Reversing the Perspective: Expansion Activities of Multinational Corporations From Middle-Income Countries

Debaere Peter[1]

Univ. of Texas, Austin

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The organization of production within the multinational corporation (MNC) depends on the relative factor abundance of the home country and the destination country. This proposition is at the heart of the theory of the multinational corporation (MNCs) that Helpman (1984, 1985) and Helpman and Krugman (1985) developed and that is primarily conceived from the perspective of the advanced, developed countries. It rationalizes one-way, North-South MNC activity; MNCs from capital-abundant nations break up domestic production and relocate the labor-intensive parts to low-wage countries. I show how two-way MNC activities are implied by the theory that Helpman and Krugman develop and how these are essential to understand MNCs from middle-income countries: these MNCs relocate labor-intensive activities to more labor-abundant countries, they also move capital-intensive components to more capital-abundant countries. I use unique South Korean firm-level data to investigate this hypothesis. I provide evidence from the affiliates of South Korea's MNCs that bears out this prediction. I also formally test the implications of the hypothesis for the parents' capital-intensity with a panel of South Korean MNC parents (1980-1996). Relocating to more capital-abundant countries indeed decreases the parent's capital-labor ratio, whereas relocating to more labor-abundant countries increase this ratio.

Production is increasingly a global activity. Not just VCRs or computers, but also cars and clothing contain components from all over the globe. In this ongoing internationalization of production, multinational corporations (MNCs) have played a critical role. Foreign direct investment has been steadily increasing and worldwide sales of multinational corporations are known to dwarf worldwide exports. While most multinationals still originate from advanced, developed nations, there is a growing number of MNCs from countries that do not belong to this select group. The UN (2000) reports that developed countries accounted for almost 95 percent of the world's outward foreign direct investment (FDI) in the early 1980s. In the 1990s, however, their share shrank to about 85 percent right before the East Asian financial crisis. MNCs from countries such as the Asian Tiger economies are responsible for a major part of this shift. [1] These MNCs and what they teach us about the international organization of production within the MNC are the subject of the present study.

There is a range of international activities that takes place within the framework of the multinational corporation and these activities can be analyzed from a number of different points

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[1] See Figure 1.

of view. [2] Recent work has tried to distinguish what is produced inside the MNC from what is produced outside. Specifically, contract theory has been used to analyze the internalization decision of vertically integrating MNCs. Antras (2003) for example seeks to differentiate foreign affiliate input production within the boundaries of the MNC from production outside its boundaries in order to characterize intra-firm and arm's length trade and to explain why some 35 percent of worldwide trade takes place within the MNC's boundaries.[3] An alternative approach that is prevalent in a large part of the MNC literature takes the internalization decision as given and focuses primarily, and in more detail, on the division of labor between parent and affiliate *within* the MNC: How it varies with the characteristics of the host country of the affiliates, how it differs from domestic firms.[4] Helpman (1984, 1985) and Helpman and Krugman (1985) are central to this latter approach. In their view MNCs that relocate activities internationally organize production both in scope (the set of products) and in depth (stages of production) between the parent and the affiliate in such a way as to take advantage of international differences in factor abundance and factor prices. It is this view of MNC activity that I will investigate for MNCs from middle-income countries.

Interestingly enough, the theory of the multinational corporation as initially developed by Helpman (1984, 1985) and Helpman and Krugman (1985) is primarily conceived from the perspective of advanced, developed countries.[5] These theories primarily view the MNCs as a

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[2] As corporations with affiliates abroad, MNCs almost by definition have a vertical component. A MNC's affiliates abroad need firm-specific (intangible) assets such as headquarter services, R&D, patents etc. to operate and these will be traded within the firm. Since this latter vertical component is part of any MNC, Markusen and Maskus (2001) do not make it the distinguishing characteristic between, what have been called, vertical and horizontal integration models of the MNCs. Essential for the vertical models in their view are differences in factor intensities of the components of the production process and relocating these to take advantage of factor price differences.

[3] Note that Antras (2003) investigates the share of intra-firm trade in *total* US trade, not in total US *MNC* trade. He finds that more capital-intensive inputs will be produced (and traded) by affiliates inside the MNC (instead of produced outside and traded at arm's length).

[4] Data on intrafirm trade as a fraction of total *MNC* trade is hard to come by. Back of the envelope calculations suggest that this fraction must be fairly high. Roughly 35 percent of *total* worldwide trade is intra-firm trade (Antras, 2003). If about half of trade takes place through MNCs, then about 70 percent of MNC trade is intra-firm trade. Moreover, the ratio of intrafirm trade to total trade is not evenly spread. Dobson (1997) and Encarnation (1994) suggest that there is significantly more intra-firm trade in East Asia. (80 percents of Japan's total (not MNC!) exports and 50 percent of its total (not MNC) imports are intra-firm transactions and the South Korean MNCs that I study are considered modeled after Japan). Obviously, the more intra-firm trade relative to total trade there is for MNCs, the less relevant outsourcing to independent foreign suppliers is, in order to understand the organization of production within the MNC and the more important it is to study what distinguishes affiliate and parents within the MNC.

[5] See also Rodriguez-Clare (1996) and the literature on fragmentation or breaking up the value-chain:

vehicle to relocate labor-intensive activities to affiliates in low-wage countries. They rationalize one-way MNC activity in which MNCs from the capital-abundant North set up affiliates in the labor-abundant South. Similarly, as an empirical matter, outward MNC activities have been studied primarily for these same developed nations.[6] Countries that are not part of this select group are studied as hosts of foreign (mostly developed-country) affiliates and little is known about their outward strategies.

In this paper I reverse perspective. I study outward MNC activity from middle-income countries. Countries such as South Korea and Taiwan whose per capita GDP is in the range of Greece are interesting because they do not fit the North-South scheme. They are caught in the middle, in between countries that are clearly more advanced and others that are less developed.[7] The MNCs from these countries have affiliates in both more and less advanced countries. On the one hand, the liberalizations in China, Malaysia, Thailand or Vietnam account for the boom of affiliates from MNCs with parents in these middle-income countries. (China now rivals the US as the main recipient of the world's FDI.) In recent policy debates in East Asia this MNC activity has been associated with "hollowing out" and MNCs in search of cheap labor. Far less attention has gone, however, to the affiliates from middle-income countries in more advanced countries; respectively 20 and 50 percent of Taiwan and Korea's FDI is destined for the US, Japan or Europe. The MNC activities associated with these flows are of particular interest to understand the internal workings of the MNC. They raise the interesting question whether relocating production to foreign affiliates is about more than just moving labor-intensive activities. In particular, one wonders whether the MNCs from middle-income countries can also tap into the resources of more advanced countries by relocating more capital-and technology-intensive parts of production over there. Against the background of the exceptional growth performance of the Tiger economies,

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Deardorff (1998), Jones and Kierkowski (1997), Arndt (1997) and Feenstra and Hanson (1996).

[6] In part, this is a consequence of the available data: Firm-level information on inputs and outputs of MNC's parents and affiliates that are increasingly used since Brainard (1997) is mostly available for only a few developed nations. See Lipsey (2001) for available data. Lipsey reports that sales data is available for only the US, Germany, Japan, Switzerland, Canada and the UK. Hanson et al. (2002, 2003) and Yeaple (2002) are recent examples of empirical investigations of US outward MNCs activities. Head and Ries (2002) study Japan's outward FDI. Aitken and Harrison (1999), Feenstra and Hanson (1997) and Haddad and Harrison (1993) study Venezuela, Mexico and Morocco as recipients of FDI.

[7] For my argument the specific definition of 'middle-income country' is not essential -- It varies by international organization. What matters is that countries are in terms of capital/labor ratios (per capita GDP) not at the very top and not at the very bottom of the world distribution. Countries such as Taiwan or Korea fit the profile.

this relocation to the North opens the possibility that *outward* MNC activity (FDI) was an independent factor in their economic development.

There is no all-encompassing theory of the multinational corporation. There are a variety of models that focus on different aspects of multinational activity that all have some empirical relevance. As mentioned, the theories by Helpman and Krugman (1985) have MNCs take advantage of factor prices and have them break up production accordingly. Brainard (1993, 1997) and Markusen (1984), on the other hand, argue that breaking up production to take advantage of factor cost differences need not be an essential motivation for MNCs. Access to rich markets is key and to save transportation costs, MNCs may set up shop in other developed countries instead of having to supply these markets through exports, even without factor price differences.[8] Finally, there is the view that MNCs emerge in an effort to jump tariffs or other existing costs associated with trading goods.[9] In this paper I want to investigate how differences in the factor abundance of the host countries of the affiliates affect the organization of production within the multinational firm from middle-income countries, even when part of the motivation for the emergence of MNCs is tariff jumping or market access.

I take the standard factor proportions theory à la Helpman and Krugman (1985) to make the basic point that MNCs will not only relocate labor-intensive activities to labor-abundant countries; MNCs will also arise in more labor-abundant countries and they will relocate capital-intensive activities to the more capital-abundant countries. This is important in light of the existing literature that has defined MNC activity and in particular vertical integration primarily as relocating labor-intensive activities to labor-abundant countries, a one-way street from North to South.[10] One-way MNC activity, I argue, follows from arbitrarily restricting the equilibrium outcomes in Helpman and Krugman. In addition, two-way MNC activities are needed to describe the MNCs from middle-income countries. This extension generates a prediction that can be tested

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[8] A fair number of variants of Markusen's basic model exist, some allowing for differences in factor prices. These models typically have to be simulated and do not include vertical integration (beyond the transfer of firm-specific assets).

[9] For reference on the literature of tariff jumping, see Blonigen, Tomlin and Wilson (2002).

[10] Note that the literature has questioned the empirical relevance of vertical integration models exactly because of its one-way prediction that is in obvious contradiction with the (two-way) MNC activity between developed countries. To the extent that one thinks that factor price differences are also relevant among OECD countries, see Davis and Weinstein (2001), the present extension can also account for two-way MNC activity among OECD countries.

with the relatively detailed firm-level data of South Korean MNC parents that I have: As MNC parents relocate labor-intensive activities of production to more labor-abundant countries they become more capital intensive and as they move capital-intensive activities to Northern affiliates, their capital-intensity is likely to decline.

It is understood that this basic prediction derived from the H&K model should prevail in alternative, more complex settings. For example, in line with Helpman (1985) one could allow for multi-product firms who will also vary the scope of (final goods) production by country of destination. Their intra-firm trade between the affiliate and the parent will differ in its composition (between intermediate and (different) final goods) from the pure vertical integration case, yet the general proposition about reallocating more labor-intensive 'activities' to more labor-abundant countries, and more capital-intensive 'activities' to capital-abundant countries will remain true. The same holds in the presence of tariffs. Even if tariff jumping is part of the motivation for why a MNC arise, the hypothesis is that a MNC will in the presence of factor price differences organize its production between parent and affiliate in such a way that it can take advantage of these differences. Also market access should not alter the basic premise. Multinationals may seek access richer markets, yet whenever there is some vertical component to production or whenever they can vary the scope of final goods production, they will relocate the more labor-intensive parts to labor-abundant and the more capital-intensive parts to capital-abundant countries.

To investigate this basic prediction, I rely on unique, unpublished firm-level data of South Korean firms and multinationals.[11] In a first step, I provide some descriptive statistics on the parents and affiliates of South Korea's MNCs. Even though these data are too restrictive to formally test any proposition, they do show significant intra-firm trade flows between parent and affiliate in both directions and the differences in capital-intensity between parent and affiliate are not insignificant. This data suggests that as South Korea's MNCs relocate labor-intensive activities to China, they also relocate capital-intensive activities to more capital-abundant countries such as Japan. In a second step, I go beyond these descriptive statistics and exploit the detailed information on the operational activities of South Korean firms and MNC parents. With a panel of South Korean MNC parents (1980-1996) I investigate whether, controlling for firm-level

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[11] Contrary to the extensive (and growing) empirical literature that studies the trade performance of firms with firm-level data, see Bernard and Jensen (1999) and Roberts and Tybout (1997), FDI has been studied far less frequently at the firm level.

heterogeneity, changes in the destination of a firm's affiliates are associated with changes in the factor intensity of South Korean MNC parents in the way that the hypothesis dictates.[12]

Note that the South Korean data is particularly well fit for this exercise. First, the parent MNC's characteristics can be directly linked with the destination of the outward investment flows *at the firm-level*. (Legal constraints prohibit such direct connection for US data at the firm level.) It turns out the average per capita GDP of the destination country of South Korea's median multinational is 2.5 times that of South Korea. In other words, the data includes a significant number of firms with affiliates in more advanced nations. This is essential to investigate the hypothesis of relocating more capital-intensive activities to more capital-abundant countries. Second, the story of South Korea's outward MNC activity is probably as close as one gets to a natural experiment. On the one hand, there is the gradual liberalization of outward investment in South Korea since 1980. On the other hand, there are the liberalizations in Asia since the mid 1980s that have shifted the destination of South Korea's MNCs.

My results indicate that the capital-intensity of South Korea's MNC parent decreases as multinational target more capital-abundant countries; it increases as they direct their activities towards less capital-abundant countries. This finding is consistent with relocating capital-intensive parts to capital-abundant countries and labor-intensive parts to labor-abundant countries in a world in which also tariff jumping or market access may give rise to MNC activity.[13] The result is confirmed across different specifications and different sub samples. I include estimates for firms that shift the destination of their affiliates from North to South as well as those that move from South to North; I present results with and without firms that never were involved in multinational activities as control group. The data suggests that the factor endowments of the destination country should affect the specific division of labor between the parent and the affiliate within the MNC.

The paper is organized as follows. I first introduce two-way MNC activity in the factor proportions theory of the MNC and specifically address the position of a middle-income country. In section 2 I present some evidence on the operational activities of the affiliates of South Korean

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[12] Cf. Feenstra and Hanson (1999) and Feenstra et al. (2002) for the US and Head and Ries (2002) for Japan.

[13] This finding reinforces the observation by Head and Ries (2002) for Japan (in terms of skilled and unskilled labor), that FDI to low-income countries raises the skill-intensity of a multinational, yet this skill-intensity upgrading diminishes as FDI flows to higher income countries.

MNCs that corroborates the hypothesis. In section 3 I investigate the parents of the South Korean MNCs with a panel data set and test whether indeed the factor abundance of the destination country is a significant factor in the internal organization of MNCs' production.

1. Middle-income MNCs and two-way MNC activity

The theories of Helpman (1984, 1985) and Helpman and Krugman (1985) were the first to have MNCs organize their internal production in light of international factor price differences. They emphasize one-way, North-South outward MNC activities and explain why MNCs from the capital-abundant North open affiliates in the labor-abundant South. These theories view MNCs primarily as a vehicle of vertical integration to move the labor-intensive production to low-wage countries. Moreover, they make intra-firm trade flows esp. for the parent essential for production. In Helpman and Krugman's (1985) (H&K) basic setting I show how MNCs from the South can easily relocate capital-intensive activities to more capital-abundant countries, giving way to, if you will, two-way MNC activity.[14] In spite of the prominence of the one-way prediction of vertical integration, I argue that two-way MNC activity is not just a possibility in H&K's setup; there is a whole class of equilibria that involve MNCs from the South opening affiliates for capital-intensive activities in the North. I use this possibility of two-way MNC activity to specifically describe MNCs from middle-income countries and apply the graphical analysis that H&K do so well.

2.1. Two-way-MNC activity

Take a capital-abundant country, North, and a labor-abundant country, South. There is free, frictionless trade. Technology is the same everywhere for the two sectors agriculture and manufacturing. Agriculture is constant returns and supplies homogeneous goods. Consumers spend a fixed income fraction on agriculture and manufacturing. Manufacturing goods are differentiated and produced with increasing returns under monopolistic competition and free entry. Consumers have a CES sub-utility function for manufacturing varieties.

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[14] See Chapter 13 in Helpman and Krugman (1985). In Helpman (1984) only the production of (intangible) headquarter services takes place in the parent. The actual production of manufacturing goods by MNCs is transferred entirely to Southern affiliates and all intra-firm trade is in these services -- unless one classifies imports of final goods assembled in the affiliates as such. Helpman (1985) makes the theory more realistic by involving the parent also directly in producing (physical) goods and introducing an intermediate good.

Fig. 2 depicts the endowment box for North and South. The dark parallelogram reflects worldwide capital and labor use in manufacturing (*03*) and agriculture (*30'*) for the integrated world economy (IWE), i.e. when factors are internationally mobile. If country endowments lie inside this parallelogram, factors prices are equalized and countries with internationally immobile production factors replicate the IWE equilibrium as they exchange factors through their trade. With equal factor prices (FPE) there is no incentive for MNCs to emerge. However, if endowments are so different that the endowment vector *OE* lies outside the parallelogram, trade can no longer equalize returns. Vertically integrated MNCs emerge in this case and they split production between parent and affiliates to take advantage of different factor prices.

This ability to relocate production lines abroad follows directly from the setup. Manufacturing consists of a labor-(23) and a capital-intensive (12) component plus headquarter services (HQ) (01) that is most capital-intensive of all. HQs are a fixed cost that all firms incur and they represent management skills and R&D that are tied to the parent. They enable firms to serve multiple plants elsewhere and they circulate within a firm to make labor-and capital-intensive components compatible.[15] Like the labor-and capital-intensive components, HQ services are differentiated by firm variety. [16] Now, as MNCs break up production they relocate the labor- and capital-intensive component.[17] In doing so, they enlarge the FPE set to *0123*. This gets at the essence of H&K's model: MNCs take advantage of international factor price differences and split production between parent and affiliate. In doing so, MNCs bring factor prices between countries closer together. H&K choose the analytical convenience of complete FPE to represent the equilibrium for this limiting case.[18]

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[15] IRS for components rationalizes vertical integration to avoid duopolies between suppliers and parents.

[16] For factor prices *w* and *r* the production cost *C* of *x* manufacturing goods consists of plant-specific costs for the labor-and capital-intensive component and a firm-specific cost for HQ services. In H&K the capital intensive component is an intermediate good and the labor-intensive component is just assembly, $C(w,r,x)$ = $C^{PZ}(w,r,h,z) + C^{PA}(w,r,h,z,x) + C^{H}(w,r,h)$ (*x* and *z* are final and intermediate goods, *h*, HQ services, an input in all parts, *P* stands for plant, A for assembly and Z for intermediates.) C^{PZ} and C^{PA} consist of a fixed cost *F (r,w)* and a variable cost *V (r,w,h,x or r,w,h,x,z)*. An alternative to H&K (without any hierarchy between both components) would be to consider both components intermediates and to make assembly costless, and let goods be assembled where consumed.

[17] In H&K the first component is assembly and the capital-intensive component an intermediate good.

[18] Debaere and Demiroglu (2003) show that world endowments are too different for worldwide FPE.

I propose an international allocation of production that differs from H&K and that allows MNCs from South to relocate capital-intensive activities to North. With full employment, firms' employment in HQ and capital-or labor-intensive components adds up to North's endowment. *OabE* is such a combination in Fig. 2. The factors of the capital-abundant country (*0E*) are employed in HQ (*0a*) and in capital-intensive components (*abE*). Northern MNCs do not produce labor-intensive components. Therefore, they rely on Southern affiliates toward which they relocate labor-intensive activities. So far, this is a regular North-South story. However, as will become clear, we also need Southern MNCs to relocate capital-intensive activities to North in order to employ all factors of endowment *OE* at the same factor prices.

As in H&K, producing a good requires comparable amounts of capital- and labor-intensive inputs from one firm, i.e.: For any amount of manufacturing produced by firms of a country, the HQ services together with the labor- and capital-intensive components should form a trapezoid isomorphic to the large trapezoid *0123*. Hence, to complement their domestic production of capital-intensive components and HQ services, North's MNCs relocate labor-intensive components to Southern affiliates. As drawn, North, however, produces too many capital-intensive components (Only a fraction (*ab)* of these (*aE*) is needed to complement its HQ services *0a*). Therefore, part of its capital-intensive components (*bE*) is matched with South's HQ services and labor-intensive components. This amounts to Southern MNCs relocating capital-intensive components to affiliates in North. In sum, South's MNCs shift their capital-intensive activities to Northern affiliates, *at the same time* that there is the "usual" MNC movement from labor-intensive activities from North to South, a clear case of two-way MNCs. Fig. 3 shows how production is distributed between North's MNCs (that relocate labor-intensive components), South's MNCs (that relocate capital-intensive components) and non-MNC firms for our example – respectively the left, middle and right trapezoid.[19]

It is easy to show that two-way MNC activity with Southern MNCs that relocate part of their capital-intensive activities to North is possible for all endowments in area *023*. Moreover, two-way MNC activity is not just a possibility. For each endowment point, there is a whole class of equilibria with two-way activity. Since MNCs establish FPE one should not be surprised about this – It is a well-established result that the production pattern in two countries is indeterminate with FPE when there are more goods than factors. However, H&K's MNC concept (MNCs relocate stages of production and take advantage of factor prices differences) and their view of

vertical integration (moving production lines abroad while keeping HQ at the parent) restrict the set of possible allocations that are consistent with FPE. As North MNC's take advantage of cheap labor, H&K state -and I follow them- that North's resources are last poured into the labor-intensive component. [20] There is, however, a second way in which the FPE allocations are constrained and it is here that the difference between H&K's and my allocation arises.

I let Northern MNCs produce at least as many capital-intensive components as HQ services. H&K, on the other hand, let them produce more HQ services than capital-or labor-intensive components. H&K propose allocation *0a'b'E* for endowment *E* in Fig. 2. As *b'* lies on *02*, Northern MNCs produce enough capital-intensive components to complement HQ services *0a'*. Since North's MNCs only produce *b'E* labor-intensive components, they relocate the production *Ec'* of labor-intensive components to South's affiliates. This is standard, one-way relocation of labor-intensive activities from North to South within the MNCs. Only Northern MNCs open affiliates in South. Now compare this allocation with my *OabE*: With no production of labor-intensive components, capital-intensive components production in North is the largest possible (and larger than HQ services). *OabE* marks the maximum MNCs from South that are active in North, while there is still MNC activity from North to South. H&K's solution *Oa'b'E,* on the other hand, marks the other extreme: no MNCs from South at all.

Comparing the two solutions, one realizes there are for a given endowment many other (less extreme) equilibria whose headquarter vector ends between *a* and *a'* and whose capital-intensive vector between *b'* and *E*. All these equilibria have MNCs from South with capital-intensive affiliates in North. In fact, moving from *a'* to *a* and from *b'* to *b*, the number of southern MNCs increases. Interestingly enough, H&K choose the only equilibrium that has no southern MNCs. H&K do not allow firms from South to take advantage of factor price differences. It is hard to see why this would happen since North's firms can. H&K's allocation could be justified if there were no manufacturing firms in South before MNC emerged (i.e., complete specialization.) However, their endowment choice tells us this is not the case.[21] It is not entirely clear how H&K motivate

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[19] Appendix 1A discusses in detail how to obtain these trapezoids.

[20] Allocations such as *Od'* and *d'E* in Fig. 2 are consistent with a FPE, but (rightly) not considered by H&K. Such allocations would imply that capital-abundant countries relocate capital-intensive components to labor-abundant countries.

[21] Before MNCs emerge, North produces in manufacturing and South is active in both sectors. See graph in appendix: The endowments lie in region I.

their restriction. Probably their assertion that it is easier (less costly) to move labor- vs. capital-intensive components abroad does the job. Needless to say, one can easily assume the opposite (getting us to the other extreme equilibrium) if one wanted to limit the multiplicity of equilibria.[22] Ultimately, what combination prevails is an empirical matter.

One may wonder why H&K choose to restrict the equilibria in this way. One reason is analytical convenience. One can easily draw their solution – However, this is true also for other allocations such as *0aE*. Another possibility is the link between MNC activity and firm-specific assets. Since most of the world's R&D takes place in developed countries, it seems natural that these countries are the primary source for MNCs. Also the history of how MNCs have been analyzed is informative. There is an older literature that associates MNC activity with capital flows, for which returns on investment are critical. In this literature capital flows from North to South where the return to capital is higher. Even though from a micro perspective MNC activity is more about control than about capital flows (see Markusen and Maskus, 2001), H&K's allocation is consistent with that older literature. Finally, and this brings us back to the starting point of the paper, there is the data availability and there are the empirical analyses that have mostly taken the vantage point of rich, developed countries. With the increased importance of middle-income countries, the increased presence from non-OECD multinationals in OECD countries, it is perhaps time to face the richer implications of the factor proportions theory of the MNC.

2. Middle-income Countries

Having allowed for MNCs from the South to set up capital-intensive affiliates in the North, it is a small step to now describe MNCs in middle-income countries. In Fig. 4. I extend the setup to three countries. The country previously named South is now Middle and I introduce a very labor-abundant country South with endowment E_2O'. Taking advantage of factor price differences, South is engaged in very labor-intensive activities. For expositional simplicity, take the example where South only produces agriculture (*Oi*) and labor-intensive components (*iE₂*) that foreign MNCs want to produce there.[23] In this case, *O'iE₂* is its employment vector. Since North does not

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[22] Alternatively, one could argue that developed country markets are more open to foreign affiliates than developing countries. In other words, with an infinitesimally small cost for developed country MNCs to move abroad, we would here also move towards the equilibrium with a maximum number of MNCs from the South.

[23] I could allow for some HQ services in Middle since there may have been manufacturing firms before MNCs emerged – This does not affect the basic message for Middle.

produce any labor-intensive components, Middle produces whatever labor-intensive products South cannot produce.

It is easy to see what MNC patterns can emerge in Middle. Since Middle cannot satisfy the entire world demand for labor-intensive components (23), some of its domestic firms can become MNCs and relocate the production of labor-intensive components. The same can happen to its MNCs that go north. Some of them may keep labor-intensive components in Middle, whereas others can go north and south, leaving only HQ services in Middle. Since I have a firm-level data set that provides most detail on the operational activities of the parents of South Korean MNCs, I am particularly interested in what these patterns of MNC activity imply for factor intensities of the parents since this is an implication that I can study empirically with a panel of MNC parents. Middle's MNCs that go south become more capital-intensive, since they no longer produce the labor-intensive component.[24] As for the firms that go north: the higher the capital-intensity of the capital-intensive component (i.e. if higher than the overall firm capital intensity) the more likely the parent's capital intensity in Middle will be lower than that of the MNCs that go South.

The basic point of the above analysis is that despite the prominent role of the prediction that MNCs relocate labor-intensive activities to more labor-abundant countries, MNC activity can easily be shown to go in the other direction in H&K's model that arguable conveys best the idea stripped down to its bare essentials that MNCs organize their in-house production according to factor prices. MNCs will also relocate capital-intensive production to more capital-abundant countries. MNCs from middle-income countries will organize their operations between the affiliate and the parent in such a way as to take into account the differences in factor abundance between Northern or Southern host countries and themselves. As MNCs relocate capital-intensive parts to capital-abundant countries the parents become more labor intensive, as MNCs move labor-intensive parts to labor-abundant countries the parents become more capital intensive. It needs no arguing that the setup of H&K is very stylized and could be extended or modified in various ways.[25] For example, one could, following Helpman (1985) explicitly consider multi-product firms. It can be shown that this would not alter the basic premise that MNCs from middle-income countries can relocate 'activities' North and South, even though the specific

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[24] The most capital-intensive firms go both North and South (and only have HQ services in Middle).

[25] I want to show how one can generate two-way MNC activity even when one stays as close as possible to the canonical setup.

content of 'activities' (intermediate vs. final goods production) may change. The same is true for other motivations for MNC activity such as tariff jumping or market access. The hypothesis under investigation is that even if a firm's decision to move abroad is also determined by such motivation, the MNC will seek to organize its production between the parent and affiliate to take advantage of international factor price differences. With data on parent firm operations I formally test the proposition that relocating to the North vs. the South will decrease vs. increase the capital intensity of the parent. Before testing this hypothesis, I first provide some supportive evidence from South Korea's affiliates abroad.

2. The affiliates

Only since 1968 have South Korean firms been investing abroad and only since the early 1980s has the South Korean government gradually allowed its manufacturing firms to open affiliates abroad, see Kim and Kang (1997). Moreover, in the wake of the liberalizations in China and other East Asian countries, the composition of the countries that MNCs target has changed dramatically. Initially South Korean MNCs went mainly to rich, developed countries. In recent years, however, China has rivaled the US as the main destination of worldwide FDI. About half of South Korea's outward investment flows stay in the region and about half go to the US, the UK or Europe. Finally note that more than 50 percent of outward activity (measured by investment flows) takes place in manufacturing. Moreover, like in Taiwan, for more than a decade now, electronics has been the most important manufacturing sector with a steady increase -- accounting for about one third of total outward FDI in manufacturing.[26]

From unpublished sources of the Export-Import Bank of Korea for 1999, we can get a snapshot of the interactions between South Korean parents and their affiliates in manufacturing. Table I reports sales and exports from affiliates for the bigger companies with outstanding investment of over 10 million dollars. I have chosen firms in electronics, since electronics is the only sector for which sufficient data for these big firms is available across many different destination countries. Of particular interest are the columns 4-6 that shed a light on the intra-firm trade between parent and affiliate. The columns 5 and 6 report the intra-firm affiliate and parent exports as a percent of, respectively, affiliate and parent sales. I also include the exports of the affiliates to Korea as a percent of the affiliate total sales in column 4.[27] Even though the data for the affiliates are too

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[26]For more details, see Lee H. (2002). From UN (1992) for 1988, we know that South Korean parents own over 50 percent of the affiliates for 81 percent of affiliates or 75 percent of the FDI stock. There is 100 percent South Korean ownership for 65 percent of the affiliates and 55 percent of the FDI stock.

limited for a formal test (I use parent-level data in section 3 for a test) and even though there is considerable heterogeneity, the data do suggest that South Korean outward MNC activities do not entirely fit the North-North, North-South pattern. There is a steady stream of exports to the affiliate and from the affiliate back to the parent. This is not only the case for low-wage countries such as China or the Philippines, but also for high-wage countries. About 60 percent of Japanese or French sales are exported back to Korea. One may wonder what these flows represent. A recent OECD study for electronics in South Korea is suggestive. Lee B. (2002) classifies the affiliates of a sample of South Korean firms in electronics according to their *main* (not only) activity. Lee shows that about 55 percent of affiliates have production as their main activity. This fraction is slightly lower in developed countries, about 40 percent. In other words, affiliates are only just sales points.[28] Lee also reports that about half of South Korean affiliates in electronics produce intermediates and half finished products, this suggests that while there maybe some relocation of the production of (different) finished goods between affiliate and parent (what the multiproduct firm of Helpman (1985) suggests), these flows will also contain intermediate goods.

While this evidence does not preclude that market-access or tariff-jumping matter for MNC activity, it is clearly inconsistent with the most stripped-down version of horizontal models of MNC activity in which a foreign affiliate just replicates the final good of the parent and affiliate production is just a (cheaper) substitute for exports. This data suggests that having affiliates abroad is not just about producing the same goods from scratch at a different location. Parents either produce finished or intermediate goods abroad and affiliates import inputs and/or (different) finished goods from the parent.

In the last two columns of Table I the capital-labor ratios of the affiliates and parents are compared. (The Export-Import Bank data are merged with the *KIS* data that contain information of the parent firms.)[29] The parents tend to be less capital-intensive than their affiliates in more capital-abundant countries and more capital-intensive than their affiliates in more labor-abundant countries. This observation suggests in my view that the factor endowments of the destination country will affect how production is distributed between affiliate and parent. There may be motives such as market access or tariff jumping involved, but what is produced in the affiliate, be

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[27] These can also include (next to the direct exports to the parent) exports to South Korean firms that are associated with the parent.

[28] I focus on production related affiliates in manufacturing, not wholesale.

it an intermediate or a different set of final goods, is not independent of the factor endowments of the destination country. This points to the basic prediction that MNCs will relocate more capital-intensive activities to more capital-abundant countries and more labor-intensive activities to more labor-abundant countries.[30]

Especially interesting are two South Korean MNCs in electronics and communications that have affiliates both in Japan and in China (and FDI over 10 million dollars). The first firm's parent has a capital-labor ratio of 194 thousand dollar per worker. The factor intensity of its four Chinese subsidiaries is one third of this or less, and its Japanese counterpart is with 527 almost three times as high. For the second multinational, the numbers are 126 thousand dollars per worker for the parent, about one tenth of this for the Chinese subsidiary, 13, and about two and a half times the South Korean capital intensity for the Japanese plant, 191. Also these numbers seem to suggest that vertical integration is about more than merely relocating labor-intensive activities.

Note that with only a cross section of affiliates available, I have to rely on the historical capital stock. The pattern of the data is very pronounced (a higher K/L in Japan, a lower in China), and unlikely to be overturned by more accurate measures. Note that one could argue that the affiliate and the parent produce the same set of goods and that the difference in their K/L is due to differences in factor prices. While differences in factor prices surely affect the capital-intensity of the affiliate (Exactly because of these differences, MNCs should organize production differently for different destination countries.), this claim is inconsistent with significant intra-firm flows and Lee (2002)'s observations that I mentioned before. More rigorous testing is needed, however, and we refer the reader to the next section where we investigate the implications for parent production of relocating either to more or to less advanced countries.

3. Factor intensities of the Parents

The evidence of South Korean affiliates abroad suggests that middle-income countries relocate capital-intensive intermediates/finished goods to capital-abundant, and labor-intensive activities to labor-abundant countries. However, the presented evidence is only for a limited set of fairly heterogeneous firms and by no means conclusive. In this section I investigate more rigorously to what extent the direction of outward activities is associated with a change in factor intensities of

[29] For a detailed discussion of these parent-level data, see section 3.1.

[30] In the knowledge capital model by Carr et al (2001) a fixed set of knowledge based assets and activities are associated with the parent MNC and independent of the destination country of the affiliates.

the parent MNC: Is it the case that relocating to capital-abundant countries is associated with a lower capital intensity of the parent and relocating labor-intensive with a higher capital intensity?

3.1. Data

The South Korean firm-level data are found in the *KIS Financial Analysis System 2000* and *KIS Stock Market Analysis Tool 2000* database of the Korea Investors Services Co., Ltd, which contains the balance sheets and the profit and loss statements of all South Korean firms that are listed on the Korea Stock Exchange.[31] The selected period runs from 1980, the beginning of the dataset, to 1996, right before the financial crisis. (To avoid complications related to the financial crisis, the last three years of the dataset are not included in the analysis.) The dataset includes 235 firms in 1980 and 601 firms in the last year.[32] In other words, this is an unbalanced dataset: New firms enter as time goes by, yet no firms leave.[33] In total there are some 8893 observations available. During the period that is covered in the data there is a liberalization of outward FDI taking place in South Korea, so firms are increasingly allowed to invest abroad. Initially, there are only 22 MNCs; by 1986 there are about 100; in 1990 one counts about 180 MNCs and by 1996 some 300 firms that have affiliates abroad. In 1987 came a significant liberalization in the wake of increasing current account surpluses: Foreign exchange constraints on foreign direct investment were removed in most sectors. Since 1996 any remaining restrictions in particular sectors have been removed.[34] Even though South Korea's outward FDI is with slightly less than one percent of GDP still fairly moderate compared to the 6 percent for Taiwan, in absolute amounts it is virtually the same for both countries, see UN (2000). Note that the manufacturing firms that are listed on the Korean Stock Exchange account for 73 percent of total manufacturing in 1990, so that the firms that are studied are increasingly representative for South Korean manufacturing. Overall, the firms that are listed tend to be larger firms, which is in part due to the criteria that have to be fulfilled before a firm can be listed.

The dataset provides information on a firm's outputs and inputs. All variables except for FDI flows are in 1000 Korean Won. For this particular exercise I am especially interested in the

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[31] For a more detailed discussion of the data, see H. Lee (2003)

[32] I have dropped observations with missing data or inconsistent reporting.

[33] Before the financial crisis it was very hard for esp. larger firms to go bankrupt, hence no exits.

[34] For a more detailed discussion, see Kim and Kang (1997)

capital-labor ratio of a firm. The data set contains the book value of the capital stock (an imperfect measure for capital), the yearly employment numbers and total gross output. The firms are classified by 2-digit *Korean Standard Industrial Classification* code, containing 13 different industries. The criteria for assigning a firm to an industry is whether 60 percent or more of a firm's output takes place in that sector. This criterion causes some 2000 (firm-year) observations to be placed in "other manufacturing/non-classified sector". Table 2 provides some summary statistics for the all firms, the MNCs (that invested at least once abroad) and the firms that never invested abroad for the last year of the sample. It is clear that MNCs are on average bigger in terms of output and in terms of employment. They tend to be more capital-intensive than the other firms. The output values are deflated with the industry-specific domestic producer price indices from the Bank of Korea's *Price Statistics Summary*. The capital stock is deflated with the price deflator for the three asset categories buildings, structures, machinery and equipment and vehicles from The Bank of Korea's *Economic Statistics Yearbook*.

The *KIS* database is then merged with data from the (unpublished) firm-level Export-Import Bank of Korea data that provides the foreign direct investment flows at the firm level for the same period. South Korean firms listed on the stock exchange invest in some 87 host countries; see Table 1A in the appendix for a complete list. During the period covered by the data there is a fairly dramatic change in the destination countries that MNCs target. Since the late 1980s and especially since the end of the Cold war and the establishment of diplomatic relations between South Korea and China in 1992, South Korean MNCs increasingly went to China. In order to differentiate MNC's foreign activity abroad I will weight the FDI flows by the real per capita GDP of the destination countries relative to South Korea, see below. The data that are used for this are taken from the World Bank (in constant 1995 dollars).

3.2 Specification and results

To study whether indeed South Korean multinational firms relocate capital-intensive activities (be it the production of intermediate goods or of a subset of finished goods) to capital-abundant countries and labor-intensive parts to labor-abundant countries, I investigate whether the particular destination of a MNC's outward investment, North vs. South, matters for the factor use of the MNC parent. The prediction is that relocating labor-intensive activities to Southern countries should increase the capital-intensity of the parent, whereas relocating capital-intensive components will (most likely) do the opposite. The alternative hypothesis is that the factor abundance of the destination country does not matter for how the MNC organizes its activities

internally. I first discuss the baseline specification that I propose with the particular variables that I create to identify the factor abundance of MNCs' destination countries and I then address the endogeneity concerns that it raises. I finally present the estimation results for various subgroups and various specifications.

Baseline specification

I propose the following regression (1) that relates the capital intensity of South Korea's firms to the changing destination of its outward investment after the firms have become multinationals. (A firm becomes a MNC with its first investment abroad.) The specification exploits the fact that I can study most South Korean firms and their operations before and after they invest abroad and as they change target countries. As the data for the affiliates suggested, there is quite a bit of firm-level heterogeneity. With a panel of firms I control for this firm-level heterogeneity as I include firm-level fixed effects and as I focus on the intertemporal dimension. I also include year dummies and a measure to control for the changing size of the firms. The regression can be related to the cost functions in the literature on increased wage inequality, to which I add variables 'MNC' to mark when a firm goes multinational and 'N/S' to capture the factor abundance of a MNC's destination countries: Conditioning on output, and for given factor prices, firms determine the optimal allocation of capital and labor. Note that the year effects are often viewed as proxies for changing factor prices.[35] They should proxy for how the changing comparative advantage of South Korea affects the factor inputs of all firms across the board.

$$\text{Ln } (K/L)_{it} = \alpha_i + \alpha_t + \beta_1 \text{ MNC}_{it} + \beta_2 \ln(\text{FDIstock}_{it}) + \beta_3 \ln \text{N/S}_{it} + \beta_4 \ln(\text{size}_{it}) + \varepsilon_{it} , \qquad (1)$$

where K/L_{it} is the capital-labor ratio of the South Korean firm i in year t; α_i and α_t are respectively the firm and the year effect; MNC is a dummy variable that is one when a firm starts investing abroad (it is one forever after that initial decision irrespective of whether there are any future investment flows) and zero before that; the FDIstock is the historical FDI stock undertaken by the firm; N/S stands for two different measures that should capture whether the MNC goes to more or less advanced countries (North or South). In particular, N/S increases with the capital-abundance

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[35] See Feenstra and Hanson (1996) for US MNCs relocating and Head and Ries (2002) for Japan. Both studies find a significant impact of outsourcing activities to affiliates abroad on the relative skilled vs. unskilled wage shares.

of the destination country relative to South-Korea and I discuss these measures shortly. To control for firm size, I include a firm's gross output as well.

The hypothesis under investigation states that the more (less) capital-abundant the destination country is, the less (more) capital-intensive the parent should get. In other words, the β_3-coefficient should be negative, i.e. $\beta_3 < 0$. Note that I include a MNC dummy in addition to the historical FDI stock that should capture the extent of a firm's foreign activities. This is informed by the theory of MNCs that assumes there is a fixed cost associated with setting up a foreign affiliate and with investing abroad. It is expected that the coefficient on the MNC dummy is positive, i.e. $\beta_1 > 0$.

To identify the factor abundance of the host countries of South Korea's affiliates, one faces the challenge that firms may invest in multiple countries. I propose two different measures to indicate whether or not a firm invests predominantly in the South or predominantly in the North. A first option is to weigh a firm's FDI flows with the per capita GDP of the destination country. In expression (2) below I multiply the share of firm i's FDI flows in its total historical FDI stock up to year t by the destination country j's per capita GDP relative to that of South Korea (sk) (I suppress i on the right-hand of the expression).[36] This indicator of the average per capita income of the destination country of a firm's investments should capture the capital abundance of firms' average destination country relative to South Korea. If the measure is larger than one, we know that the mass of a firm's investment goes north, if the measure is smaller than one, on the other hand, most of it goes south. In my dataset this N/S1 measure is 2.5 times South Korea's real per capita income for the median South Korean multinational. This number indicates that there is a fair amount of activity moving 'up', i.e. to higher income countries. In other words, I should be able to capture the impact of the foreign activities that are typically absent in the studies of MNCs that take the vantage point of advanced developed countries that either invest 'south' or in other rich countries.[37]

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[36] I choose to use the stock of FDI since the affiliates abroad remain active, even when the FDI flows have seized.

[37] Head and Ries (2002) for example report that the average destination country of their median Japanese firm is 0.68 of Japan's per capita GDP.

$$N/S1_{it} = \sum_{j=1,t'=1}^{N,t} FDIjt' \times \left(\frac{GDPjt' / Ljt'}{GDPskt' / Lskt'} \right) \Bigg/ \sum_{j=1,t'=1}^{N,t} FDIjt' \qquad (2)$$

with j indicating the destination country of FDI and t time. GDP/L measures a country's per capita GDP. In the regression we take the log of $N/S1_{it}$.[38]

Note that the measure and the way it is constructed have some advantages. I take the FDI activities of a firm as given. As we know, why firms open affiliates abroad can be motivated by a variety of reasons and this decision can be affected by distance, tariffs, the presence or absence of large markets, etc. By including N/S in the regression, I study whether there is a relation between the factor abundance of the destination country for these investments and the factor intensity of the parent in South Korea, while allowing for motivations other than factor price differences for these investments.

A variation on N/S1 is to use a dummy variable that is one if the proposed measure (2) is larger than one (as firms go north) and zero when it is the case that the mass of the FDI stock is going south. The advantage of the first measure compared to the second is obviously that it gives a continuum. It measures the changing direction not only of the MNCs that exclusively invest in the North or exclusively in the South, but also of those that switch between North and South. The second measure is primarily identified by the firms that switch between north and south. This involves some 74 firms covering some 1100 (firm-year) observations. To the extent that these firms represent more dramatic changes and to the extent that relocating production is a more discrete process, this is a better measure.[39]

Figure 5 plots the (natural log of) the average per capita GDP of a firm's destination country, N/S_1, vs. (the natural log of) the stock of the firm's FDI for the years 1980, 1985, 1990 and 1995. One sees clearly how the destination of South Korea's MNCs gradually changes. From initially being almost exclusively oriented towards the richer, developed countries, the gradual

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[38] Most of the action in expression (2) comes from the changing FDI-shares over time (not from South Korea's changing relative per capita GDP vis a vis other countries). Still, the year effects should capture any effects due to Korea's changing relative per capita GDP.

[39] If the decision is to outsource labor-intensive parts, it may not matter whether the destination country is,

liberalizations in East Asia bring South Korea's firms to a position where its stock is fairly evenly divided between destination countries in the North and countries in the South. This fairly even distribution puts South Korea in the ideal position to study two-way MNC activity and in particular to evaluate the position of middle-income countries in the factor proportions theory of the multinational corporation. [40]

<u>Endogeneity</u>

The main objective of the present study is to determine whether indeed the changing capital-abundance of a firm's destination country affects the factor use of its parent negatively. One may worry that the endogeneity of the right-hand side N/S variable will bias the estimation of regression (1). Theory suggests that as the parent relocates activities to more capital-abundant countries (proxied by N/S), less capital per worker will be required at the parent plant; the opposite should hold for relocating to labor-abundant countries, i.e. $\beta_3 < 0$. However, a feedback effect in the opposite direction is not inconceivable when N/S also depends on a firm's K/L. I approach this issue from three different angles. I first investigate under which (reasonable) conditions I can judge the sign of β_3 even if there is a bias. I also propose an instrument for N/S and I finally present the estimates with lagged dependent variables.

If indeed the destination of a firm's investments, N/S, also depends on the firm's factor intensity, K/L, the coefficient β_3 will be biased. However, to the extent that higher capital use of the parent induces firms to move to more capital-abundant countries (N/S depends positively on K/L), there is a (positive) upward bias that does not favor my hypothesis – to confirm the hypothesis I need to estimate a negative β_3.[41] In other words, if I estimate the right (negative) sign for N/S, which I

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say, two or three times as labor-abundant as South Korea.

[40] Head and Ries (2002) argue that the positive impact of outsourcing on firms' relative share of skilled vs. unskilled labor diminishes as Japanese firms outsource to other high income countries instead of to low-income. To the extent that Japan was a middle-income country early in their sample and to the extent that it outsourced to more advanced countries at the time (most of its FDI went to low-wage countries such as Taiwan, South Korea etc. in the 1970s, however), their findings support my thesis: Middle-income countries outsource labor-intensive parts to labor-abundant and capital-intensive parts to capital-abundant countries.

[41] Consider, for expositional purposes, a system of OLS regressions (a) and (b) that would represent the true (simultaneous) relation between *K/L* and *N/S*. Regression (a) is similar to our regression (1) (a): $K/L = X_1\beta + \alpha_1 N/S + \varepsilon$; regression (b) indicates that N/S depends on K/L: $N/S = X_2\beta + \alpha_2 K/L + \mu$. Under the outsourcing hypothesis the coefficient α_1 will be negative. Estimating regression (a) while ignoring regression (b) will yield a biased coefficient. With α_2 positive, an independent increase in K/L (due to a positive shock ε in regression (a) that is uncorrelated with μ) will raise N/S. Therefore, N/S will be positively correlated with the error in regression (a) and therefore the estimated coefficient will have an

will, we know that the unbiased estimate would be even more negative. Note that it is not unlikely that a firm's K/L affects N/S in a positive way. Only for increasingly more capital-intensive firms does it make sense to relocate capital-intensive activities to capital-abundant countries. If not much capital is used, why move it? Also, investments to richer countries tend to be in more capital-intensive sectors, whereas those to poorer ones takes place in more labor-intensive sectors.[42] Note that to the extent that a MNC's outward activities are driven by motives other than factor prices (i.e. market access), one expects that increasing capital-labor ratios make firms more likely to move to more capital-abundant countries – esp. if more capital-intensive products tend to be higher-quality products for which there is a larger market in richer (more capital-abundant) countries.

One can, of course, also try to instrument for N/S. The gradual shift of South Korea outward activities may in large part be due to changing policies toward FDI outside (and inside) South Korea. On the one hand, there is the gradual liberalization in South Korea since the 1980's. Gradually the South Korean government allows firms from different sectors and subsectors to invest abroad. On the other hand, there are the liberalizations that take place in the surrounding low-wage countries of East Asia in the 1980's. Both types of liberalizations make the gradual shifts in the destination of South Korea's MNCs possible. Ideally one would want to construct instruments that link N/S to the sectoral liberalizations by the South Korean government or any destination country government. Unfortunately, these (esp. the South Korean) liberalizations took place at a much more disaggregate level than the 2-digit KSIC classification of the firm-level data that I have, so that is impossible to directly link a firm to a liberalization in a sector at a given time.[43] There is, however, a cruder way to instrument for N/S. In particular, one can focus on China, the main low-wage destination for South Korea's MNCs. Even though, South Korean firms had been investing in China for a while, the end of the Cold War and the subsequent establishment of diplomatic relations between South Korea and China in 1992 carried a stream of

upward (positive) bias.

[42] See also for the US, Hanson, Mattaloni and Slaughter (2001). Yeaple (2002) notes a positive interaction between factor intensity and factor abundance for US outward FDI – He uses skilled and unskilled labor. To the extent that skilled-intensive sectors tend to be the more capital-intensive ones, this is in line with the hypothesis.

[43] As I, in addition, lack detailed data (beyond FDI flows) on the operational activities (such as sales, input use, etc.) of the affiliates, I have to focus the analysis on the question, given that a firm invests in various countries, how does factor abundance of the destination country help shape the internal workings of the multinational, instead of, why do affiliate operations occur in particular destination country.

MNCs to China in its wake. Therefore, I will use a dummy that is one after 1991 to instrument for the changing direction in South Korea's target countries as measured by N/S.

Finally, even though this does not fully address the correlation between the right-hand side variables and the error from the regression, the literature often introduces lagged values of the independent variables in regressions à la (1) – It also suggest an adjustment lag. I will present estimation results with lagged variables.

Estimation Results

In this section I present estimates of the baseline regression equation (1) for different sub samples and with variations in the specification (with/without year effects, with industry trends) that should illustrate the robustness of the finding. Tables 3 through 6 report the estimation results. Table 3 focuses on firms that at some point in the sample become a multinational, i.e. the firms that at least in one year of the sample invest abroad. Table 4 includes the control group of firms that did never invest abroad during that same period. The results are mostly consistent across the two datasets; the estimates are similar in sign and magnitude and there are no qualitative differences between estimates with contemporaneous or lagged right-hand side variables or, for that matter, with the instrumental variables. In Table 5 I single out the firms that switch between investing in a more capital-abundant and a more labor-abundant country. I also provide some estimates at the sectoral level in Table 6.

As the Tables 3 and 4 indicate, one obtains a positive and significant coefficient for the MNC dummy or MNC lagged. This implies that a higher capital-to-labor ratio is required from firms that want to invest abroad in all specifications, which is what one would expect if there is a fixed cost associated with investing abroad. However, this positive impact is mitigated not only by the destination country of the investment flows, but also by the size of the stock of a firm's outward investment. An increase in the total stock of FDI of a firm has a negative impact on its capital-labor ratio. Note that this still leaves a net positive increase in the capital-labor ratio of the median MNC firm that invests abroad. (For the median firm that invests abroad: FDI stock of 6.429 x - 0.023 (coefficient of contemporaneous FDI stock in Table 3) = -0.147 is smaller (in absolute size) than the estimated coefficient of the FDI dummy, 0.34).

Of central interest is the coefficient on N/S. The N/S- variable measures the extent to which firms invest in the North versus in the South and whether this over time is associated with a higher or a

lower capital-labor ratio. For both the continuous variable NS_1 and for the North-South dummy NS_2 I obtain a negative estimate in all cases in Tables 3 and 4.[44] As argued above, there is a likely, positive (upward) bias in the estimated coefficient of contemporaneous N/S, as the capital-intensity of the firm may affect the direction N/S positively. In this light, it is important to note that we estimate a negative coefficient. Correcting for the bias would yield an even more negative coefficient, i.e.: the obtained sign is not affected by the bias. Using lagged right-hand side variables confirms the sign. Across all specifications in Table 3 and 4, the dummy variable is somewhat more precisely estimated. In all cases and for both datasets is the North-South dummy significant at the 95 percent level. For the group of firms that at least once invested abroad that is reported in Table 3, the coefficient estimate for the continuous variable N/S is significant at the 95 percent level in all but one case (i.e. at 90 percent for lagged variable with year effects). For the entire group of firms in Table 4 (including firms that do not invest abroad) most estimates are significant at the 95 percent level. (with year effects the coefficient on the continuous variable is significant at 90 percent; the lagged variable has the right sign but is insignificant.) In last column of Table 3 and 4 I present the instrumental variable estimates using the beginning of diplomatic relations with China as instrument (with robust standard errors). As one can see the instrumental variable estimates confirm the basic result.

All the estimates with the dummy N/S variable suggest that firms investing in a northern country have declining capital-intensity. On the other hand, firms that move to a southern, low-wage country are associated with increasing capital-labor ratios. Or, in terms of the continuous variable, the more south a firm goes the more capital-intensive it is and the more north it goes, the less capital-intensive. For the median firm, with a destination country of 2.5 times South Korea's GDP, one obtains a drop in the capital-intensity. (Note that this drop still does not undo the higher capital-labor requirement for investing abroad – the coefficient on the MNC dummy.) This empirical result corroborates the pattern of intra-firm trade and capital-labor ratios of affiliates vs. parents that I described in section 2. As such, the estimates are consistent with the prediction of two-way MNC activity for MNCs from middle-income countries. (More than average) capital-intensive activities are outsourced to the capital-abundant countries of the North and the labor-intensive stages of production find their way into labor-abundant countries.

In what follows, I investigate the result for different samples. I first consider firms that shift the direction of their investments from North to South or from South to North. Table 5 reports the

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[44] One obtains similar results if one includes sector-specific trends in the regression.

estimates for this group. As mentioned before, this group includes 74 firms (good for some 1100 firm-year observations). Thirty percent of these firms at least at one point shift the destination of their MNC activities from South to North. I run regression (1) for this subgroup of firms that move from South to North. I also include the results for the remaining group of firms that predominantly move from North to South. As one can see, the coefficients are of the right sign and they are in most instances significant at the 95 percent level. (I present the estimates with and without lags and the IV estimates.) To study the robustness of the results, I have also broken down the sample in a different way (not reported), focusing exclusively on firms that are active in the North or the South. The firms from the North confirmed our results so far. For the firms of the South I obtained a positive and insignificant (at 90 percent) coefficient on N/S1. While this may suggest that moving more to the South, once you are in the South, does not matter as much, it may as well simply be a function of the relatively small sample size.

Table 6 then provides estimates of the stripped-down fixed effects regression with the N/S dummy across various sectors for both datasets. I present the estimates for sectors with a minimum number of observations – more than 200 observations in the dataset with only MNCs. (The results with lagged independent variables, not reported, are qualitatively similar.) As one can see, the signs are except in one case (Transportation) consistent with the aggregate estimates and the coefficient estimates are mostly significant in spite of the limited set of observations. The magnitudes of the estimated coefficients do vary somewhat across sectors, however. (The coefficients tend to be more precisely estimated for the larger dataset that also includes domestic firms.) The results for textiles, electronics and petroleum and chemicals best mimic the aggregate estimates: a positive coefficient on the MNC dummy, a negative coefficient on the stock of accumulated outward FDI and a negative coefficient on N/S showing an increase in the capital-intensity of the parent as it goes south and a drop as it goes north. That the results for electronics, a sector often referred to exactly because of its extensive outsourcing, is important.

Conclusion

Multinationals predominantly originate from advanced, developed countries. This does not imply, however, that MNCs from countries that do not belong to this select group are non-existent. In the 1970s and early 1980s countries such as Argentina, Brazil or India did have their own multinationals. However, this often-called 'first' wave of MNCs was mainly regional and directed towards countries at a similar stage of development; it did not expand dramatically. The more

recent wave of MNC activity from the middle-income countries in Asia seems different. Not only has it experienced a fairly steep increase; it has also been much more diverse in its destinations.[45] A significant fraction of the multinationals from these countries have opened affiliates either in less or in more advanced countries.

In the present study I have exploited this interesting mix of more and less developed nations as destination countries for MNCs from middle-income countries to learn about the in-house distribution of production between affiliate and parent within the MNC. What emerges is a view of MNC activity that complements the way in which we have been used to think about multinational activity. Relocating stages of production or part of the scope of production is not merely a one-way, North-South street as implied by the theories of Helpman and Krugman. Using a unique firm-level data set for South Korean firms and multinationals I document that relocating production goes beyond moving labor-intensive activities to labor-abundant countries. Statistics of South Korea's affiliates suggest that South Korean MNCs are shifting capital-intensive activities to more advanced countries such as Japan at the same time that they move production to China. In addition, a panel data analysis of the factor use of South Korea's MNCs parents bears out the implications from this ability to relocate both south and north. Targeting more advanced countries is associated with the decreasing capital intensity of the parent, whereas moving south with increasing capital use per worker. In the more theoretical part of the paper, I show how this (empirically relevant) ability to relocate capital-intensive activities to more capital-abundant was ruled out in the existing literature based on unnecessarily restrictive assumptions.

The ability to relocate more capital-intensive components to more capital-abundant countries is intriguing. On the one hand, it shows us how the pattern (and function) of outward FDI changes as countries develop and how MNC activity can be another way to let a country exploit its specific comparative advantage to the fullest. As a country breaks up stages or scope of production, it can shed those (labor-intensive) activities that it used to perform all too well in the past and defer the (more capital/technology-intensive) activities it is not yet as well equipped to perform competitively. At the same time, it raises a broader issue. The Asian Tiger's growth experience has attracted a fair amount of research, in large part in an attempt to disentangle growth and trade. The question arises, whether these countries' outward investment had any stake in their successful development strategy, i.e. whether the changing pattern of MNC activity is

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[45] See Dunning (1997)

more than just an endogenous response to a changing economic environment. To address this question, however, more careful study is needed of the specific impact of outward activities (and the differential impact across destination countries) on firm performance and especially on productivity.

Bibliography

Aitken, B, A. Harrison, 1999, Do Domestic Firms Benefit from Foreign Investment? Evidence
        from Venezuela., *American Economic Review*, 89, p. 605-618.
Arndt, S., 1997, Globalization and the Open Economy, *North American Journal of*
        Economics and Finance 8, 71-79.
Bernard, A. and B. Jensen, 1999, Exceptional Exporter Performance: Cause, Effect or
        Both?" *Journal of International Economics* 47, 1-26.
Brainard, L., 1993, A Simple Theory of Multinational Corporations and Trade with a Trade-off
        between Proximity and Concentration, NBER WP 4236.
Brainard, L., 1997, An Empirical Assessment of the Proximity-Concentration Tradeoff between
        Multinational Sales and Trade, *American Economic Review*, p. 520-544.
Davis, D. and D. Weinstein, 2001, An Account of Global Trade, American Economic Review,

        91, 5, 1423-54.

Deardorff, A., 1998, Fragmentation Across Cones, Mimeo, Univ. of Michigan.
Debaere, P., 2003, *Relative* Factor Abundance and Trade, *Journal of Political Economy 111*, 589
        -610.
Debaere P. and U. Demiroglu, 2003, On the Similarity of Country Endowments, *Journal of*
        International Economics 59, 101-136.
Dunning, J. Hoesel, R. and R. Narula, 1997 Explaining the 'New' Wave of
        Outward FDI from Developing countries: the Case of Taiwan and Korea, *International*
        Business Review.
Feenstra, R. and G. Hanson, 1997, Foreign Direct Investment and Wage Inequality: Evidence
        from Mexico's Maquiladoras, *Journal of International Economics* 42, 371-393.
Hadad, M. and A. Harrison, 1993, Are There Positive Spillovers from Direct Foreign Investment?
        Evidence from panel data for Morocco, *Journal of Development Economics* 42, 51-74.
Hanson, G., R. Mataloni and M. Slaughter, 2001, Expansion Strategies of U.S. Multinational
        Firms: in D. Rodrik and S. Collins (eds) *Brookings Trade Forum 2001*.
Hanson, G, R. Mataloni and M. Slaughter, 2002, Vertical Specialization and
        Multinational Firms, Mimeo Dartmouth.
Head, K. and J. Ries, 2002, Offshore Production and Skill Upgrading by Japanese
        Manufacturing Firms, *Journal of International Economics*, 58, 81-105.
Helpman, E., 1984, A Simple Theory of Trade with Multinational Corporations, *Journal of*
        Political Economy, p. 451-471.
Helpman, E., 1985, Multinational Corporations and Trade Structure, *Review of Economic Studies*,
        p. 443-458.
Helpman, E. and P. Krugman, 1985, *Market Structure and Foreign Trade*, MIT Press.
Jones, R. and H. Kierzkowski, 1997, Globalization and International Fragmentation, Mimeo.
Kim, J-D and I-S Kang, 1997, Outward FDI and Exports: The Case of South Korea and Japan,
        Journal of Asian Economics, 8 (1), p. 39-50.
Lee, B., 2002, FDI from Developing Countries: A Vector for Trade and Development,
        Development Centre Studies, OECD.
Lee, H., South Korea's Outward FDI, Firm-level Evidence, Mimeo University of Texas, Austin.
Lipsey, R., 2001, Foreign Direct Investment and the Operations of Multinational Firms:
        Concepts, History and Data, NBER WP 8665.
Markusen, J., 1984, Multinationals, Multi-plant Economies, and the Gains from Trade, *Journal of*
        International Economics, 205-226.
Markusen, J., 1995, The Boundaries of Multinational Enterprises and the Theory of International

Trade, *Journal of Economic Perspectives*, 169-189.

Markusen, J. and K. Maskus, 2001, General-Equilibrium Approaches to the Multinational Firm: A Review of Theory and Evidence, NBER WP 8334.

Rodriguez-Clare, A., Multinational Linkages and Economic Development, *American Economic Review*, 1996.

Roberts, M. and J. Tybout, 1997, The Decision to Export in Columbia: An Empirical Model of Entry with Sunk Costs, *American Economic Review*, 87, pp. 545 – 564.

UN, 2000, *World Investment Directory, South East Asia and the Pacific*, Volume 7, New York.

UN, 1992, *World Investment Directory, Asia and the Pacific*, Volume I, New York.

Yeaple, S., 2001, The Determinants of U.S. Outward Foreign Direct Investment: Market Access vs. Comparative Advantage, Review of Economics and Statistics, forthcoming.

Figure 1

Figure 6. Developing economies and Asia and the Pacific as a share of world FDI outflows, 1980-1998
(Percentage)

Source: UNCTAD, FDI/TNC database.

Figure 2

Figure 3

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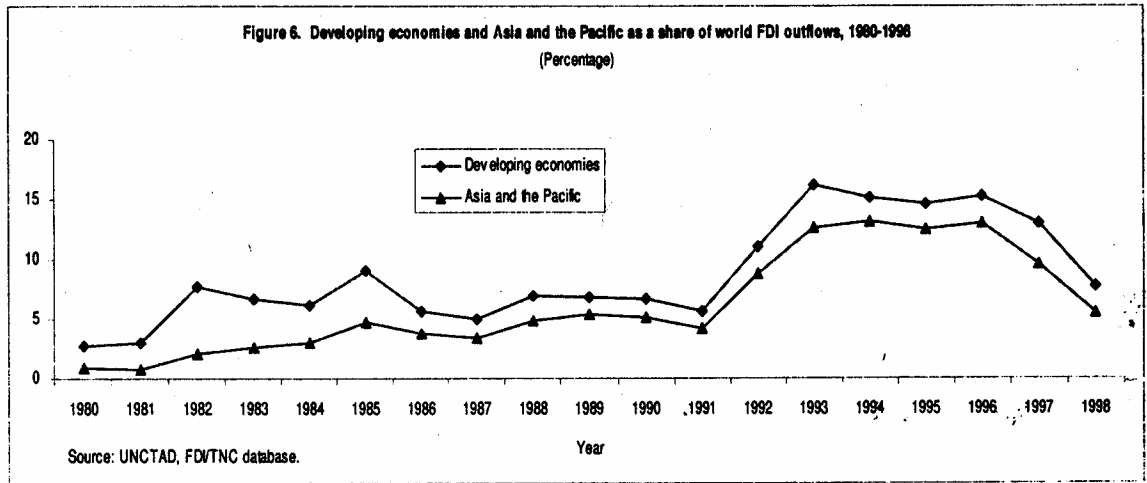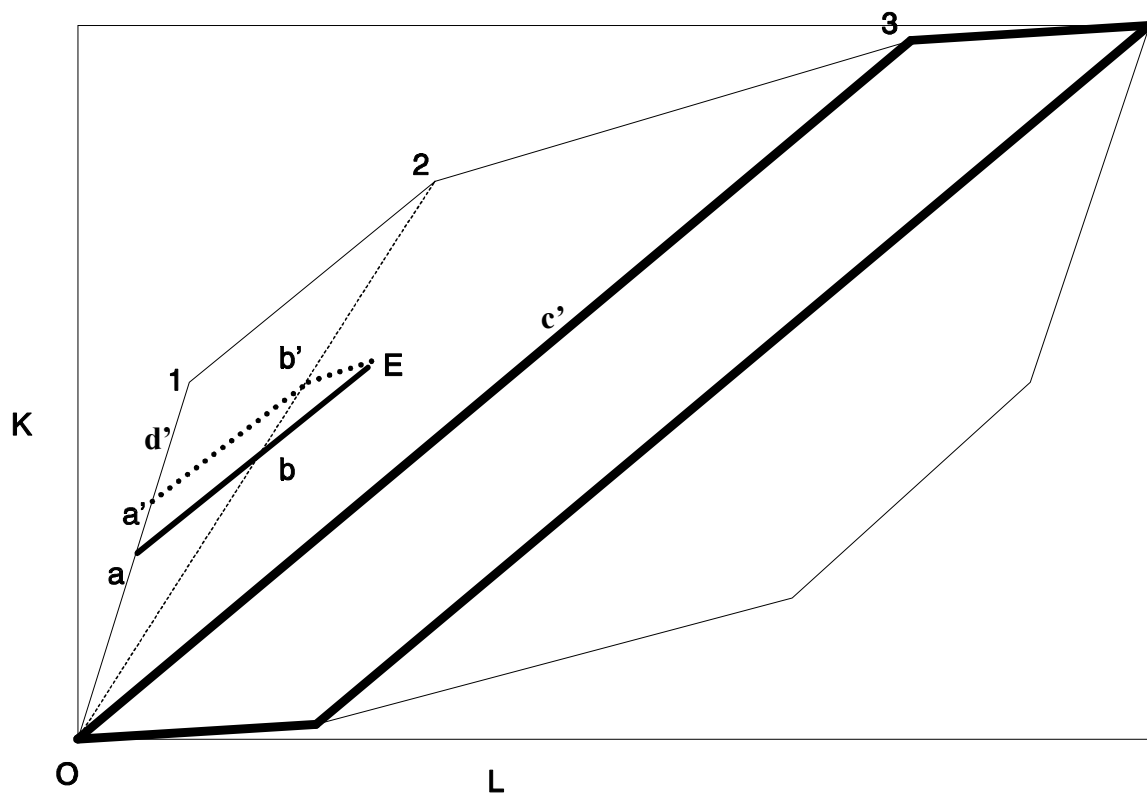
Figure 4

Figure 5: The changing destination of South Korean FDI

14.8749

FDIstock

0

-2.13886   NS   1.99449

N/S vs FDI stock, 1980

17.3856

FDIstock

0

-3.03715   NS   1.9737

N/S vs FDI stock, 1985

N/S vs FDI stock, 1990

N/S vs FDI stock, 1995
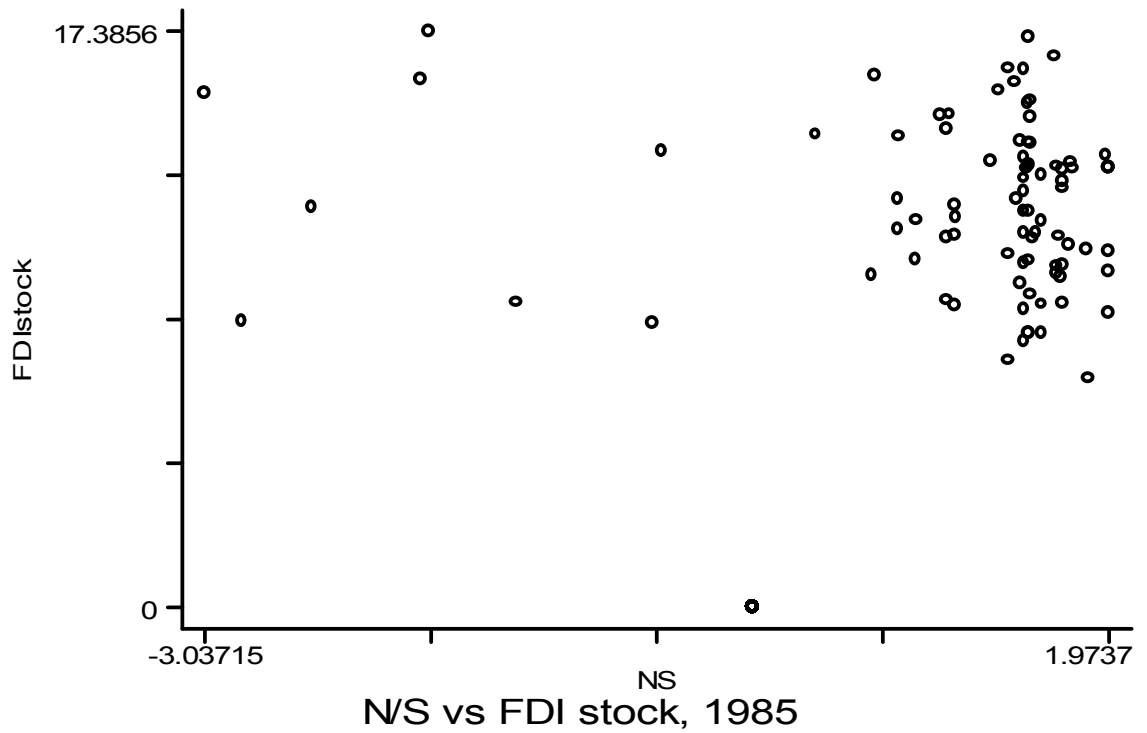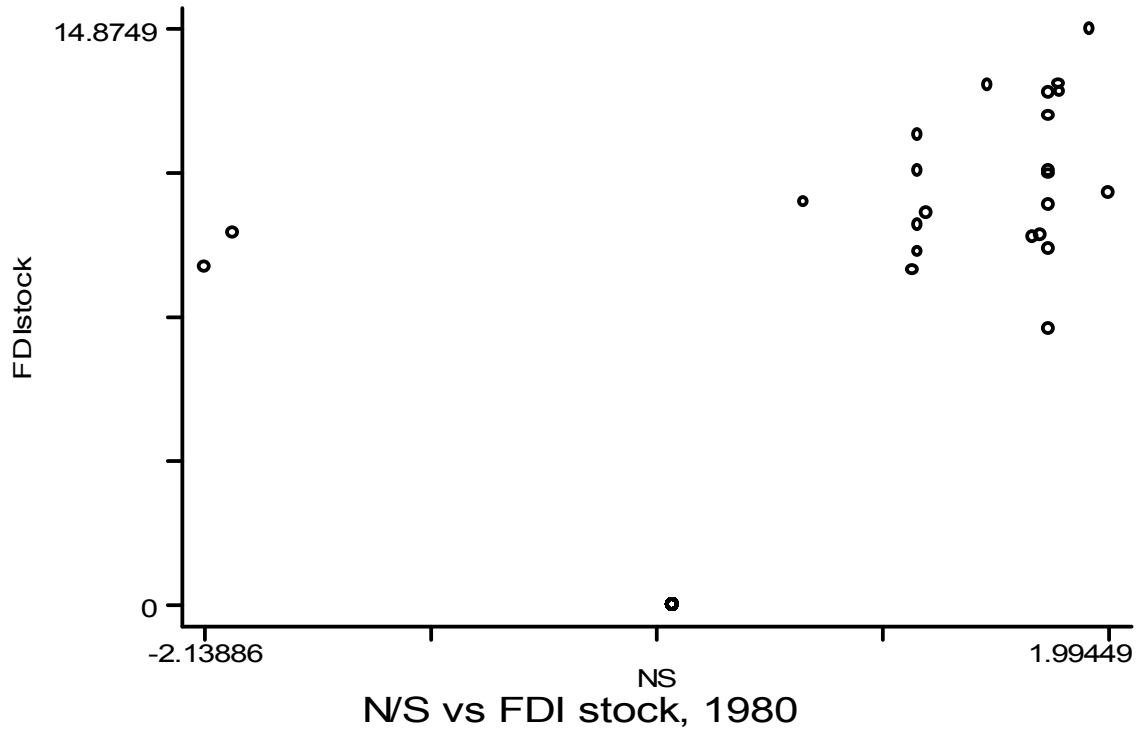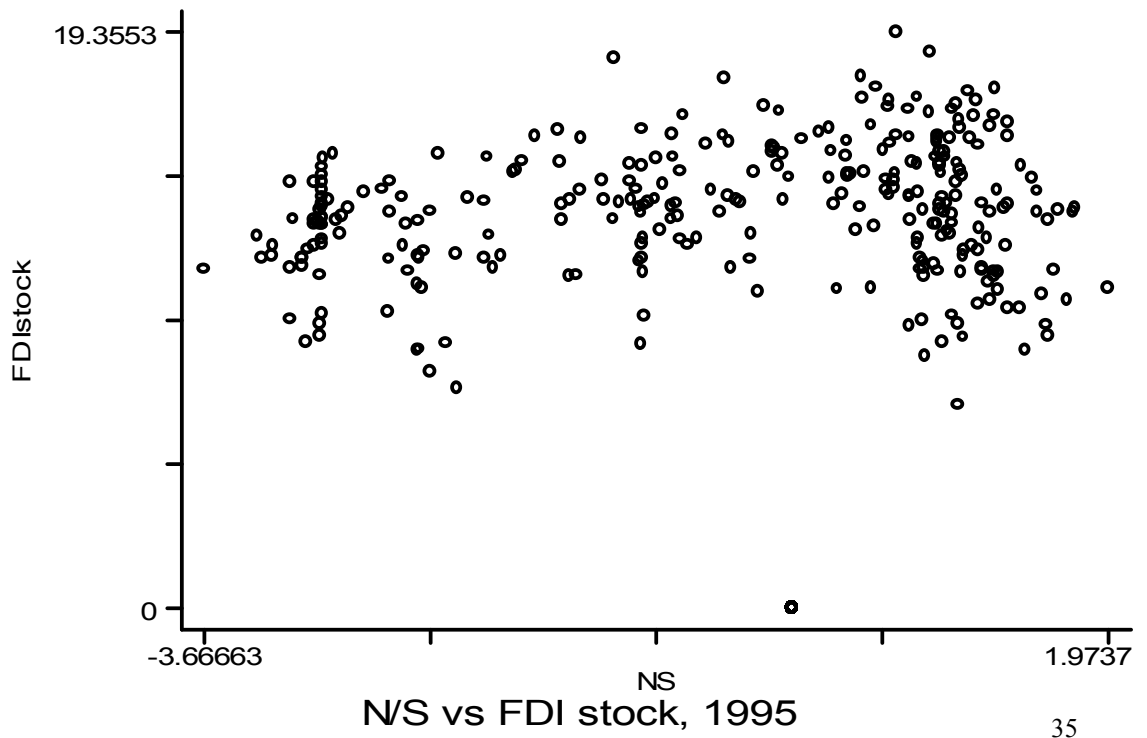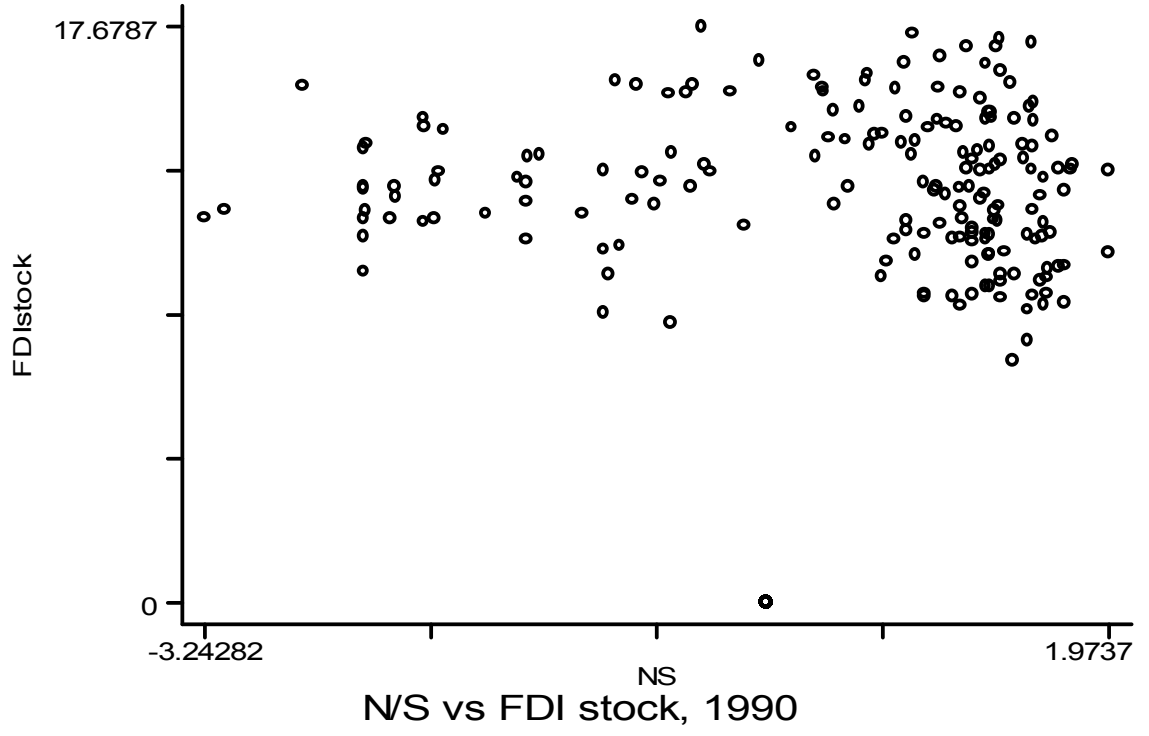
Table 1 South Korean MNC abroad in Electronics

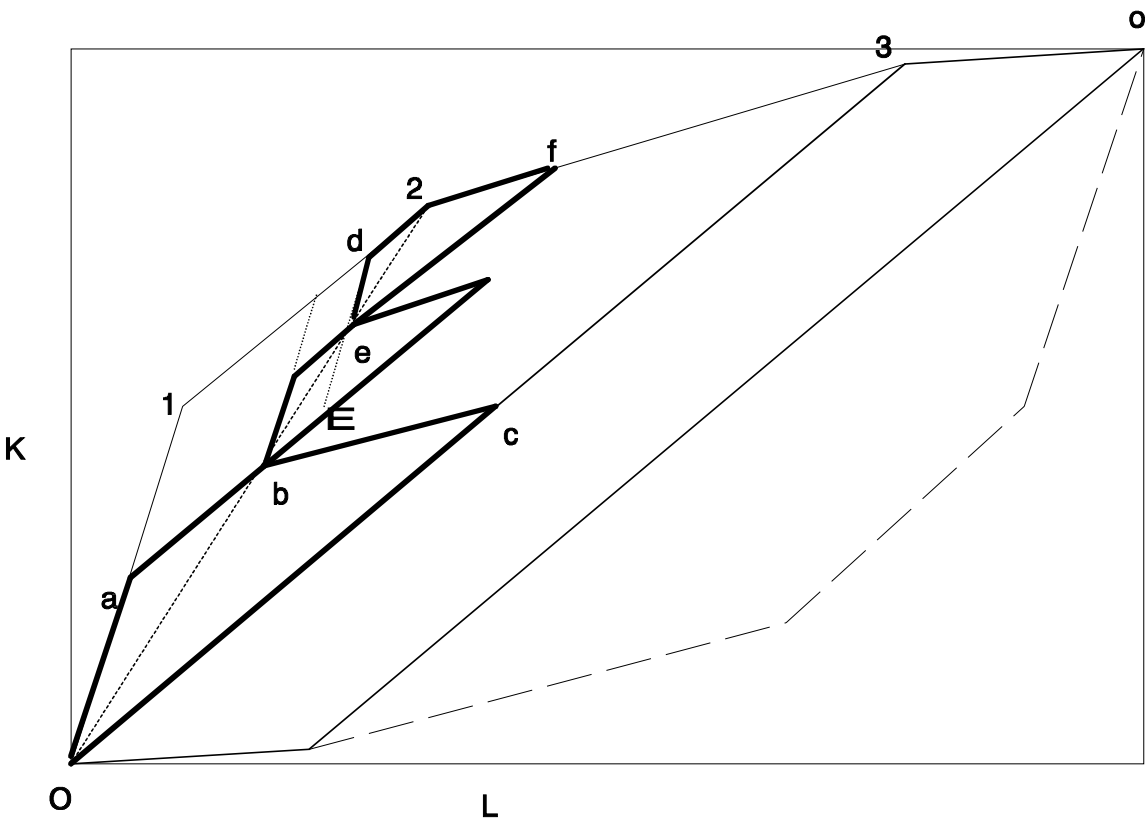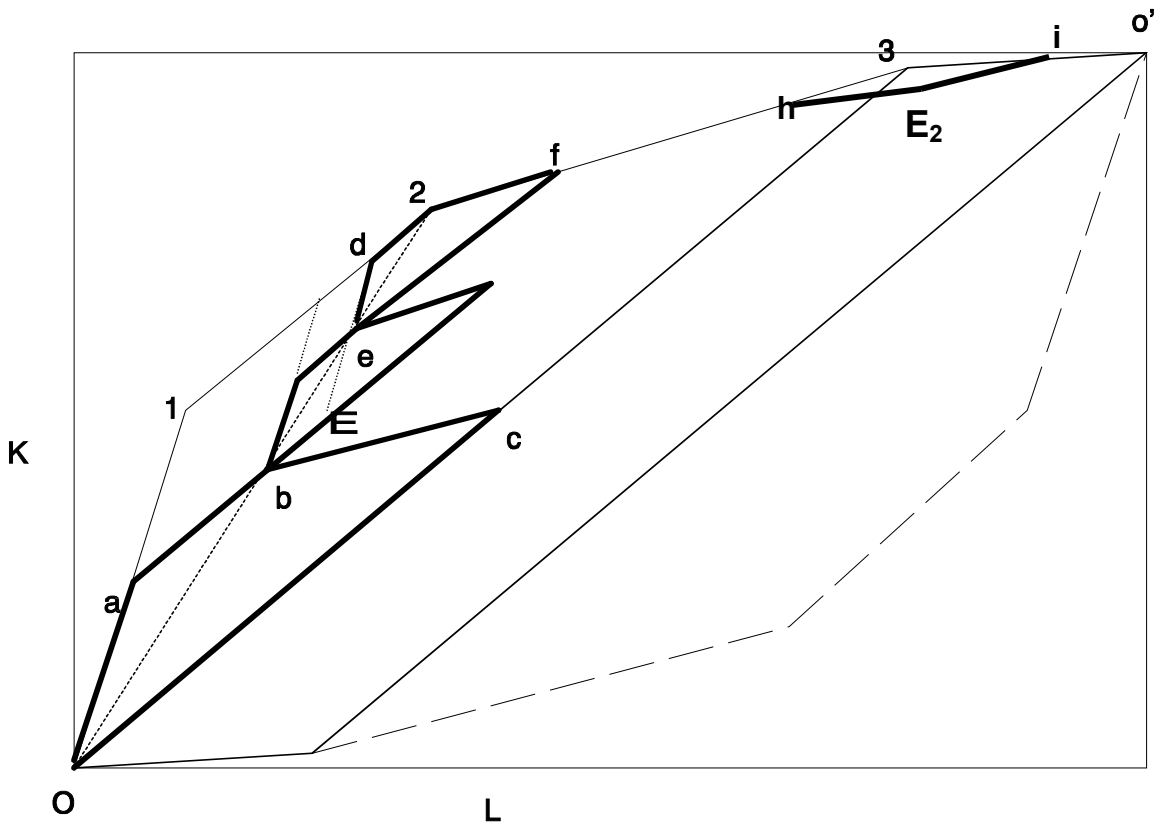| Location	Number of Affiliates	Sales	Avg. Export to Sales Ratio			Avg. K / L Ratio	
			from affi. To Korea	from affi. To Parent	from Parent to affi,	Parent	Affiliate
Asia							
China	11	1,852,202	40.5	27.6	32	107.5	31.2
Indonesia	4	827,764	10.7	9.9	24.1	88.6	17.5
Hong Kong	1	606,231	19.8	14.5	29.3	88.7	80.3
India	3	477,098	0.2	0	8.5	67	26.3
Vietnam	3	156,362	18.6	17.5	27.7	105	45.7
Japan	2	931,564	61.7	53	53.8	159.4	337.9
Singapore	1	1,472,458	22.2	22.2	33	193.7	217.5
Philippines	4	152,206	54	50.7	29.8	103.4	17.2
Thailand	3	338,327	82.7	17.3	50.9	87.1	20.6
Malaysia	3	936,311	9.5	9.2	10.7	80.9	39.3
North America							
U.S.A.	7	4,647,956	2	0.5	38	80.2	171.2
Europe							
UK	5	1,088,411	7.9	6.8	39.4	43.1	99.9
Germany	2	254,490	6.3	5.3	33.3	27.3	83
Poland	2	220,885	41.5	41.5	29	133.3	128.7
France	2	238,475	57.8	57.8	45.8	72.9	134.8
Latin America							
Brazil	4	404,566	4.6	3.1	72.3	31.2	35.3
Mexico	2	498,314	21.7	20.9	40.5	60.7	14.3

Sources: See previous tables
* Units of K/L ratio = thousand of Won per worker
** number of Korean affiliates that have more than $10 millions outstanding investment in 1999.

Table 2 Firm Characteristics, 1996

	Average all firms	FDI firms	Non-FDI firms
Output	$5.6\ 10^8$	$9.2\ 10^8$	$1.75\ 10^8$
employment	1,518	2336	635
Capital / empl	168,584	196466	138482
Observ.	601	312	289

Notes: Units for employment: number of employees, other values: thousands of Korean Won.

Table 3: Estimates of fixed effect regression (1), firms that become multinationals

$$Ln\ (K/L)_{it} = \alpha_i + \alpha_t + \beta_1\ MNC_{it} + \beta_2\ ln(FDIstock_{it}) + \beta_3\ ln\ N/S_{it} + \beta_4 ln(size_{it}) + \varepsilon_{it}$$

dependent variable: firm capital labor ratio

independent variables			industry trends		no year effects		
N/S dummy -measure		Lagged Indep. Var		Lagged Indep. Var		Lagged Indep Var.	IV for NS
MNC dummy	0.34	0.28	0.36	0.26	0.29	0.25	0.8
	**3.8	**3.1	**4	**2.8	**3.2	**2.7	**5
N/S dummy	-0.1	-0.1	-0.11	-0.13	-0.13	-0.13	-0.7
	**-3.25	**-3.1	**-3.6	**-3.9	**-4.3	**-3.9	**-4.7
FDI stock	-0.02	-0.019	-0.023	-0.01	-0.01	-0.01	-0.03
	**-3.3	-*2.6	**-3.4	*-1.8	-1.2	-1.25	**-3.5
R^2	0.12	0.1	0.14	0.12	0.09	0.09	0.1
Observ.	4708	4396	4708	4396	4708	4396	4708
N/S continuous measure							
MNC dummy	0.26	0.2	0.28	0.17	0.19	0.16	0.38
	**3.13	**2.4	**3.3	**1.9	**2.3	*1.8	**4.1
N/S	-0.024	-0.019	-0.023	-0.027	-0.032	-0.027	-0.2
	**-2.32	-*1.8	**-3.2	**-2.6	**-3.2	**-2.6	**-4.5
FDI stock	-0.022	-0.018	-0.025	-0.01	-0.01	-0.01	-0.03
	**-3.12	*-2.5	**-3.2	*-1.6	-1.2	-1	**-3.3
R^2	0.12	0.1	0.14	0.12	0.09	0.09	0.1
Observ.	4708	4396	4708	4396	4708	4396	4708

t-statistics below the
estimate
** significant at the 95 percent level
* significant at the 90 percent level

Table 4: Estimates of fixed effect regression (1), all firms

$$\text{Ln }(K/L)_{it} = \alpha_i + \alpha_t + \beta_1 \text{ MNC}_{it} + \beta_2 \ln(\text{FDIstock}_{it}) + \beta_3 \text{ N/S}_{it} + \beta_4 \ln(\text{size}_{it}) + \varepsilon_{it}$$

dependent variable: firm capital labor ratio

independent variables			industry trends		no year effects		IV for NS
		Lagged Indep. Var.		Lagged Indep. Var.		Lagged Indep. Var.	
N/S dummy -measure							
MNC dummy	0.36	0.3	0.34	0.24	0.32	0.28	0.9
	**4.09	**3.4	**3.8	**2.6	**3.53	**3.1	**8.4
N/S dummy	-0.08	-0.09	-0.09	-0.11	-0.14	-0.13	-0.7
	**-2.6	**-2.8	**-2.8	**-3.4	**-4.3	**-4	**-9
FDI stock	-0.03	-0.02	-0.01	-0.02	-0.014	-0.014	-0.09
	**-4.5	**-3.7	**-2.8	**-2.4	**-2.1	**-2.1	**-8
R^2	0.14	0.13	0.16	0.14	0.09	0.1	0.1
Observ.	8893	8292	8893	8292	8893	8292	8893
N/S continuous measure							
MNC dummy	0.3	0.23	0.27	0.16	0.22	0.19	2.5
	**3.6	**2.7	**3.3	*1.8	**2.6	**2.2	**6
N/S	-0.017	-0.015	-0.017	-0.02	-0.03	-0.03	-1.6
	*-1.74	-1.5	*-1.8	**-2.2	**-3.2	**-2.7	**-5.5
FDI stock	-0.029	-0.02	-0.027	-0.015	-0.012	-0.01	-0.06
	**-4.35	**-3.5	**-4	**-2.2	*-1.9	**-1.9	**-5
R^2	0.14	0.13	0.16	0.14	0.09	0.09	0.1
Observ.	8893	8292	8893	8292	8893	8292	8893

t-statistics below the estimate
** significant at the 95 percent level
* significant at the 90 percent level

Table 5: Estimates of fixed effect regression (1), firms that switch between North and South

$$\mathrm{Ln}K/L_{it}=\alpha_i +\alpha_n industrytrend +\beta_1 \mathrm{MNC}_{it} +\beta_2 \mathrm{lnFDIstock}_{it} +\beta_3\ \mathrm{N/S}_{it} +\beta_4 \mathrm{lnsize}_{it}+ \varepsilon_{it}$$

dependent variable: firms capital labor ratio

independent variables	switchers			South To North		North To South	
Before/after initial FDI		Lagged Indep. Var.	IV for NS		Lagged Indep. Var.		Lagged Indep. V
MNC dummy	0.38	0.45	1.6	0.69	0.51	0.34	
	**2	**2.3	**2.2	**2.2	*1.7	1.3	
N/S dummy	-0.17	-0.22	-0.6	-0.15	-0.28	-0.18	
	**-3.3	**-4.1	**-2.2	**-2.1	**-3.8	**-2.2	**-2.4
FDI stock	-0.01	-0.016	-0.09	-0.06	-0.05	-0.003	
	-0.6	-1.1	**-2.1	**-2.3	*-1.8	-0.17	
R^2	0.08	0.08	0.08	0.17	0.16	0.15	
Observ.	1194	1118	1194	304	284	890	

t-statistics below the
estimate
** significant at the 95 percent level
* significant at the 90 percent level

Table 6: Estimates of fixed effect regression (1), sectors with > 200 Obs for FDI.

$$\text{Ln } (K/L)_{it} = \alpha + \beta_1 \text{ MNC}_{it} + \beta_2 \text{ N/S}_{it} + \beta_3 \ln(\text{FDIstock}_{it}) + \beta_4 \ln(\text{size}_{it}) + \varepsilon_{it}$$

dependent variable: firms capital labor ratio

Sector	independent variables	FDI firms	t-stat	all firms	t-stat
Food and beverages	FDI	0.33	1.2	0.38	1.55
	N/S dummy	-0.15	*-1.8	-0.15	**-1.96
	FDI stock	-0.02	-0.9	-0.027	-1.3
	R^2	0.02		0.03	
	Observ.	372		662	
Textile	FDI	0.87	**2.6	1.1	**2.78
	N/S dummy	-0.22	**-2.5	-0.29	**-2.66
	FDI stock	-0.05	**-1.96	-0.09	**-2.9
	R^2	0.05		0.13	
	Observ.	398		632	
Petroleum and Chemicals	FDI	0.58	**2.5	0.65	**2.75
	N/S dummy	-0.22	**-3.3	-0.22	**-3.05
	FDI stock	-0.02	-0.09	-0.025	-1.39
	R^2	0.19		0.17	
	Observ.	794		1827	
Basic Metals	FDI	0.66	1.56	0.65	*1.68
	N/S dummy	-0.65	**2.97	-0.64	**-3.2
	FDI stock	-0.003	-0.09	-0.006	-2
	R^2	0.13		0.13	
	Observ.	304		624	

Electronics	FDI	0.59	**3.4	0.72	**4.11
	N/S dummy	-0.18	**-2.69	-0.21	**-3.12
	FDI stock	-0.41	**3.1	-0.058	**-4.5
	R^2	0.09		0.15	
	Observ.	703		1234	
Transportation	FDI	0.76	**3.5	0.93	**4.31
	N/S dummy	0.08	0.8	0.08	0.8
	FDI stock	-0.04	**-2.3	-0.068	**-4.12
	R^2	0.09		0.09	
	Observ.	325		558	

t-statistics below the estimate
** significant at the 95 percent level
* significant at the 90 percent level

Figure A1
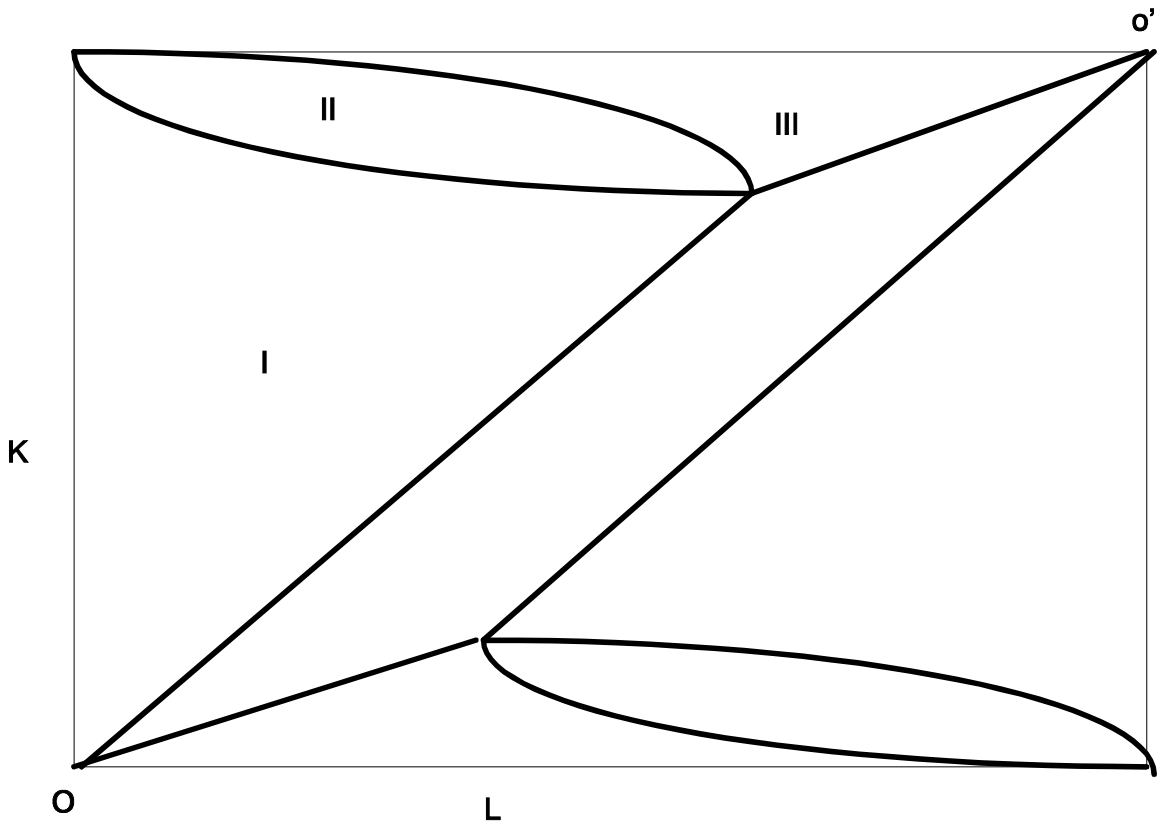
Appendix A1: Distributing Production Between MNCs from the North, the South and domestic firms

Figure 3 pictures three trapezoids. The left trapezoid shows the factor use by the North's MNCs, the one in the middle by South's MNCs and the one to the right is for South's (non-MNC) firms. To make North's trapezoid isomorphic to *0123* we complement *0a* and *ab* that are produced in North with the labor-intensive vector *bc* (parallel to *23*) that was relocated to South. To obtain the right trapezoid, we project the fraction of the capital-intensive components that Southern MNCs relocate to Northern affiliates (*bE)* on the capital-intensive component's factor use *12*. The segment *d2* then represents the capital-intensive component produced in South by non-MNC firms. (The segment *1d* is what North produces.) The intersection of *dE* and *02* tells us the Southern HQ services needed to complement capital-intensive components, i.e. *de*. As we supplement *de* and *d2* with labor-intensive parts that are produced in South, we complete the right trapezoid. What is left, capital-intensive components produced in North by affiliates of Southern MNCs plus HQ services and labor-intensive components from Southern MNCs, constitutes the middle trapezoid of South's MNCs.

Table A1, Destination countries for South Korean FDI, 1996.

Argentina	Germany	Netherlands	United Ar. Em.
Australia	Ghana	New Zealand	Uruguay
Austria	Greece	Norway	USA
Bahamas	Guam	Pakistan	Uzbekistan
Bahrain	Guatemala	Panama	Venezuela
Bangladesh	Honduras	Papua N. Guinea	Vietnam
Belgium	Hong Kong	Peru	Virgin Islands
Bermuda	Hungary	Philippines	Yemen
Bolivia	Iceland	Poland	Zambia
Brazil	India	Portugal	
Bulgaria	Indonesia	Romania	
Cambodia	Iran	Russia	
Canada	Italy	Saudi Arabia	
Chile	Jamaica	Singapore	
China	Japan	South Africa	
Colombia	Jordan	Spain	
Congo	Kazachstan	Sri Lanka	
Costa Rica	Laos	Sudan	
Dominican RP	Macao	Sweden	
Ecuador	Malaysia	Switzerland	
Egypt	Marshal Islands	Syrian Arab Rep	
El Salvador	Mexico	Taiwan	
Ethiopia	Mongolia	Thailand	
Fiji	Morocco	Turkey	
Finland	Myanmar	Ukraine	
France	Nepal	United Kingdom	