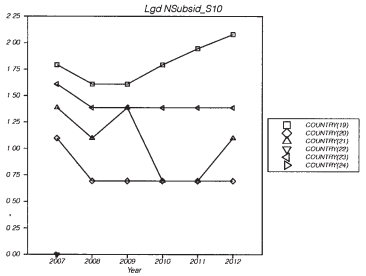

Figure 21 Time Variations of LNumSubsid_S10 by Country

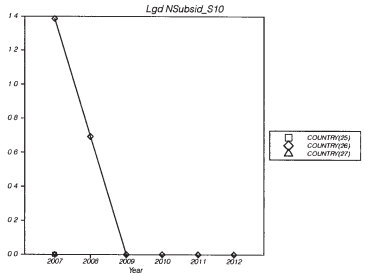

Figure 22 Time Variations of LNumSubsid_S10 by Country

4.2.2 Non-manufacturing sector: LNumSubsid_S22 (Wholesale) and Figs. 23-28 and 29-33

The results here are different from those for LNumSubsid_S10 (GeneralPurposeMachine), in particular with respect to the time trend. First, Fig. 23 for LNumSubsid_S22 (Wholesale), whose CTaxR is not statistically significant,[59] charts cross-sectional variations of the combined effects for each of 6 fiscal years, showing that, for *every* fiscal year, those countries with statistically significant dummies in Table 10 are above or

[59] See the first footnote for *(i)* in Subsection 3.4.1.

below the reference country 6 (ChinaExcldHK).[60] Second, Figs. 24-28 for LNumSubsid_S22 (Wholesale) charting time series variations of the combined effects of each of 27 countries suggests, for *every* country, that there is present an *upward* trend in the combined effects; this is consistent with the time-specific effects observed earlier. One could infer that in terms of LNumSubsid_S22 (Wholesale), the Japanese business entry into the world market became *more* active over time during the sample (sharp yen-appreciation) period from 2007 through 2012.

The latter (upward time trend) is well documented, too, by Figs. 29-33 which draw time series plots of LNumSubsid_S22 (Wholesale).

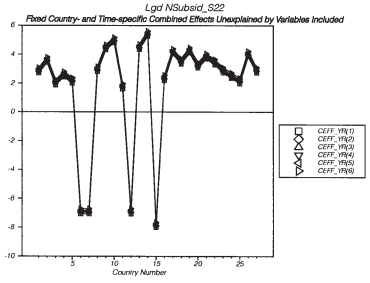

Figure 23 LNumSubsid_S22: Variations across Countries in Country- and Time-specific Combined Effects Unexplained by Variables Included (Fixed-effects Model With Both Effects in Table 10). Note: see Table 1 for country numbers; country 6 (ChinaExcldHK) is a reference country; and two countries, 7 and 12 (ChinaHongKongSAR and Taiwan), are excluded due to missing data and thus should be disregarded in Figs. 23-33.

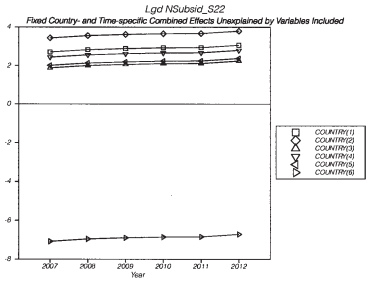

Figure 24 LNumSubsid_S22: Time Variations in Country- and Time-specific Combined Effects Unexplained by Variables Included (Fixed-effects Model With Both Effects in Table 10). See Note in Fig. 23.

[60] As for Figs. 12-22, two countries are excluded due to missing data and thus should be disregarded in Figs. 23-33 as well: ChinaHongKongSAR (7) and Taiwan (12).

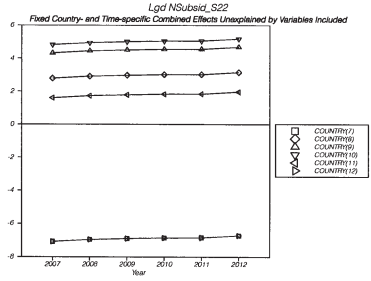

Figure 25 LNumSubsid_S22. See Fig. 24.

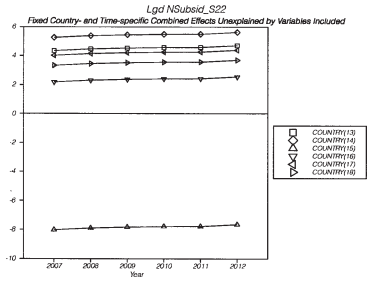

Figure 26 LNumSubsid_S22. See Fig. 24.

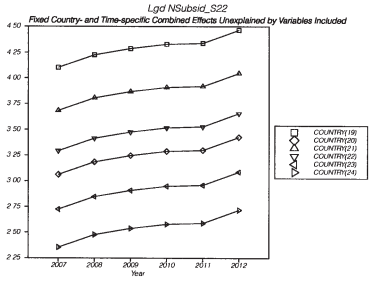

Figure 27 LNumSubsid_S22. See Fig. 24.

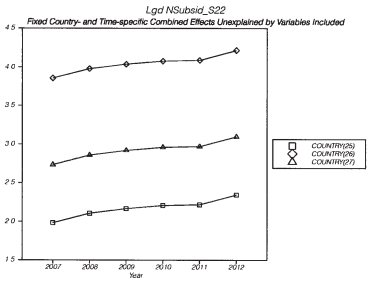

Figure 28 LNumSubsid_S22. See Fig. 24.

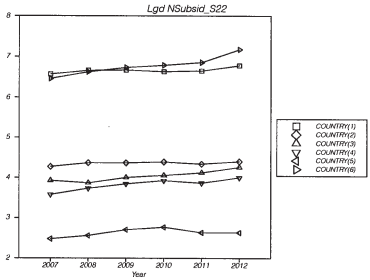

Figure 29 Time Variations of LNumSubsid_S22 by Country

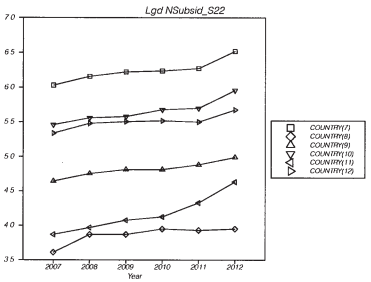

Figure 30 Time Variations of LNumSubsid_S22 by Country

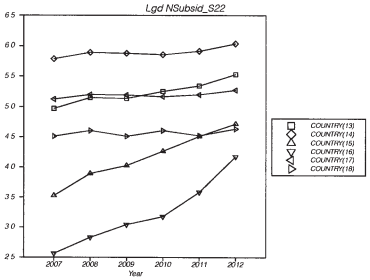

Figure 31 Time Variations of LNumSubsid_S22 by Country

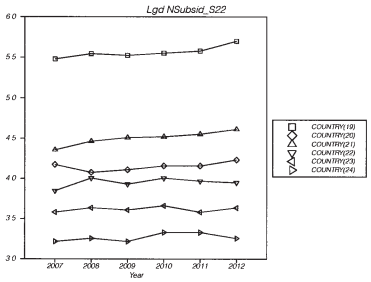

Figure 32 Time Variations of LNumSubsid_S22 by Country

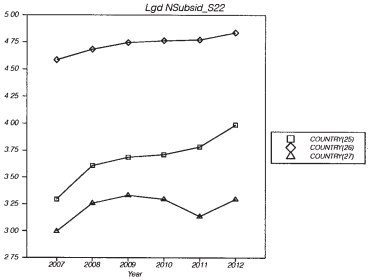

Figure 33 Time Variations of LNumSubsid_S22 by Country

Examining the combined effects graphically, by cross section (country) and by time, we now see that the effects are consistent with those strong respective effects as documented earlier (in Subsection 4.1).

5 Concluding Remarks

The effects of foreign/host country corporate taxes as well as some other country factors (such as research intensity/excellence and market potential) on the location/country choice of Japanese multinationals are empirically studied by static panel data econometric (fixed-effects) modeling of location and annual data. 27 host locations/countries and 6 fiscal years, 2007 through 2012, compose the industry-level panel data, for each

of 25 industrial sectors.

Our two novel results, mainly in Table 10 reporting the estimated both-effects models with ChinaExcldHK being a reference country and 2007 a reference year, are that the number of Japanese foreign subsidiaries chosen to be located in a foreign country whose corporate taxes and/or country factors are found statistically significant is estimated for each industrial sector (see Subsection 3.4 or 5.1) and that strong country- and time-specific effects (unexplained by the explanatory variables included) are detected with the specific country names and time trends being identified for each industrial sector (see Section 4 or Subsection 5.2). The results are summarized in Tables 12-14 in Subsections 5.1 and 5.2 below.

5.1 Effects on location choice of four explanatory variables

Table 12 gives the rough number of Japanese foreign subsidiaries chosen to be located in a foreign country, as estimated for each of four explanatory variables *(i)* through *(iv)* below (see Subsection 3.4 for the accurate estimated number):

(i) There are found only six (out of 25) industries for which CTaxR (corporate tax rate) is found statistically significant.

(ii) For only three industries, RelAppPatent (the degree of research-excellence/intensity in a foreign economy relative to that in Japan) is found statistically significant.

(iii) There are as many as fifteen industries (including Mfg and Nonmfg) for which RelPopul (the market potential as measured by population in a foreign economy relative to that in Japan) is found statistically significant.

(iv) RelpcNomGDP (the market potential as measured by per capita nominal GDP in a foreign economy relative to that in Japan) is found statistically significant for ten industries (including Mfg and Nonmfg).

5.2 Effects on location choice, unexplained by four explanatory variables included

Turning to individual-(country-) and time-specific dummies in the models we investigate those individual (country) and time effects unexplained by the four explanatory variables included. Plausible country and time

Table 12 Summary of Effects of Explanatory Variables

(i)	CTaxR in a host country	Industrial sectors whose Japanese multinationals are likely to choose to locate another foreign subsidiary in the host country
	Reduced by 1%	S10 (GeneralPurposeMachine); S18 (Mining), S19 (Construction) and S23 (Retail)
	Raised by 1%	S13 (ElectricalMachinery); S25 (MiscellaneousNonmanufacturing)
	Remarks: 1. For all other sectors, however, the effects of CTaxR are statistically insignificant with their signs being mixed. 2. A further investigation of varying effects of corporate taxation on the location choice will require a comprehensive set of firm-level (rather than aggregated, sector-level) data, which is, currently, not readily available in an electronic form to the author for Japanese multinationals.	
(ii)	RelAppPatent (host relative to Japan)	Industrial sectors whose Japanese multinationals are likely to choose to locate two or more additional foreign subsidiaries in the host country
	Higher	S2 (Textile) and S8 (NonferrousMetals); S25 (MiscellaneousNonmanufacturing)
	Remarks: 1. For the three sectors here CTaxR turns out not statistically significant. 2. Why the effects of RelAppPatent turn out statistically insignificant for all other sectors will require a study using the dataset suggested in Remark 2 in *(i)*.	
(iii)	RelPopul (host r.t. Japan)	Same as for *(ii)*.
	Higher	Mfg, S1 (Food), S3 (Lumber-Pulp-Paper), S7-S10 (Steel, NonferrousMetals, MetalProducts, GeneralPurposeMachine), S15 (TransportationEquipment) and S16 (MiscellaneousManufacturing); Nonmfg, S19 (Construction) and S21-S24 (Transportation, Wholesale, Retail, Service)
	Remark: For all those sectors listed here except for S10, S19 and S23, CTaxR turns out statistically insignificant.	
(iv)	RelpcNomGDP (host r.t. Japan)	Same as for *(ii)*.
	Higher	Mfg, S7 (Steel), S9 (MetalProducts), S11 (MachineForProduction), S13 (ElectricalMachinery) and S15 (TransportationEquipment); Nonmfg, S19 (Construction), S21(Transportation) and S22 (Wholesale)
	Lower	S8 (NonferrousMetals); S25 (MiscellaneousNonmanufacturing)
	Remarks: 1. For all those sectors listed here except for S13 and S19, CTaxR turns out statistically insignificant. 2. The positive [negative] effect detected here appears to apply to industrial sectors operating more aggressively in more [less] developed nations.	

effects are unobservable and unexplained by the four variables already included; such effects would be possibly due to those country characteristics and time-varying factors being omitted in the model.

5.2.1 Country-specific effects

Table 13 summarizes, for each of *(i)* and *(ii)* below, country- and time-specific effects as detected with the specific country names and time trends being identified for each industrial sector (see Subsection 4.1.1 for the corresponding country names):

(i) The positive [negative] sign of statistically significant country effects detected in Table 10 implies that the number of Japanese subsidiaries chosen to be located in those countries increases [decreases] as compared to that in ChinaExcldHK (whose country dummy is set equal to zero in Table 10).

(ii) Assigned zero in Table 11 is the coefficient on dummy for country 14 (Singapore), whose CTaxR is lowest among 27 host countries studied (see Fig. 1). We compare Tables 10 and 11 with respect to the country dummies for S10 (GeneralPurposeMachine) and S23 (Retail) in particular, whose CTaxR is statistically significant negative.

5.2.2 Time-specific effects

The presence of time effects as summarized in the lower-half panel of Table 13 might be partially due to appreciation of Japanese yen against U.S. dollar during the period from 2008 through 2012 (as compared to the yen exchange rate in 2007 whose time dummy is set equal to zero).

5.2.3 Combined effects

The coefficients on dummies for USA (1) through New Zealand (27) and FY2007 (1) through FY2012 (6) in Table 10 are added up to indicate a magnitude of country- and time-specific *combined* effects unexplained by the four explanatory variables included. Table 14 summarizes the combined effects observed for two selected industries *(i)* and *(ii)* below:

(i) The combined effects computed are plotted in Figs. 12-17 for LNumSubsid_S10 (GeneralPurposeMachine), whose CTaxR is statistically significant negative. (Fig. 12 charts *cross-sectional* variations of the combined effects for each of 6 fiscal years; Figs. 13-17 chart *time series* variations of the combined effects of each of 27 countries.)

Table 13 Summary of Country- and Time-specific Effects

Reference Country	
(i) ChinaExcldHK	Industrial sectors for which statistically significant, *positive* individual (country) effects are detected
	Mfg, S7-S10 (Steel, NonferrousMetals, MetalProducts, GeneralPurposeMachine), S12 (MachineForCommercialUse), S15 (TransportationEquipment) and S16 (MiscellaneousManufacturing); Nonmfg, S19 (Construction) and S21-S23 (Transportation, Wholesale, Retail)
Remarks: 1. The corresponding countries with positive effects for each of those sectors are as listed in Subsection 4.1.1. 2. Why, for S12 and S15, the country effects turn out statistically significant for only one country (respectively, Russia and Thailand) will require a further investigation using the dataset suggested in Remark 2 in *(i)* in Table 12.	
(ii) Singapore	Industrial sectors for which statistically significant, *negative* individual (country) effects are detected
	S10 (GeneralPurposeMachine) and S23 (Retail) in particular, whose CTaxR is statistically significant negative
Remarks: 1. The corresponding countries with negative effects for each of the two sectors are as listed in Subsection 4.1.1. 2. Why, for S10, the country effects turn out statistically significant *positive* for only one country (Thailand) will require a study using the dataset suggested in Remark 2 in *(i)*.	

Reference Year	
2007	Industrial sectors for which at least one time-specific dummy turns out significant
	All sectors but S5 (Oil-Coal), S7-S8 (Steel, NonferrousMetals), S17-S19 (AgricultureForestryFishery, Mining, Construction) and S21 (Transportation) for which *all* time dummies are statistically insignificant
Remark: Why, for S5, S7-S8, S17-S19 and S21, all time dummies turn out statistically insignificant will require a study using the dataset suggested in Remark 2 in *(i)*.	
2007	Industrial sectors for which the sign of statistically significant time effects is positive *throughout* the period from 2008 to 2012
	Nonmfg, S20 (InformationCommunication), S22 (Wholesale) and S24 (Service)
Remark: In those non-manufacturing sectors the number of Japanese subsidiaries abroad significantly increased every year as compared to that in 2007.	

(ii) The results for LNumSubsid_S22 (Wholesale) are different than those for LNumSubsid_S10 (GeneralPurposeMachine), in particular with respect to the time trend. (Fig. 23 for LNumSubsid_S22 (Wholesale), whose CTaxR is not statistically significant, charts cross-sectional variations of the combined effects for each of 6 fiscal years; Figs. 24-28 for LNumSubsid_S22 (Wholesale) charts time series variations of the combined effects of each of 27 countries.)

Table 14 Summary of Combined Effects for Two Selected Industries

(i) LNumSubsid_S10 (GeneralPurposeMachine)	
Fig. 12	Well *above* ChinaExcldHK, a reference country, are USA, Canada, Brazil, Mexico, Argentina, Philippines, Malaysia, Thailand, Indonesia, Korea, Singapore, Vietnam, United Kingdom, France, Germany, Italy, Netherlands, Belgium, Spain, Switzerland, Russia,Australia andNew Zealand, all of which have statistically significant positive dummies. Somewhat (but not statistically significantly) *below* ChinaExcldHK is India.
Figs. 13-17	First, located above ChinaExcldHK are all the remaining countries but India (15) in Fig. 15. This coincides with Fig. 12. Second, what applies to *every* country is that there is present a *downward* trend in the combined effects. This is consistent with the time-specific effects observed in Subsection 5.2.2.
	Inference: In terms of LNumSubsid_S10 (GeneralPurposeMachine), the Japanese business entry into the world market became *less* active over time even during the sample period from 2007 through 2012 when the Japanese yen did sharply appreciate.
	Remark: This is evidenced, too, by Figs. 18-22 which draw time series plots of LNumSubsid_S10 (GeneralPurpose Machine) with downward trend present in many countries.
(ii) LNumSubsid_S22 (Wholesale)	
Fig. 23	For *every* fiscal year, those countries with statistically significant dummies in Table 10 are above or below ChinaExcldHK.
Figs. 24-28	For *every* country, there is present an *upward* trend in the combined effects. This is consistent with the time-specific effects observed in Subsection 5.2.2.
	Inference: In terms of LNumSubsid_S22 (Wholesale), the Japanese business entry into the world market became *more* active over time during the sample (sharp yen-appreciation) period from 2007 through 2012.
	Remark: The upward time trend here is well documented, too, by Figs. 29-33 which draw time series plots of LNumSubsid_S22 (Wholesale).

Finally, one critical future research task that remains is a further investigation of varying effects of corporate taxation on the location choice; this will require, as repeatedly emphasized, the dataset suggested in Remark 2 in *(i)* in Table 12. The sample period for the future, firm-level study would be from 2009, the year of Japan's tax system reform (see Hasegawa and Kiyota 2013, as reviewed in Subsection 1.2). And, as documented in Appendix C, both the statutory and effective corporate tax rates in Japan have been continuously lowered by the government in 2012 through 2015, in an effort to promote global competitiveness of the Japanese multinational firms as well as the tax system (corporate tax code, in particular); these more recent tax reductions will be, too, incorporated into the future study.

A Fundamentals of Panel Data Fixed-effects Modeling

This appendix summarizes panel data methodology focusing on fixed-effects modeling. See Kojima (2004, Appendix A) for a comprehensive panel data econometrics including random-effects modeling as well.

A.1 Model with neither individual nor time effects

Our fundamental model, to be constasted with other alternative models, is a constant-intercept regression model written as below, which may be also called a constrained model in the sense that neither individual nor time variations occur:

$$y_{it} = \alpha + \boldsymbol{x}'_{it}\boldsymbol{\beta} + u_{it}, \quad i = 1, ..., N; t = 1, ..., T \tag{1}$$

where: α is the intercept (a scalar); $\boldsymbol{\beta}$ a K column vector of the slope coefficients;

$$\boldsymbol{x}_{it} = \begin{bmatrix} x_{1it} \\ \vdots \\ x_{Kit} \end{bmatrix}$$

the it-th observation on K explanatory variables (the K column vector of the explanatory variables); and u_{it} the usual error term. In vector form,

$$\boldsymbol{y} = \alpha \boldsymbol{l}_{NT} + \boldsymbol{X}\boldsymbol{\beta} + \boldsymbol{u} \tag{2}$$

where $\boldsymbol{y}$ is the NT column vector of the dependent variables, $\boldsymbol{l}_{NT}$ the NT column vector of unity,

$$\boldsymbol{X} = \begin{bmatrix} \boldsymbol{x}'_{11} \\ \vdots \\ \boldsymbol{x}'_{1T} \\ \vdots \\ \boldsymbol{x}'_{N1} \\ \vdots \\ \boldsymbol{x}'_{NT} \end{bmatrix}$$

the $NT \times K$ matrix of the explanatory variables, and $\boldsymbol{u}$ the NT column vector of the error terms satisfying

$$E(\boldsymbol{u}) = \boldsymbol{0} \text{ and } E(\boldsymbol{u}\boldsymbol{u}') = \sigma_u^2 \boldsymbol{I}_{NT}. \tag{3}$$

See Balestra (1996, p.36).

A.2 Omitted variables problem and model with individual and time effects

Let now the error term u_{it} in (1) consist of two components that vary across individuals and time:

$$u_{it} = \mu_i + \lambda_t + \nu_{it}, \tag{4}$$

so that

$$y_{it} = \alpha + \boldsymbol{x}'_{it}\boldsymbol{\beta} + \mu_i + \lambda_t + \nu_{it}, \quad i = 1, ..., N; t = 1, ..., T \tag{5}$$

where μ_i, λ_t and ν_{it} are the error components of the error u_{it} (ν_{it} is now the usual error term).[61] The individual effects, μ_i, and the time effects, λ_t, so defined are those individual- and time-specific effects that are not included in the regression: Not all the μ_i or λ_t variables are available for inclusion in the regression equation, and each of those effects reflects the omitted, unobservable individual- and time-specific variables. The individual effects, μ_i, reflect individual-variant but time-*in*variant omitted variables, while the time effects, λ_t, time-variant but individual-*in*variant omitted variables. (See Approach C in Kojima 2004, Appendix B.)

[61] The vector form will be written out in the later section.

The magnitude of the effects that are found significantly different from some individual- or time-invariant constant implies the need for searching specific reasons behind the effects.

Depending on whether the individual and time effects are fixed or random, model (5) will be correspondingly fixed- or random-effects model. Several approaches to the problem of how to choose between "fixed" and "random" are summarized in Kojima (2004, Appendix B).

A.3 Models with only individual effects (One-way error component model)

Suppose now $\alpha = 0$ in (5), the reason for which will be given later, and that the individual effects, μ_i, are not random but rather fixed:

$$y_{it} = \boldsymbol{x}'_{it}\boldsymbol{\beta} + \mu_i + \nu_{it}, \quad i = 1, ..., N; t = 1, ..., T \tag{6}$$

This is an alternative, unconstrained model that will be contrasted with the null, constrained model (1). It is also called the individual dummy variables model, and a *full* set of N individual dummies is included in the equation. In vector form,

$$\boldsymbol{y} = \boldsymbol{X}\boldsymbol{\beta} + \boldsymbol{D}_N\boldsymbol{\mu} + \boldsymbol{\nu} \tag{7}$$

where $\boldsymbol{D}_N$ is the $NT \times N$ matrix of dummies containing a set of N individual dummies (with $\otimes$ denoting a Kronecker product, $\boldsymbol{D}_N = \boldsymbol{I}_N \otimes \boldsymbol{l}_T$), $\boldsymbol{\mu}$ the N column vector of the individual effects, and $\boldsymbol{\nu}$ the NT column vector of the error terms.

The properties that $\boldsymbol{D}_N$ has and a set of assumptions for model (7) are given by Balestra (1996, pp.35-36). One of those assumptions is that the $NT \times (N + K - 1)$ matrix $\boldsymbol{D}_N\boldsymbol{X}$ has full column rank, implying that "the $T \times K$ matrices $\boldsymbol{X}_i$, whose t-th row is $\boldsymbol{x}'_{it}$, must *not* contain the constant term (an obvious restriction) nor a column proportional to it (which precludes any variable that is time-invariant for a given individual but varying from individual to individaul)." This is in fact the reason for assuming $\alpha = 0$. For a more intuitive reason, see Doan (*UG*, p.522).

Estimating the model There are two *equivalent* methods of estimation here: Using the RATS (= Regression Analysis of Time Series software) terminology, *(i)* "Panel Regression - Estimation by Fixed Effects" and *(ii)* "Linear Regression - Estimation by Least Squares." The latter

estimates *individual-varying* intercepts in model (7) by doing fixed effects as least squares with *individual* dummies, whereas the former does not; all other slope coefficient estimates obtained by the latter method are exactly the same as those obtained when the former is employed. Kojima (2004) and the present paper apply the latter method, while Kojima (2009) the former.

Testing for fixed effects The null hypothesis here is the absence of individual effects/variations, i.e., that the coefficients on dummies are *all* equal (to some individual-invariant constant). The null, constrained model is as given by Eq.(1) and the alternative, unconstrained model is Eq.(6).

The test statistic here is distributed under the null as an F-variable with $N-1$ and $NT-N-K$ degrees of freedom:

$$F_{UC1} = \frac{(RSS_C - RSS_{UC1})/(N-1)}{RSS_{UC1}/(NT-N-K)} \tag{8}$$

where RSS_C and RSS_{UC1} are, respectively, the residual sums of squares for the constrained model (1) and the unconstrained model (6). See Balestra (1996, pp.37-38) and Baltagi (2001, p.14).

Interpretation of the test results If the null hypothesis is rejected, then one would observe "spikes" in coefficients on dummies of one or more individuals, while all other individuals would be seen to have some individual-invariant, common constant coefficient on their dummies. The magnitude of those spikes may be interpreted as follows: **The corresponding individuals would have significantly** *larger or smaller* **individual effects on the dependent variable than those individuals with individual-invariant constant would have, depending on whether the spikes are** *above or below* **the individual-invariant constant.**

For the model with only individual, fixed effects (10), where the constant $\alpha = 0$ and a *full* set of N individual dummies is included, remember that the signs of the dummies' coefficients are *irrelevant*: Their signs can*not* be interpreted as positive or negative magnitude of the spikes.[62]

[62]The signs become indeed relevant for models with both individual and time, fixed effects where the constant α is included but only $N-1$ individual dummies and $T-1$ time dummies are included. See Section A.5.

See Subsection 4.2, Kojima (2004, Subsections 4.2.1 and 4.2.2) and Kojima (2009, Subsection 4.2.2) for the empirical applications of the interpretation here.

A.4 Models with only time effects

Again let $\alpha = 0$ in model (5), the reason for which is as given earlier, and suppose that the time effects, λ_t, are fixed:

$$y_{it} = \boldsymbol{x}'_{it}\boldsymbol{\beta} + \lambda_t + \nu_{it}, \quad i = 1, ..., N; t = 1, ..., T. \tag{9}$$

This is an alternative, unconstrained model that will be contrasted with the null, constrained model (1). It is also called the time dummy variables model, and a *full* set of T time dummies is included in the equation. In vector form,

$$\boldsymbol{y} = \boldsymbol{X}\boldsymbol{\beta} + \boldsymbol{D}_T\boldsymbol{\lambda} + \boldsymbol{\nu} \tag{10}$$

where $\boldsymbol{D}_T$ is the $NT \times T$ matrix of dummies containing a set of T time dummies ($\boldsymbol{D}_T = \boldsymbol{l}_N \otimes \boldsymbol{I}_T$), and $\boldsymbol{\lambda}$ the T column vector of the time effects.

Estimating the model As for the fixed-effects mdel, there are two equivalent methods of estimation: *(i)* "Panel Regression - Estimation by Fixed Effects" and *(ii)* "Linear Regression - Estimation by Least Squares." The latter estimates *time-varying* intercepts by doing fixed effects as least squares with *time* dummies, which is model (10), whereas the former does not; all other slope coefficient estimates obtained by the latter method are exactly the same as those obtained when the former is employed. Kojima (2004) and the present paper apply the latter method, while Kojima (2009) the former.

Testing for fixed effects The null hypothesis here is the absence of time effects/variations, i.e., that the coefficients on dummies are *all* equal (to some time-invariant constant). The null, constrained model is as given by Eq.(1) and the alternative, unconstrained model is Eq.(9).

The test statistic here is distributed under the null as an F-variable with $T - 1$ and $NT - T - K$ degrees of freedom:

$$F_{UC2} = \frac{(RSS_C - RSS_{UC2})/(T-1)}{RSS_{UC2}/(NT - T - K)} \tag{11}$$

where RSS_{UC2} are the residual sums of squares for the unconstrained model (9). See Balestra (1996, p.38).

Interpretation of the test results The same interpretation as given to individual, fixed effects model in Section A.3 holds here, with 'individual' being replaced by 'time (period).' Here, the signs of the time dummies' coefficients are irrelevant.

A.5 Models with both individual and time effects (Two-way error component model)

The model with both individual and time effects is as given by Eq.(5), and the overall constant term α remains in the model. This is an alternative, unconstrained model that will be contrasted with the null, constrained model (1). It is again a dummy variables model, and note here that a set of $N-1$ individual dummies and $T-1$ time dummies is included in the equation. The notation becomes therefore slightly different in that the asterisk is being attached to the dummies and the corresponding coefficients. In vector form,

$$\boldsymbol{y} = \alpha \boldsymbol{l}_{NT} + \boldsymbol{X}\boldsymbol{\beta} + \boldsymbol{D}_{N*}\boldsymbol{\mu}_* + \boldsymbol{D}_{T*}\boldsymbol{\lambda}_* + \boldsymbol{\nu} \tag{12}$$

Letting $\boldsymbol{D} = [\boldsymbol{l}_{NT}\boldsymbol{D}_{N*}\boldsymbol{D}_{T*}]$ and denoting $\boldsymbol{\gamma}' = \alpha\boldsymbol{\mu}'_*\boldsymbol{\lambda}'_*$, Eq.(12) may be rewritten in a compact way:

$$\boldsymbol{y} = \boldsymbol{X}\boldsymbol{\beta} + \boldsymbol{D}\boldsymbol{\gamma} + \boldsymbol{\nu} \tag{13}$$

Notice this is formally analogous to the individual effect model (7). The value of the intercept for it-th observation can be easily computed from Table 15 where it is assumed the Jth individual and the Sth time dummies are deleted and their coefficients μ_J and λ_S are assigned zero.

Table 15 Intercept for itth Observation

	$i = J^a$	$i \neq J$
$t = S$	α	$\alpha + \mu_{*i}$
$t \neq S$	$\alpha + \lambda_{*t}$	$\alpha + \mu_{*i} + \lambda_{*t}$

[a] It is assumed the Jth individual and the Sth time dummies are deleted and their coefficients μ_J and λ_S are assigned zero.

The matrix $\boldsymbol{DX}$ must be of full column rank, meaning that $\boldsymbol{X}$ must not contain individual-invariant variables, nor admit time-invariant variables.[63]

Estimating the model As usual, there are two equivalent methods of estimation: *(i)* "Panel Regression - Estimation by Fixed Effects" and *(ii)* "Linear Regression - Estimation by Least Squares." The latter estimates *both individual- and time-varying* intercepts by doing fixed effects as least squares with *individual and time* dummies, which is model (12), whereas the former does not; all other slope coefficient estimates obtained by the latter method are exactly the same as those obtained when the former is employed. For both-effects model here Kojima (2004, 2009) and the present paper all apply the latter method.

Testing for fixed effects The alternative hypothesis common to the three tests below is the unconstrained model (12), as will be clear from the test statistics (14)-(16) below.

a. Test the null that both individual and time effects are absent (model with no such effects) The null hypothesis is equivalent to the null that coefficients on both individual dummies and time dummies are *all* equal to zero with "zero" corresponding to the slope coefficients on the dummies deleted. Note that the null is the initial, constrained model with neither effects, (2).

The test statistic here is distributed under the null as an F-variable with $N+T-2$ and $NT-N-T-K+1$ degrees of freedom:

$$F_{UC3a} = \frac{(RSS_C - RSS_{UC3})/(N+T-2)}{RSS_{UC3}/(NT-N-T-K+1)} \tag{14}$$

where RSS_{UC3} is the residual sum of squares for the alternative, unconstrained model (12) or, equivalently, (13). See Balestra (1996, p.42).

b. Test the null that time effects are absent (model with only individual effects). The null here is equivalent to the null that coefficients on time dummies are *all* equal to zero with "zero" corresponding to the slope coefficient on the dummy deleted. Note that the null here is the earlier

[63] See Balestra (1996, pp.39-40).

model with only individual effects, (7), which is constrained in the sense of absence of time effects.

The test statistic here is distributed under the null as an F-variable with $T-1$ and $NT-N-T-K+1$ degrees of freedom:

$$F_{UC3b} = \frac{(RSS_{UC1} - RSS_{UC3})/(T-1)}{RSS_{UC3}/(NT-N-T-K+1)}. \tag{15}$$

c. Test the null that individual effects are absent (model with time effects only). The null is equivalent to the null that coefficients on individual dummies are *all* equal to zero with "zero" corresponding to the slope coefficient on the dummy deleted. Note that the null here is the earlier model with only time effects, (10), which is constrained in the sense of absence of individual effects.

The test statistic here is distributed under the null as an F-variable with $N-1$ and $NT-N-T-K+1$ degrees of freedom:

$$F_{UC3c} = \frac{(RSS_{UC2} - RSS_{UC3})/(N-1)}{RSS_{UC3}/(NT-N-T-K+1)} \tag{16}$$

How to interpret the test results *(i)* Rejecting the null in test a, which is more likely than failing to reject it, leads to inferring that at least one of the effects is present.

(ii) If, moreover, the nulls are rejected in both tests b and c as well, then we will infer that both effects are present.

(iii) If, however, only one of the nulls is rejected in tests b and c (for examle, the null in test c is rejected, while that in test b is not), then only that particular effect may be present (for example, the individual effect is present but the time effect is not).

(iv) As noted in "Interpretation of the test results" in Section A.3, the signs of individual and time dummies in the model with both effects (12) here become important, for the constant α is included but only $N-1$ individual dummies and $T-1$ time dummies are included in the model. If a null hypothesis is rejected in one or more of tests a through c, then one would observe "spikes" in coefficients on dummies of one or more individuals and/or time periods, while all other individuals and/or time periods would be seen to have 'zero'-valued coefficient on their dummies.[64] The magnitude of those spikes may be interpreted here

[64]Recall that in the present model it is assumed the Jth individual and the Sth time dummies are deleted and their coefficients μ_J and λ_S are assigned zero.

as follows: **The corresponding individuals and/or time periods would have significantly** *positive larger or negative larger* **effects on the dependent variable than that individual and/or time period whose dummy is being deleted (i.e., Jth individual and/or Sth time dummy in Table 15) would have, depending on whether the dummies are** *positive or negative in sign.*

See Subsection 4.1 and Kojima (2009, Subsection 4.2.1) for the applications of the interpretation here.

B Panel Data

The whole industry-level panel data used in the present analysis are laid out in Table 16. How each of the data in the table is used in the panel data models is described in Section 2 and briefly in the table's footnotes.

See Fig. 1, in Section 1, that partially draws CTaxR complied in Table 16. In Subsection 2.3, Figs. 2 through 4 partially plot three remaining explanatory variables (RelAppPatent, RelpcNomGDP and RelPopul).

Table 16 Industry-level Panel Data: Industry-level Japanese FDI and Possible Determinants of Their Location Choice[a]

Country		FY/	Dependent Variables: Manufacturing: LNumSubsid_																	Non-mfg.		
Name	No	CY	Mfg	Nonmfg	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
USA	1	2007	1178	1437	73	24	9	161	6	24	57	24	33	51	62	44	70	112	338	90	7	30	28
	1	2008	1042	1620	68	19	7	142	6	25	52	18	32	38	66	39	50	76	312	92	9	28	24
	1	2009	1017	1646	63	16	8	142	6	26	41	19	35	40	65	39	48	80	302	87	10	22	23
	1	2010	998	1651	65	13	8	144	9	25	34	18	39	41	70	39	49	73	286	85	9	28	24
	1	2011	1011	1638	62	15	7	159	8	24	43	16	35	39	72	44	44	76	282	85	7	30	21
	1	2012	1081	1893	75	15	9	154	8	31	40	17	42	43	71	52	59	76	290	99	10	33	29
Canada	2	2007	87	124	3	NA	7	6	NA	2	1	2	NA	8	2	2	6	6	35	7	NA	8	1
	2	2008	71	132	2	NA	4	4	NA	2	1	2	NA	5	4	2	5	3	32	5	NA	6	1
	2	2009	73	136	3	NA	5	5	NA	2	1	2	NA	4	4	3	5	3	29	7	NA	9	1
	2	2010	65	146	2	NA	4	5	NA	2	1	2	1	3	5	2	4	3	26	5	NA	14	2
	2	2011	64	147	3	NA	4	6	NA	2	1	1	1	3	6	3	3	3	24	4	NA	13	3
	2	2012	71	171	5	NA	4	8	NA	2	1	1	1	3	6	3	4	2	26	5	NA	17	3
Brazil	3	2007	91	101	6	6	3	9	2	NA	6	2	3	5	3	4	6	6	25	5	7	3	5
	3	2008	84	104	7	6	1	8	3	NA	5	2	2	4	5	5	2	2	28	4	6	3	4
	3	2009	87	117	8	7	1	9	3	NA	2	2	3	4	5	5	2	1	29	6	8	2	3
	3	2010	96	126	9	7	1	10	3	NA	3	2	3	4	5	5	3	3	32	6	9	2	3
	3	2011	99	132	8	7	1	10	3	NA	1	3	4	5	5	5	4	5	32	6	12	2	3
	3	2012	116	150	12	6	1	15	3	NA	5	2	3	4	4	6	5	5	38	7	11	3	5
Mexico	4	2007	90	75	2	NA	NA	5	NA	1	3	4	1	8	4	3	6	12	31	10	NA	2	4
	4	2008	90	90	3	NA	NA	8	NA	1	3	3	2	3	5	2	5	12	35	8	NA	2	2
	4	2009	85	97	3	NA	NA	7	NA	1	3	4	3	3	3	3	5	12	31	7	NA	2	4
	4	2010	89	105	3	NA	NA	7	NA	1	3	2	3	3	3	3	4	13	36	8	NA	2	4
	4	2011	96	101	4	2	NA	7	NA	1	4	3	2	3	3	3	6	12	38	8	NA	1	1
	4	2012	117	111	3	2	NA	10	NA	1	7	4	2	3	2	4	6	12	52	9	NA	2	1
Argentina	5	2007	13	17	2	NA	NA	2	NA	NA	NA	NA	NA	NA	2	NA	NA	1	2	3	1	2	NA	NA
	5	2008	9	21	1	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	1	2	NA	NA
	5	2009	7	22	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	4	1	2	NA	NA
	5	2010	7	23	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	4	1	2	NA	NA
	5	2011	8	23	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	1	NA	NA	1	4	1	2	NA	NA
	5	2012	7	25	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	4	1	1	NA	2
ChinaExcldHK	6	2007	2485	1296	145	228	35	257	11	77	75	71	108	87	129	81	227	329	367	264	8	2	41
	6	2008	2677	1536	145	242	45	257	12	86	97	79	131	89	142	95	252	304	395	306	8	2	46
	6	2009	2832	1670	163	235	52	269	11	74	88	88	160	98	181	94	244	311	426	338	9	2	45
	6	2010	2846	1773	164	221	46	268	12	83	86	97	165	102	185	95	228	321	420	353	8	3	46
	6	2011	3002	1906	167	238	47	280	13	79	94	98	164	97	207	91	236	350	456	385	6	3	41
	6	2012	3879	2600	185	353	64	328	15	102	102	127	226	132	286	127	306	397	530	599	11	3	63
ChinaH.K.SAR	7	2007	285	596	7	15	1	19	1	1	5	13	14	5	3	18	20	91	4	68	NA	NA	5
	7	2008	240	677	11	10	2	18	1	NA	3	10	11	4	4	11	16	73	4	65	1	NA	6
	7	2009	257	703	8	11	1	14	1	1	3	10	13	3	6	15	21	76	6	68	1	NA	4
	7	2010	232	714	7	11	1	15	1	NA	3	6	12	2	5	13	18	68	5	65	NA	NA	5
	7	2011	217	753	6	11	1	12	NA	NA	3	4	10	2	4	17	16	65	5	61	NA	NA	5
	7	2012	263	958	8	13	2	14	NA	NA	2	6	23	3	5	19	20	72	4	72	NA	NA	8
Philipplnes	8	2007	214	158	4	1	4	21	NA	1	7	8	10	7	6	8	13	58	45	21	4	5	20
	8	2008	213	172	6	NA	4	22	NA	NA	7	8	9	5	6	6	14	55	47	24	3	5	19
	8	2009	203	171	6	2	2	15	NA	1	6	6	9	6	6	7	14	48	51	24	3	5	20
	8	2010	216	176	4	2	2	17	NA	1	5	7	11	5	9	6	15	57	50	25	3	5	19
	8	2011	224	170	4	2	2	19	NA	1	6	8	10	5	11	9	17	55	51	24	2	5	18
	8	2012	259	209	5	3	3	17	NA	3	6	11	15	5	12	16	15	57	55	36	2	11	28
Malaysia	9	2007	365	218	12	7	12	42	1	15	9	22	20	8	10	7	18	97	37	48	NA	3	25
	9	2008	366	249	10	5	8	41	2	16	10	25	19	6	16	8	22	94	38	46	NA	1	27
	9	2009	361	248	11	6	12	42	1	14	9	25	21	7	17	9	15	86	37	49	NA	2	24
	9	2010	363	253	11	7	11	47	2	14	7	24	21	8	16	9	14	88	39	45	NA	1	26
	9	2011	366	280	11	7	7	48	3	14	10	21	23	7	14	11	13	86	41	1	2	2	26
	9	2012	403	311	11	7	13	52	5	16	8	26	20	11	14	13	12	89	42	64	2	1	32
Thailand	10	2007	783	454	38	33	11	84	3	17	36	42	45	22	39	16	61	59	194	83	2	1	42
	10	2008	812	510	41	41	8	85	3	18	38	42	43	23	48	14	62	61	201	84	2	1	44
	10	2009	864	523	45	37	8	84	3	19	37	36	49	27	53	19	61	63	230	93	3	1	42
	10	2010	877	557	51	36	8	83	3	15	40	36	55	29	59	17	58	65	229	93	3	1	45
	10	2011	864	577	53	37	8	81	3	17	37	36	49	23	56	17	60	55	235	94	3	1	45
	10	2012	1071	736	51	47	14	104	3	20	42	39	64	30	81	20	72	72	278	134	3	1	56
Indonesia	11	2007	398	173	17	27	6	58	3	9	18	12	12	13	11	4	16	44	90	58	8	NA	24
	11	2008	390	179	16	28	5	55	2	7	18	11	13	11	13	4	13	40	95	59	7	1	24
	11	2009	400	182	16	26	8	51	1	10	19	12	16	11	13	4	14	37	103	59	8	2	22
	11	2010	396	189	15	24	9	52	1	10	17	12	19	13	15	4	12	36	97	60	8	2	26
	11	2011	415	213	15	27	8	57	1	8	20	9	19	10	20	5	10	32	107	67	7	2	23
	11	2012	516	271	20	30	7	66	3	11	23	12	29	14	25	6	15	36	132	87	5	2	30
Taiwan	12	2007	356	344	9	9	2	70	1	16	8	14	15	22	20	9	23	57	55	26	2	3	20
	12	2008	335	380	8	8	2	73	1	21	8	12	10	18	20	8	21	49	54	22	2	1	18
	12	2009	346	391	8	9	2	69	1	20	5	13	15	19	21	10	20	55	53	26	1	1	17
	12	2010	343	408	9	7	3	69	1	18	6	10	17	18	23	10	17	57	52	26	1	1	19
	12	2011	348	402	10	7	2	68	1	19	6	9	16	19	24	12	17	61	52	25	2	1	15
	12	2012	382	490	14	8	3	72	1	18	4	14	17	21	26	15	22	65	55	27	2	1	19
Korea, Rep. of	13	2007	277	242	3	4	NA	65	2	7	6	2	9	16	34	9	18	43	46	13	1	NA	5
	13	2008	250	278	2	5	NA	54	3	8	6	3	10	13	33	8	17	30	41	17	1	NA	5
	13	2009	262	293	3	5	NA	57	3	8	6	5	9	13	35	9	18	31	41	19	1	NA	4
	13	2010	263	318	4	4	NA	60	2	9	6	6	9	15	36	9	16	33	35	19	1	NA	5
	13	2011	266	356	5	4	NA	64	2	11	6	5	9	13	30	13	14	33	37	20	1	NA	4
	13	2012	315	444	9	6	NA	71	3	13	7	7	12	15	38	16	19	33	43	23	1	NA	3

(Continued on next page)

[a]The sources of the data are detailed in Subsection 2.1.

Non-mfg, NGDP and pcNGDP stand, respectively, for Non-manufacturing, nominal GDP and per capita nominal GDP; the reciprocals of RelAP, RelpcNGDP and RelPop are, respectively, RelAppPatent, RelpcNomGDP and RelPopul, all as defined in Table 3. Note that relative data such as RelAP displayed here are Home (Japan) figure divided by Host figure; in every actual regression, however, their reciprocals such as RelAppPatent (i.e., Host divided by Home, as defined in Table 3) are used. NAs are treated as missing/skipped data in the MacRATS programs. HK, H.K. and Rep. of stand, respectively, for Hong Kong and Republic of.

The panel data as complied here are balanced in the sense that every individual (country) has data for exactly the same set of time periods, though with some missing values being included. (See *RATS 7.0 Reference Manual*, pp.348-349.) Those variables that will be actually used in the estimation are listed in Table 3 and asterisked in the table (Continued: Right Half of Upper Panel) on the next page.

Table 16 (Continued: Right Half of Upper Panel)

			Dependent Variables						Explanatory Variables (with an asterisk)[a]					
			Non-manufacturing											
Country		FY/	LNumSubsid_						*	*			*	*
NAme	No	CY	S20	S21	S22	S23	S24	S25	CTaxR	RelAP	NGDP	pcNGDP	RelpcNGDP	RelPop
USA	1	2007	107	92	713	71	160	229	40	0.51	14477625	47955	0.710	0.419
	1	2008	113	91	784	79	271	221	40	0.56	14718575	48302	0.784	0.415
	1	2009	115	87	790	80	317	202	40	0.65	14418725	46909	0.838	0.411
	1	2010	111	84	762	82	342	209	40	0.71	14964400	48314	0.888	0.408
	1	2011	108	76	775	81	345	195	40	0.79	15517925	49746	0.928	0.404
	1	2012	147	96	886	92	398	202	40	0.84	16163150	51450	0.904	0.401
Canada	2	2007	2	10	72	8	9	14	36.1	9.75	1457873	44383	0.767	3.858
	2	2008	3	9	79	9	13	12	33.5	9.90	1542561	46465	0.815	3.815
	2	2009	4	8	79	9	16	10	33	11.88	1370839	40822	0.963	3.773
	2	2010	4	7	81	9	18	11	31	11.99	1614072	47531	0.903	3.732
	2	2011	5	7	77	10	20	12	28	13.34	1778632	51850	0.891	3.692
	2	2012	6	11	82	10	24	18	26	15.90	1821445	52489	0.886	3.653
Brazil	3	2007	4	10	51	2	6	13	34	69.71	1366853	7214	4.718	0.670
	3	2008	4	10	48	2	12	15	34	61.07	1653539	8633	4.386	0.664
	3	2009	5	11	55	2	16	15	34	60.59	1622311	8382	4.691	0.658
	3	2010	6	11	58	3	17	17	34	66.15	2142905	10961	3.915	0.652
	3	2011	5	11	62	2	18	18	34	69.15	2474636	12536	3.683	0.647
	3	2012	7	13	71	3	17	20	34	74.02	2247745	11281	4.125	0.641
Mexico	4	2007	NA	9	36	3	8	13	28	149.16	1043472	9573	3.556	1.121
	4	2008	NA	8	42	4	15	17	28	142.39	1101274	9940	3.809	1.107
	4	2009	1	10	47	4	13	16	28	153.66	894950	7947	4.948	1.094
	4	2010	1	10	51	3	17	17	30	168.67	1051128	9197	4.666	1.080
	4	2011	1	11	48	3	16	16	30	171.85	1171185	10124	4.594	1.067
	4	2012	2	12	55	3	21	21	30	231.51	1185699	10129	4.594	1.053
Argentina	5	2007	NA	NA	12	NA	2	1	35	866.97	329275	8489	4.010	3.235
	5	2008	NA	NA	13	1	4	1	35	1250.57	403744	10293	3.679	3.284
	5	2009	NA	NA	15	1	3	1	35	3312.22	376826	9499	4.139	3.182
	5	2010	NA	NA	16	1	3	1	35	2013.50	461512	11504	3.731	3.154
	5	2011	NA	NA	14	1	5	1	35	1619.33	556564	13719	3.366	3.126
	5	2012	NA	NA	14	1	6	1	35	1740.92	603038	14698	3.166	3.097
ChinaExcldHK	6	2007	142	172	639	64	164	64	33	5.09	3504605	2652	12.835	0.095
	6	2008	194	173	756	83	193	81	25	4.70	4547716	3424	11.059	0.095
	6	2009	190	173	842	98	229	82	25	3.78	5105769	3826	10.277	0.094
	6	2010	210	169	892	116	241	88	25	2.62	5949648	4437	9.673	0.094
	6	2011	204	178	954	136	291	93	25	2.37	7314482	5429	8.505	0.093
	6	2012	278	250	1308	179	395	113	25	2.34	8386677	6194	7.512	0.092
ChinaH.K.SAR	7	2007	17	63	416	22	35	38	17.5	NA	211599	30497	1.116	18.349
	7	2008	19	66	473	28	42	42	16.5	NA	219280	31488	1.203	18.272
	7	2009	15	61	505	27	52	38	16.5	NA	214046	30594	1.285	18.175
	7	2010	11	65	512	24	60	37	16.5	NA	228637	32421	1.324	18.064
	7	2011	9	65	531	28	75	40	16.5	NA	248514	34941	1.322	17.942
	7	2012	17	70	679	38	96	50	16.5	NA	262630	36589	1.272	17.802
Philippines	8	2007	14	28	37	2	23	27	35	1460.16	149360	1684	20.213	1.432
	8	2008	16	26	48	3	28	24	35	2212.54	173603	1918	19.742	1.409
	8	2009	14	23	48	2	30	26	30	1419.52	168485	1851	21.243	1.386
	8	2010	13	24	52	2	30	28	30	2301.14	199591	2155	19.915	1.363
	8	2011	14	24	51	2	30	24	30	1850.67	224143	2379	19.409	1.339
	8	2012	26	29	52	3	30	28	30	2901.53	250240	2612	17.814	1.316
Malaysia	9	2007	7	34	104	13	19	13	27	252.21	193614	7144	4.765	4.746
	9	2008	10	40	116	13	24	18	26	138.28	231072	8372	4.523	4.663
	9	2009	8	35	123	14	26	16	25	133.08	202284	7203	5.459	4.583
	9	2010	13	32	123	13	29	16	25	92.31	247539	8659	4.956	4.504
	9	2011	10	35	132	18	36	20	25	147.77	289336	9956	4.638	4.427
	9	2012	13	33	147	20	38	25	25	149.05	304957	10331	4.504	4.352
Thailand	10	2007	16	58	235	26	42	32	30	4623.83	246977	3757	9.060	1.926
	10	2008	20	64	260	26	52	41	30	1691.94	272578	4110	9.213	1.924
	10	2009	21	66	265	28	63	34	30	1490.50	263711	3943	9.972	1.922
	10	2010	24	65	293	27	63	36	30	447.44	318908	4740	9.054	1.918
	10	2011	22	67	299	28	76	38	30	580.06	345672	5115	9.027	1.912
	10	2012	31	78	388	39	97	43	23	669.58	365966	5390	8.633	1.905
Indonesia	11	2007	6	33	48	4	21	29	30	3082.56	432265	1898	17.934	0.551
	11	2008	6	31	53	6	25	29	30	2876.30	510494	2210	17.133	0.544
	11	2009	6	31	59	5	25	24	28	4258.57	538613	2299	17.741	0.536
	11	2010	6	28	62	6	23	28	25	2013.50	709342	2985	14.378	0.529
	11	2011	7	34	76	8	30	26	25	2989.54	845573	3508	13.163	0.522
	11	2012	9	42	103	12	41	27	25	3108.79	877801	3591	12.958	0.515
Taiwan	12	2007	11	25	208	27	30	18	25	NA	393102	17122	1.988	5.553
	12	2008	14	25	240	32	28	20	25	NA	400206	17372	2.180	5.536
	12	2009	13	24	246	33	39	17	25	NA	377568	16331	2.403	5.518
	12	2010	14	26	249	35	43	20	17	NA	428221	18488	2.321	5.503
	12	2011	13	22	245	40	47	17	17	NA	465205	20030	2.305	5.489
	12	2012	19	28	292	49	60	20	17	NA	475327	20386	2.282	5.468
Korea, Rep. of	13	2007	19	16	144	16	31	10	27.5	3.93	1122679	23101	1.473	2.675
	13	2008	20	16	172	18	36	10	27.5	3.64	1002219	20475	1.849	2.660
	13	2009	25	15	170	20	46	12	24.2	3.71	901935	18339	2.144	2.644
	13	2010	17	18	191	22	51	13	24.2	3.35	1094499	22151	1.937	2.628
	13	2011	18	16	209	26	67	15	22	3.75	1202464	24156	1.912	2.613
	13	2012	31	22	252	36	76	23	24.2	3.69	1222807	24454	1.903	2.597

(Continued on next page)

[a] Included as explanatory variables in the regressions are those asterisked: CTaxR and reciprocals of RelAP, RelpcNGDP and RelPop (see footnote *a* on the preceding page for details). Two data, NGDP and pcNGDP, are not included in the regressions.

Table 16 (Continued: Lower Panel)

Country	FY/	Dependent Variables																						
				Manufacturing																		Non-mfg.		
				LNumSubsid.																				
NAme	No	CY	Mfg	Nonmfg	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
Singapore	14	2007	269	548	11	2	NA	52	3	5	7	10	16	13	15	9	28	54	9	35	1	1	14
	14	2008	210	619	11	1	148		3	5	6	9	15	9	12	4	15	33	7	31	1	2	15
	14	2009	218	614	11	1	NA	51	3	5	6	8	17	6	16	8	15	35	6	30	1	2	15
	14	2010	211	619	13	1	NA	48	3	4	7	8	16	8	16	7	14	36	8	22	2	2	16
	14	2011	209	657	12	1	NA	49	4	5	8	4	17	6	15	9	15	30	9	25	2	1	19
	14	2012	217	757	13	2	150		4	6	5	18	5	15	10	16	34	7	27	2	2	22	
India	15	2007	107	67	1	NA	NA	18	NA	NA	4	NA	1	4	6	NA	11	8	51	3	NA	NA	4
	15	2008	123	96	3	NA	NA	22	NA	NA	4	1	2	5	7	3	12	5	55	4	NA	NA	4
	15	2009	127	109	3	NA	NA	16	NA	NA	4	1	1	6	9	4	11	5	62	5	NA	NA	4
	15	2010	141	126	3	1	NA	18	1	NA	5	2	1	6	9	5	11	5	66	8	1	NA	4
	15	2011	164	169	3	1	NA	23	1	3	8	2	2	7	11	3	11	5	73	11	1	NA	7
	15	2012	197	213	5	3	NA	27	1	4	10	2	5	8	11	5	13	5	83	15	1	1	13
Vietnam	16	2007	185	83	15	9	3	19	NA	5	7	5	10	4	8	8	9	25	35	23	4	NA	9
	16	2008	212	114	14	13	6	20	NA	6	7	8	10	5	9	8	14	21	38	33	5	NA	10
	16	2009	247	120	14	15	8	18	NA	11	9	8	15	5	11	9	9	27	43	45	4	NA	11
	16	2010	263	127	18	15	9	20	NA	10	10	8	16	5	12	7	11	33	47	42	3	NA	17
	16	2011	286	146	17	16	8	21	NA	10	12	11	18	5	10	10	12	34	54	48	3	NA	13
	16	2012	402	208	23	24	13	28	1	13	16	14	25	7	21	14	23	42	69	69	3	NA	17
United Kingdom	17	2007	224	360	22	8	NA	24	3	5	4	1	4	11	15	17	14	34	42	20	1	12	3
	17	2008	197	397	22	8	NA	23	3	5	2	1	4	9	14	10	10	27	41	18	1	14	3
	17	2009	188	390	20	6	NA	21	2	5	2	2	3	8	15	14	10	23	39	19	NA	16	3
	17	2010	176	387	21	6	NA	19	2	5	NA	2	2	9	14	13	8	20	37	18	NA	18	2
	17	2011	172	429	17	7	NA	26	2	4	1	1	2	8	12	15	7	21	34	15	NA	16	2
	17	2012	182	444	20	7	129		1	4	1	1	2	9	13	15	8	20	34	17	NA	21	1
France	18	2007	99	99	6	3	NA	24	NA	1	NA	NA	1	4	3	9	7	10	22	9	2	2	NA
	18	2008	94	94	6	2	NA	26	NA	1	NA	NA	2	3	5	3	6	6	22	12	2	2	NA
	18	2009	97	97	2	2	NA	22	NA	1	NA	NA	2	6	4	6	5	5	22	15	2	1	NA
	18	2010	94	94	8	2	NA	25	NA	1	NA	NA	2	3	4	5	5	5	21	13	2	1	NA
	18	2011	97	97	8	2	NA	27	NA	2	1	NA	2	4	3	7	4	6	19	12	2	1	NA
	18	2012	110	110	9	4	NA	31	NA	2	1	NA	1	4	4	7	5	6	22	14	2	1	NA
Germany	19	2007	151	317	2	6	5	30	NA	3	2	1	3	6	19	10	13	28	13	10	NA	NA	3
	19	2008	137	356	3	5	3	23	NA	6	2	1	3	5	21	9	12	20	15	9	NA	NA	2
	19	2009	138	358	3	4	4	25	NA	5	2	1	3	5	21	11	13	19	12	10	NA	NA	2
	19	2010	131	362	3	3	3	23	NA	5	1	1	3	6	21	8	11	19	13	11	NA	NA	1
	19	2011	138	365	3	3	3	26	NA	5	1	1	3	7	19	10	11	24	14	8	NA	NA	2
	19	2012	142	418	3	2	2	27	NA	9	2	1	3	8	18	11	11	19	15	11	NA	NA	3
Italy	20	2007	46	81	2	2	NA	6	NA	2	NA	NA	NA	3	4	2	4	5	12	4	NA	NA	NA
	20	2008	39	83	1	2	NA	6	NA	2	NA	NA	NA	2	5	1	1	4	11	4	NA	NA	NA
	20	2009	42	83	1	2	NA	4	NA	2	NA	NA	1	2	4	2	1	4	12	7	NA	NA	NA
	20	2010	40	83	NA	3	NA	5	NA	2	NA	NA	NA	2	4	2	1	3	10	8	NA	NA	NA
	20	2011	42	93	NA	4	NA	4	NA	2	NA	NA	NA	2	4	2	2	4	12	6	NA	NA	1
	20	2012	45	102	2	5	NA	4	NA	2	NA	NA	2	2	4	2	2	4	10	6	NA	NA	1
Netherlands	21	2007	77	212	4	1	NA	18	NA	NA	2	NA	NA	4	1	5	8	6	13	15	1	12	3
	21	2008	59	237	3	1	NA	13	NA	NA	2	NA	NA	3	1	3	5	6	9	13	1	11	2
	21	2009	57	254	3	1	NA	11	NA	NA	2	NA	NA	4	1	5	4	6	6	14	2	14	2
	21	2010	53	260	3	1	111		NA	NA	2	NA	NA	2	NA	3	4	6	7	13	2	16	1
	21	2011	51	282	2	2	NA	10	NA	NA	2	NA	NA	2	NA	5	2	4	8	14	2	20	1
	21	2012	58	297	2	2	112		0	0	2	0	0	3	0	5	4	3	7	17	2	21	1
Belgium	22	2007	44	62	2	NA	NA	12	NA	NA	NA	NA	NA	1	NA	2	4	4	12	7	NA	NA	1
	22	2008	35	75	2	NA	NA	11	NA	NA	NA	NA	NA	NA	NA	2	5	7	6	NA	NA	NA	NA
	22	2009	30	73	1	NA	NA	9	NA	NA	NA	NA	NA	NA	NA	2	2	4	6	6	NA	NA	NA
	22	2010	30	78	2	NA	NA	9	NA	NA	NA	NA	NA	NA	NA	2	2	4	6	5	NA	NA	NA
	22	2011	34	71	2	NA	NA	11	NA	1	NA	NA	NA	NA	NA	3	2	4	7	4	NA	NA	NA
	22	2012	34	74	2	NA	NA	9	NA	2	NA	NA	NA	NA	NA	3	2	4	8	4	NA	NA	NA
Spain	23	2007	48	55	NA	NA	NA	13	NA	NA	NA	NA	NA	1	5	2	2	3	5	13	4	1	NA
	23	2008	43	58	NA	NA	NA	11	NA	NA	NA	NA	NA	1	4	2	NA	3	4	13	5	1	NA
	23	2009	45	55	NA	NA	NA	11	NA	NA	NA	NA	NA	1	4	2	1	3	4	13	6	2	NA
	23	2010	43	58	1	NA	NA	11	NA	1	NA	NA	NA	1	4	2	NA	2	3	12	6	2	NA
	23	2011	46	53	NA	NA	NA	16	NA	1	NA	NA	NA	1	4	1	1	2	3	12	5	2	NA
	23	2012	50	61	NA	NA	NA	17	NA	1	NA	1	1	1	4	1	1	5	3	11	5	1	NA
Switzerland	24	2007	7	33	NA	NA	1	2	NA	NA	NA	NA	NA	NA	1	NA	1	NA	2	NA	NA	NA	NA
	24	2008	6	34	NA	NA	1	1	NA	NA	NA	NA	NA	NA	1	1	NA	2	NA	NA	NA	NA	NA
	24	2009	5	33	NA	NA	1	2	NA	NA	NA	NA	NA	NA	1	NA	NA	1	NA	NA	NA	NA	NA
	24	2010	7	36	NA	NA	NA	2	NA	NA	NA	NA	NA	NA	1	2	NA	1	NA	1	NA	NA	NA
	24	2011	10	37	NA	NA	1	NA	1	NA	NA	NA	NA	NA	1	2	NA	1	NA	1	NA	NA	NA
	24	2012	8	39	NA	NA	NA	3	NA	NA	NA	NA	NA	NA	1	3	NA	NA	NA	1	NA	NA	NA
Russia	25	2007	11	38	NA	NA	2	1	NA	NA	NA	NA	NA	1	NA	NA	NA	2	4	1	NA	NA	NA
	25	2008	14	50	NA	NA	3	1	NA	NA	NA	NA	NA	NA	NA	1	NA	2	6	1	NA	NA	NA
	25	2009	12	56	NA	NA	2	1	NA	NA	NA	NA	NA	NA	NA	1	NA	2	5	1	NA	NA	1
	25	2010	10	57	NA	NA	1	1	NA	NA	NA	NA	NA	NA	1	NA	NA	1	5	1	NA	NA	1
	25	2011	14	60	1	NA	1	1	NA	1	NA	NA	1	NA	1	NA	NA	2	5	1	NA	NA	1
	25	2012	21	73	1	NA	2	2	NA	1	NA	NA	1	NA	1	NA	NA	2	9	3	NA	NA	1
Australia	26	2007	83	227	NA	1	6	4	4	NA	9	2	4	1	1	3	6	15	10	17	42	2	
	26	2008	78	246	13	1	4	6	5	4	NA	10	1	2	3	NA	5	3	13	10	18	43	2
	26	2009	73	269	11	1	4	5	1	3	NA	9	1	1	3	2	4	3	13	8	17	52	2
	26	2010	76	284	15	1	4	7	1	4	NA	9	2	1	5	NA	4	2	13	9	18	56	2
	26	2011	80	285	14	1	4	7	2	3	NA	11	2	1	5	1	6	2	12	9	15	55	3
	26	2012	78	359	14	2	3	6	2	3	NA	12	2	1	4	1	5	3	13	8	15	71	4
New Zealand	27	2007	21	41	4	1	7	2	NA	NA	NA	NA	1	1	NA	NA	NA	NA	3	2	2	NA	NA
	27	2008	19	48	3	1	8	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	4	3	NA	NA	
	27	2009	20	50	4	1	9	2	NA	NA	NA	NA	1	NA	NA	NA	NA	1	2	3	NA	NA	
	27	2010	25	47	6	1	9	2	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	1	5	3	NA	NA
	27	2011	22	47	6	1	8	2	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	4	3	NA	NA
	27	2012	20	50	6	NA	6	3	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	4	3	NA	NA

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Table 16 (Continued: Right Half of Lower Panel)

			Dependent Variables					Explanatory Variables (with an asterisk)						
			Non-manufacturing											
Country		FY/	LNumSubsid_					*	*				*	*
NAme	No	CY	S20	S21	S22	S23	S24	S25	CTaxR	RelAP	NGDP	pcNGDP	RelpcNGDP	RelPop
Singapore	14	2007	21	71	326	24	39	51	20	53.05	179981	39224	0.868	26.891
	14	2008	22	76	362	28	53	60	18	49.59	192231	39722	0.953	26.257
	14	2009	19	68	357	27	70	55	18	51.13	192406	38577	1.019	25.655
	14	2010	24	66	349	27	73	60	17	50.10	236420	46570	0.922	25.074
	14	2011	24	64	370	33	81	63	17	58.18	274065	52871	0.873	24.522
	14	2012	32	74	418	37	104	66	17	60.96	286908	54007	0.862	23.996
India	15	2007	6	8	34	2	8	5	33.99	30.69	1238478	1081	31.488	0.110
	15	2008	11	11	49	3	13	5	33.99	26.81	1223206	1053	35.959	0.108
	15	2009	11	10	56	2	21	5	33.99	31.05	1365343	1159	33.927	0.107
	15	2010	8	12	71	4	21	5	33.99	25.27	1708541	1430	30.012	0.106
	15	2011	9	14	91	5	36	6	32.44	29.38	1880102	1553	29.733	0.104
	15	2012	19	18	112	5	38	6	32.45	33.25	1858748	1515	30.714	0.103
Vietnam	16	2007	14	19	13	2	14	8	28	4623.83	77520	920	36.998	1.470
	16	2008	20	26	17	2	23	11	28	4793.83	98269	1154	32.812	1.457
	16	2009	22	24	21	2	25	11	25	5962.00	101634	1181	33.295	1.444
	16	2010	20	27	24	2	23	11	25	3579.56	112771	1297	33.089	1.430
	16	2011	22	29	36	2	30	11	25	2159.11	134598	1532	30.140	1.416
	16	2012	30	30	65	8	40	15	25	3347.92	155565	1753	26.544	1.401
United Kingdom	17	2007	25	35	168	17	32	67	30	5.01	2853176	46866	0.726	2.087
	17	2008	27	39	181	21	46	65	30	5.25	2709573	44131	0.858	2.076
	17	2009	23	37	180	17	54	60	28	5.92	2217427	35885	1.096	2.064
	17	2010	23	35	175	17	55	62	28	6.59	2296930	36891	1.163	2.052
	17	2011	26	29	181	63	57	55	26	7.97	2464639	38945	1.186	2.039
	17	2012	31	32	195	46	55	63	24	8.85	2470565	38781	1.200	2.027
France	18	2007	6	10	91	7	4	1	33.33	4.23	2668805	43156	0.789	1.986
	18	2008	6	10	100	17	19	2	33.33	4.06	2937321	47273	0.801	1.976
	18	2009	6	8	91	15	21	1	33.33	4.13	2700658	43234	0.909	1.965
	18	2010	7	12	100	14	25	4	33.33	4.46	2651772	42249	1.016	1.954
	18	2011	6	10	92	14	24	6	33.33	5.25	2865304	45430	1.016	1.943
	18	2012	9	11	103	15	27	6	33.33	5.58	2688210	42415	1.097	1.931
Germany	19	2007	9	22	240	20	15	8	38.36	1.56	3328589	40485	0.841	1.522
	19	2008	12	23	256	24	25	14	29.51	1.53	3640727	44398	0.853	1.527
	19	2009	17	23	251	20	35	10	29.44	1.78	3306780	40424	0.973	1.531
	19	2010	15	23	258	20	33	12	29.41	1.83	3310600	40496	1.060	1.534
	19	2011	13	20	265	20	35	10	29.37	2.06	3631435	45208	1.021	1.536
	19	2012	16	21	299	25	37	17	29.48	2.32	3427853	42569	1.093	1.537
Italy	20	2007	1	4	65	2	5	2	37.25	9.41	2130241	36587	0.930	2.139
	20	2008	1	6	59	5	9	3	31.4	9.72	2318162	39523	0.958	2.126
	20	2009	1	4	61	4	11	2	31.4	11.24	2116627	35875	1.096	2.115
	20	2010	NA	4	64	2	12	1	31.4	12.13	2059188	34789	1.234	2.105
	20	2011	1	3	64	6	14	4	31.4	14.47	2198350	37031	1.247	2.097
	20	2012	3	4	69	5	17	3	31.4	15.30	2014381	33915	1.372	2.090
Netherlands	21	2007	6	28	78	4	29	51	25.5	6.28	834346	50931	0.668	7.739
	21	2008	6	32	87	8	38	51	25.5	6.60	935707	56896	0.666	7.714
	21	2009	5	31	91	8	53	48	25.5	6.74	860261	52042	0.756	7.690
	21	2010	4	32	92	7	55	51	25.5	8.03	837949	50433	0.851	7.665
	21	2011	4	30	95	9	77	44	25	11.07	894576	53590	0.862	7.639
	21	2012	5	30	101	10	87	40	25	10.68	823595	49158	0.947	7.613
Belgium	22	2007	1	7	47	1	4	1	33.99	24.70	460280	43486	0.783	11.917
	22	2008	2	8	55	2	7	1	33.99	25.34	509765	47790	0.792	11.818
	22	2009	2	7	51	2	10	1	33.99	29.66	474483	44125	0.891	11.725
	22	2010	2	8	55	4	7	2	33.99	30.22	472097	43552	0.985	11.640
	22	2011	2	5	53	2	6	3	33.99	32.71	513790	46705	0.989	11.567
	22	2012	3	6	52	3	7	3	33.99	35.91	483187	43551	1.068	11.505
Spain	23	2007	1	6	36	6	4	1	32.5	21.42	1443500	31910	1.067	2.849
	23	2008	1	4	38	6	6	2	30	20.68	1600913	34815	1.088	2.814
	23	2009	NA	3	37	5	6	2	30	19.07	1458111	31447	1.250	2.783
	23	2010	1	3	39	5	4	4	30	18.21	1387427	29797	1.440	2.758
	23	2011	NA	3	36	4	4	4	30	22.44	1455867	31151	1.482	2.737
	23	2012	NA	3	38	6	9	4	30	25.54	1323214	28294	1.645	2.722
Switzerland	24	2007	NA	3	25	2	1	2	20.63	7.27	450530	59999	0.567	16.821
	24	2008	NA	3	26	1	2	2	19.2	7.61	524289	69049	0.548	16.636
	24	2009	NA	2	25	2	3	1	18.96	8.11	509466	66156	0.594	16.448
	24	2010	NA	2	28	1	3	2	18.75	8.57	5491105	70525	0.609	16.263
	24	2011	NA	2	28	2	4	1	18.31	9.61	658867	83719	0.552	16.086
	24	2012	2	2	26	2	5	2	18.06	10.31	631184	79344	0.586	15.912
Russia	25	2007	NA	4	27	4	1	2	24	37.75	1299703	9102	3.740	0.886
	25	2008	NA	5	37	4	2	2	24	35.86	1660846	11639	3.253	0.886
	25	2009	NA	7	40	4	3	1	20	40.50	1222645	8562	4.593	0.886
	25	2010	NA	6	41	4	4	1	20	39.58	1524915	10671	4.022	0.887
	25	2011	NA	6	44	4	4	1	20	38.52	1904790	13320	3.467	0.888
	25	2012	NA	8	54	4	4	2	20	39.10	2017469	14079	3.305	0.889
Australia	26	2007	5	13	98	10	15	25	24	13.53	1299703	45152	0.754	5.989
	26	2008	7	13	108	7	22	26	30	14.84	948913	49107	0.771	5.882
	26	2009	7	11	115	8	27	30	30	17.17	1054596	45626	0.862	5.779
	26	2010	10	8	117	8	30	35	30	18.21	997636	56348	0.762	5.684
	26	2011	6	9	118	8	31	36	30	22.23	1249364	66534	0.694	5.599
	26	2012	13	11	126	7	46	66	30	25.45	1498366	67863	0.689	5.521
New Zealand	27	2007	3	3	20	5	1	7	33	69.36	132906	31376	1.085	30.061
	27	2008	3	3	26	4	4	5	30	80.34	132737	31043	1.220	29.761
	27	2009	3	3	28	4	4	5	30	98.71	119465	27622	1.424	29.459
	27	2010	2	2	27	4	5	4	30	104.26	142292	32517	1.320	29.156
	27	2011	2	3	23	4	7	5	28	118.13	162669	36877	1.252	28.844
	27	2012	2	3	27	5	6	4	28	143.64	170369	38376	1.213	28.531

C Japan's Corporate Tax Data

Not compiled in Table 16, statutory corporate tax rates in Japan, a home country, during the sample period are tabulated in Table 17: Up until

2011, they were slightly higher than the U.S. rates;[65] more recently, they have been lowered by the Japanese government in 2012 through 2015.

Table 17 Corporate Tax Rates in Japan (%)[a]

	Sample Period								
Fiscal Year	2007	2008	2009[b]	2010	2011	2012	2013	2014	2015
Statutory	40.69	40.69	40.69	40.69	40.69	38.01	38.01	35.64	33.06
Effective					39.54	37.00	37.00	34.62	32.11

[a]Data sources: Statutory/policy tax rates in *(ii)* in Subsection 2.1; effective rates graphed at the Japanese Ministry of Finance's Website (in Japanese) located at https://www.mof.go.jp/tax_policy/summary/corporation/084.htm

[b]In April 2009 Japan changed the corporate tax system from the worldwide tax system to a territorial tax system. (See Subsection 1.2.)

While not studied in the present paper, Japan's effective tax rate, a corporate tax rate *actually paid* (to be used in the first through third stages of multinational's decision making, as suggested by Auerbach, et al. 2010 referenced in Section 1), has been slightly *less* than the statutory rate, due to tax preferences, and recently been reduced, too, as readily seen in Table 17.

Recent literature looking at Japanese corporate tax system includes Suzuki (2014) refering to Auerbach, et al. (2010) and estimating the Japanese corporate average effective tax rates; see also Tajika (2011).

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[65]See Table 16 for the U.S.A. See also Fig. 1 comparing countries including Japan for the two selected years, 2007 and 2012. Notice in the figure and the table that, in 2012, the U.S.A. ranks as the (world's) highest.

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