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Foreign Operations and Ownership: The Underlying Economics, Organizational Structure, Strategy and Foxconn

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Abstract

As technology driven firms develop new products, these products are often manufactured and sold first in their home country markets. Home markets are the natural outlet for these new products. Home production is also desirable if the new products developed contain new technology to be protected.

As the domestic markets get saturated these innovative firms will seek growth in overseas markets, first by exporting and eventually by setting up their shop abroad as well. This pattern of foreign expansion by firms has been observed historically for many technology oriented products invented by innovative firms. We also note that, as home markets saturate and growth in product sales declines, then the inventor firm's shareholders would ask their firm managers to seek markets outside the home market to realize further growth. As firms expand overseas, their new technology that underlies the new product will also become subject to spillover in foreign markets.

In this paper we discuss protection of firms' technology and other intellectual property as it relates to the structure of organizational forms, particularly their ownership structure that describe the firms' overseas expansion. We then apply our analysis to the manufacturing arrangements that characterize Apple and Foxconn.

Keywords: *protection of intellectual property rights (IPR); foreign direct investment (FDI); ownership; contract manufacturing; Apple and Foxconn*

INTRODUCTION

As technology driven firms develop new products, these products are often manufactured and sold first in their home country markets. Home markets are the natural outlet for these new products which might have been developed to meet domestic demands and consumer preferences. Home production is also desirable if the new products developed contain new technology to be protected.

As the domestic markets get saturated these innovative firms will seek growth in overseas markets, first by exporting and eventually by setting up their shop abroad as well.[1)] This pattern of foreign expansion by firms has been observed historically for many technology oriented products invented by innovative firms. We also note that, as home markets saturate and growth in product sales declines, then the inventor firm's shareholders would ask their firm managers to seek markets outside the home market to realize further growth. As firms expand overseas, their new technology that underlies the new product will also become subject to spillover in foreign markets. In this paper we dis-

cuss protection of firms' technology and other intellectual property as it relates to the structure of organizational forms, particularly their ownership structure that describes the firms' overseas expansion. We then apply our analysis to the manufacturing arrangements that characterize Apple and Foxconn.

FOREIGN OPERATIONS AND OWNERSHIP FORMS

Traditionally firms contemplating investing in FDIs in foreign countries face alternative forms of foreign expansion to choose from. Suppose that a foreign parent firm (FP) decides to set up an FDI factory in a host country.[2)]

Foreign operations with FP's ownership

The alternative forms of ownership for FP's foreign operations, typically include (1) fully owned subsidiaries (SUBs) and (2) joint ventures (JVs). A JV is owned by FP and its local joint venture partner (JP). Organizationally both SUBs and JVs are foreign entities (firms) and their production depends on transfer of technology and management skills particularly from FP. Such technology transfer is typically done based on the licensing agreements and other contracts between FP and their SUBs or JVs.

FP chooses the ownership form of its foreign operation based on several factors: how protection of their intellectual property rights (IPR) including patents and trade secrets, can be managed; how the form chosen enhances their FDIs' management capabilities; and the rules that constrain the form of FDIs in the host country.

We note that, in many developing economies fully-owned FDIs are not necessarily allowed by law and in those cases JV between FP and their local joint venture partner, JP, may be formed. If FP does not own majority shares in their JV, then important management decisions may have to be negotiated with the local JV partner, slowing the speed of management decisions for JV. Also, given that JP might be FP's potential competitor in the global market, FP would have to worry about the potential spillover of their technology to JP via JV. On the other hand, JV might be able to get help from JP, for example, in dealing with political, regulation and other government issues that need to be solved with the host country government.

Another potential problem with a JV is that JVs are generally unstable over time. Regardless of how a JV is set up at the outset, chances are high that it will be resolved over time and bought out, for example, by one of the parent firms. For example, consider a 50-50 JV set up by a technologically superior FP and a host country partner (JP) which is good at managing the workforce of the JV. As this JV grows, JP begins to learn how JV's products are produced and develops new production methods to produce products that compete with FP's products, which are being produced by the JV. As JP develops its skill in producing their own products, which are similar in characteristics to FP's, the original reasons that this JV was set up disappear and this JV will cease to exist (Nakamura, Shaver and Yeung (1996), Nakamura and Xie (1998), Nakamura (2005)).

Protection of their IPR, management speed, stability issues of a joint venture, and corporate policy are among the main reasons that most Western technology firms set up fully-owned SUBs where it is possible for their main lines of business.

FOREIGN OPERATIONS WITHOUT FP'S OWNERSHIP

In addition to the two forms of ownership for FP's foreign operations, fully owned SUBs and jointly owned JVs, there are other forms with which firms can expand their operations overseas. Of particular interest to us are forms of foreign expansion which do not involve FP's ownership.

Typically, FP manages these foreign operations without ownership, directly or indirectly, by contractual arrangements, including licensing contracts and supply and outsourcing contracts. These contracts include clauses which are intended to protect FP's IPR from being abused, for example, by the operators and owners (the agents) of FP's overseas operations. But such contracts may be still ineffective to protect FP's IPR fully. This is partly because no effective monitoring of FP's overseas agents is possible and partly because there is no good way to solve any dispute by a trustworthy third party like a court (e.g. Nakamura and Xie (1998)).

Forms of foreign operations without ownership

Various forms of foreign operations without ownership are known. Many businesses enter foreign markets with licensing agreements that allow a host country partner firm to produce FP's brand name products using FP's technology. The host country partner is typically allowed to produce and sell FP's products in the host country. However, host country partner is not usually allowed to modify or improve FP's original technology, nor are they allowed to develop derivative technologies based on FP's technology. However, it is well known that, despite the legal restrictions against host country partner firm's development of new technologies arising from their association with FP, many disputes are known in which the partner firm is accused of violating the original licensing contracts.

An original equipment manufacturer (OEM) agreement is another form of FP's foreign operation without ownership. Traditionally OEM contracts are used when FP finds it economical to have a foreign (or even domestic) partner firm manufacture their products and attach FP's brand name to final products. Many home appliances, for example, are manufactured this way even now.

OEM contracts are often used when the technology and product design are well defined and contract providers (FPs) have relatively little concern about illegal technology spillover. Nevertheless, such contracts benefitted contracted manufacturers in terms of upgrading their production skill and giving scale economies in their manufacturing activities (e.g. Ohgai (2004)). In these OEM contracts it was not unusual that the contractor receives an instruction, for example, in the form of a basic design of the product to produce from their customer. This was the case with the OEM order Toshiba received from Sears Robuck.[3)]

Matsushita, following Toshiba, also began OEM and private brand (PB) production contracted by their customers. Table A1 in Appendix shows the output of color television sets for export markets produced by their Saijo plant during the 1966–1971 period. Clearly Matsushita increased their ability to make and sell their own brand sets as they accumulate their production of OEM/PB sets. While doing so, they began to enjoy scale economies in their output. The effects of learning on Matsushita are evident but this might not have been a serious issue for Matsushita's customers. This is because most of their customers are mass merchandisers, not manufacturers of television sets, and hence Matsushita's skill enhancement might not have worried them much. After all, Matsushita could become one of their suppliers. This is also the case with Sears' OEM contracts with Toshiba.

ECONOMICS AND ORGANIZATIONAL ISSUES UNDERLYING FOREIGN OPERATIONS WITHOUT OWNERSHIP

In this section we discuss the role of ownership in technology driven FP's foreign operations first. Then we discuss under what conditions FP can achieve foreign operation without ownership.

When does ownership matter?[4)]

FP's operations in a host country generally require tangible and intangible production inputs from FP, local firms and local workers. Suppose all inputs are observable and their quantities used and the resulting output produced are verifiable. (This means, for example, that a dispute about an illegal use of FP's production input can be unequivocally resolved by a third party (like a court) which contradicts or confirms disputing party's observation.) Furthermore suppose that there are well-specified contracting mechanisms for the use of each input and the disposition of outputs. Under these ideal conditions there is no need for FP to own any part of its foreign operations since all aspects of the operations can be contracted out to local input providers.

In practice there are certain important reasons why some of these ideal conditions fail to hold. First, the quantities of some intangible assets inputs and the output produced are not verifiable. For example, use of a licensed technology or brand name may not be limited to originally specified purposes; and nonverifiable output arises when JV's accounting procedure cannot delineate every benefit resulting from the use of FP's transferred assets (technology spillover).

Secondly, many contractual relationships incur agency cost because of the lack of incentives on the part of input providers in the host country. In both cases vertical integration, or direct ownership of

foreign operations, may help mitigate FP's problems (Nakamura and Xie (1998)).

It is important to note that so long as contracts can effectively protect the rights of parent (transferring) firms (i.e. complete contracting is possible), ownership structure may not matter even if there is information asymmetry between FP and its contracting firms including JP in the host country. On the other hand, contract incompleteness can lead to departures from the first-best solution even when there are no information asymmetries among the risk-neutral contracting parties (Hart and Holmstrom (1987)).

Foreign operation without ownership

Our discussion above suggests that at least the following basic assumptions must be satisfied to justify foreign operations without ownership by contracts.

(A1)All inputs are observable and their quantities used and the resulting output produced are verifiable. For example, there are no problems of IPR protection even though FP is not present in the sites of foreign operations.

(A2)There are well-specified contracting mechanisms for the use of each input and the disposition of outputs. That is, we have a complete contract.[5)]

(A3)There is little advantage of having manufacturing components within the firm. In this setting, for example, in-house production experiences do not give useful feed back to the firm's R&D and design work. In a traditional vertically integrated firm, such feedback was considered an important implication of vertically integrated firms (Fruin (1999)).

Under these conditions, FP can contract out their operation to a local production facility (a contractor) and hence no ownership based FDI is needed.

As we note above, if a complete contract can be written, then all FP has to do is to locate a contractor that can do what FP wants to get done cheaply. Provided that such a contractor is found, FP may be able to save significant amounts of production cost. This may be called a first best solution.

Now suppose FP has a situation with a complete contract. However, suppose that managers of FP's contract factory are not well motivated to perform contracted tasks required by FP. This happens, for example, when the factory managers do not have any bonus incentives for their high performance that would be paid if the factory was owned by FP.

If such incentive problems arise among factory workers, there will be a deviation between the workers' best performance and the performance when they are not motivated. There may also be moral hazard problems. For example, factory workers take advantage of FP's proprietary machinery and brand name for their own use, which is not authorized by contracts with FP. These circumstances which are not optimal to FP cause so-called agency costs. Agency cost will be discussed below.

Apple's experience with clones, licensing and supply chain

Before discussing general economic issues associated with foreign operations (e.g. agency, licensing), we briefly review Apple's experience in dealing with clones (non-Mac computers) which ran Mac OS.

Apple has not always been interested in outsourcing their production or licensing their technology out to other firms. This is shown below.

(1) Apple forbids Mac OS X from running on anything but a Mac. But in past years, an army of Mac cloners has emerged, their rise facilitated in large part by Apple's 2006 decision to switch to Intel chips. The most prominent example is Florida-based Psystar, a startup selling Mac clones, which has been in legal battle with Apple since July. Shortly following Psystar's lead were companies with similar offerings: OpenTech, OpeniMac and Art Studios Entertainment Media (Chen, 2008).

(2) But in 2006, Apple opened itself up to attack again (knowingly or not) when it ditched its own Power PC processors in favor of Intel's more power-efficient CPUs. Because Apple then had to code OS X to run on Intel processors, it opened a door for hackers: They could modify the operating system code to run on any Intel-powered, non-Mac machine (Chen, 2008).

(3) "I would say that one of the things that's happening to Apple is that it's less able to keep secrets than it used to be because it has broader supply chain and broader distribution," said Roger Kay, an Endpoint Technologies analyst.

Apple wasn't always opposed to Mac clones. For

a brief period in the 1990s—when Steve Jobs was still exiled from Apple—Apple CEO Michael Spindler licensed the Mac operating system to several manufacturers: Power Computing, Motorola, Umax, APS, Radius and DayStar. When Jobs retook the helm in 1997, one of the first items on his agenda was to destroy the clone program and eliminate these cheaper alternatives to Apple's goods (Chen, 2008).

(4) Apple during a time of financial crisis. From early 1995 through mid-1997, it was possible to buy PowerPC-based clone computers running Mac OS, most notably from Power Computing. Other licensees were Motorola, Radius, APS Technologies, DayStar Digital, UMAX, MaxxBoxx, Bandai (Apple Pippin), and Tatung. However, by 1996 Apple executives were worried that high-end clones were cannibalizing sales of their own high-end computers, where profit margins were highest.

(5) Jobs ends the official program. Soon after Steve Jobs returned to Apple in 1997, he halted negotiations of upcoming licensing deals with OS licensees that Apple executives complained were still financially unfavorable. Because the clone makers' licenses were valid only for Apple's System 7 operating system, Apple's release of Mac OS 8 left the clone manufacturers without the ability to ship a current Mac OS version and effectively ended the cloning program. Apple bought Power Computing's Mac clone business for $100 million, ending the Clone era. Only UMAX ever obtained a license to ship OS 8, which expired in July 1998. (Wikipedia,"Macintosh clone," 2014.)

As we see from the above Apple's experience with closes of Mac computers was volatile and, as Intel chips were introduced, pirating and other IPR problems became evident. In addition some clones began hurting Apple's higher end products.

Also, Intel-chip based clone products being designed to operate fully under Mac OS meant more clone parts were able to take advantage of Mac OS's trade-secret functions. This is particularly so given that wider compatibility of Intel chips meant Apple was less able to keep secrets than it used to be because their and clones' production processes had broader supply chain and broader distribution (3 above). Clearly Apple recognized the difficulty protecting IPR of their products under licensing when manufacturing supply chains are organized by clone producers. Having learned a lesson about problems associated with licensing, Apple's Steve Jobs banned clones and only Mac computers became able to run Mac OS X. Apple reverted to their traditional full ownership of their IPR without licensing. This solution got rid of the problems with clones and their producers. But Apple's own supply chain involving more suppliers for Intel chip based Mac computers are broader than before, making Apple being subjected to potential spillovers of their technology. This raises a serious issue to Apple, since Apple does not own suppliers in their supply chain in general. Given that Apple and suppliers are in a contract-based outsourcing relationship, Apple will need to monitor suppliers. As we discuss below, agency cost will inevitably occur in such monitoring activity.

Agency cost

Suppose there are incentive and moral hazard problems among workers in the factory. Then the contracted performance is not achieved and moral hazard problems further reduce FP's income. The amount by which the contracted factory deviates from the contracted (first best) performance is called agency cost. If such an agency cost makes the contracted factory underperform FP's expectations, a first best solution is no longer achievable.

Agency issues are real possibilities when contractors and FP are connected only by contracts. We discussed earlier that license-based foreign production of FP's brand name products to be sold in the host country may not necessarily go well because of problems of quality. Such quality problems damage FP's global reputation. Similarly, the host country partner may abuse FP's reputation by using it to sell their own products. For example, it is well known that some Coca Cola bottlers, which are not owned in part or fully by Coca Cola, use their access to the Coca Cola brand name to promote their own products (Sellers (1990)). Without FP's direct monitoring, their local partner, who might become FP's potential competitor in the host country and also globally, is tempted to violate the basic conditions (1) stipulated in the production contracts. The incidences of agency and moral hazard behavior will incur various types of agency costs which

Table 1. Large electronics manufacturing service companies

	2012			2013		
	(1)revenue (100 million yen)	(2)profit margin (100 million yen	(3)profitabioity (=(2)/(1)) in %	(4)revenue (100 million yen)	(5)profit margin (100 million yen)	(6)profitabioity (=(5)/(4)) in %
Foxconn	105,551	2,916	2.8	131,744	3,644	2.8
Pegatron	23,789	391	1.3	32,295	569	1.8
Quanta Computer	27,448	409	1.5	24,071	206	0.9
Compal Electronics	18,421	272	1.5	23,509	275	1.2
Flextronics	18,801	255	1.4	21,155	146	0.7
Wistron	17,745	222	1.2	28,840	192	0.9
Inventec	11,077	97	0.9	16,209	577	3.6
Jabil Circuit	13,681	496	3.6	14,626	408	2.8

Notes: fiscal year ends in December for Flextronics, and in August for Jabil.
Exchange rates used in computing figures in Japanese yen above are: 1 yen=T$0.37 = US$0.013 for 2012, and 1 yen=T$0.30=US$0.010.

must be born by FP.

Apple's supply chain and Foxconn

Prior to contracting out iPhone production to Foxconn, Apple had Foxconn manufacture their iPod. But most of 451 parts used to produce an iPod were purchased from outside. For example, the first 30-gigabyte video iPod was priced $299 at retail stores. The primary parts used for this iPod and their costs to Apples were: the Toshiba hard drive ($73), the display module ($20), the video/multimedia processor chip ($8), and the control chip ($5). The labor cost of final assembly in China cost about $4 per unit. Many of other parts used were generic products made by producers in highly competitive markets and their costs were estimated to be very low (Varian, 2007). It is estimated that, of the iPod's $299 retail value, $80 went to Apple, $75 to distribution and retail costs and $8 to parts makers, all in the U.S.

Most of the characteristics that describe Apple's management of their iPod's supply chain still hold for their later products, iPads and iPhones. Apple determines the primary supply chain suppliers for main parts of their products, where Apple exercises their bargaining power as a scale purchaser. Another important observation is that potential quality management problems in this type of supply chain management are to a large extent avoided because main parts are produced by established and reputable manufacturers while generic parts are bought in a competitive market where reliability records are likely to be well established. The rest of quality and other management issues in assembly are delegated to Foxconn.[6)]

It is also important to point out that the skill in supply chain management of contract assemblers/manufacturers (EMS) such as Foxconn and Quanta Computer is clearly transferrable across product lines (e.g. Mac / MacBook Pro computers, iPod, iPad, iPhone) and across competing final product firms (e.g. Apple, HP, Sony, Amazon). For example, Foxconn assembles iPod, iPad and iPhone but they added to this list MacBook Pro in 2012, which seemed to be entirely assembled by another Taiwanese assembler Quanta Computer. Quanta also produces Amazon's Kindle Fire (Nikkei, 2012a).[7)] (See Table 1.)

As Apple's supply chain becomes complex and involves more suppliers, no ownership strategy may have to be modified. It seems that Apple directly chooses major suppliers while Foxconn may choose suppliers of generic components. Since major suppliers Apple deals with do deal with multiple buyers which are mostly Apple's competitors, bargaining processes naturally take place between Apple and these suppliers. Some major parts suppliers might not be willing to adjust their production runs according to Apple's demand fluctuations and seek alternative buyers. This problem became evident,

for example, with large fluctuations in the sale of iPhone 4 and iPhone 5. Apple is said to have to acquire one of Sharp's display plants to respond to such circumstances. It is evident that the more alternative business clients to Apple the parts makers get, the more bargaining power they get against Apple. (Nikkei, 2014, Sept.15, and Nikkei, 2014, Oct. 19; Diamond, 2012, Oct.1)

Foreign operation without ownership and organizing a supply chain

FP continuously evaluates the relative value of each component of their entire operations from upstream to downstream activities. So-called fabless semiconductor and electronics manufacturing companies, including Apple, have found that their manufacturing (assembly) component is not valuable enough (relatively low value added) compared to other functions of their supply chain. In particular, they've found that their head office functions, such as R&D, design and marketing, as well as design of their supply chain, are much more valuable than the assembly / manufacturing components.[8)] Provided that they can create a setting for a low-cost foreign operation without FP's ownership to undertake their manufacturing / assembly operation, FP can focus their attention on their most profitable corporate activities (e.g.,Worstall (2012)). This is exactly what Apple has done.[9)] Even though Apple had traditionally disliked their technology being used by other firms, they've found that Foxconn[10)] can do what Apple wanted contract manufacturing firms to do satisfactorily without serious infringement of their IPR. Having achieved outsourcing manufacturing / assembly operations to a low cost contractor, Apple can now spend their capital and efforts on R&D, design, marketing, supply chain management and other head office functions. For example, Apple makes decisions about the suppliers of the main components of iPhones. This allows Apple to continue control their supply chain as a whole as if they were vertically integrated.

In managing their supply chain, the transfer of various types of technology, production and management skill and technical knowledge will take place from FP (e.g. Apple) to the contractor (e.g. Foxconn) based on licensing and other contracts. What is transferred here represents many aspects of FP's IPR. Without FP's direct presence to monitor their partner's operation, unintended spillovers to the partner of FP's IPR may take place. This has not appeared to be an issue with Apple, suggesting Apple runs a successful supply chain using Foxconn as their main assembler of final products.

BARGAINING POWER AND OWNERSHIP FORMS

For contemporary technology companies the important determinants of their decisions about the ownership form of foreign operation include the following factors:

(i)how they can protect their IPR such as patents, trade secret, management methods; (ii)how fast decisions can be made and executed; (iii)how they can effectively cope with local politics, culture and personnel management / industrial relations; and (iv)the cost of the form to be chosen.

Bargaining theory based models tell us that FPs with strong bargaining positions are likely to set up fully owned SUBs (Wells and Fagre (1982), Nakamura and Xie (1998), Nakamura (2005)). In particular, firms with long-standing successful foreign operations and strong IPR have overwhelming bargaining power against potential JV partners and the governments of possible host countries, and set up SUBs rather than JVs.

There is also empirical evidence that suggests that FP's ownership share in a JV which is owned jointly by FP and JP, is proportional to FP' bargaining power relative to that of their foreign partner (Nakamura and Xie (1998), Nakamura (2005)).

Generally ownership shares of FDIs are proportional to the degree of FP's bargaining power. So firms with strong bargaining power choose to set up SUBs, or majority-owned JVs, where SUBs are not allowed.

No-ownership option for foreign operations and bargaining power

We noted that FP's foreign operations without ownership may be efficient if, in addition to the cost advantages,

(i)complete contracting dictates the foreign operation;

and

(ii)no agency costs exist that arise from the agency behaviour, the spillover cost of technology and moral hazard problems associated with FP's foreign operator.

Although there seems to be no clear cut relationship between the degree of the success of FP's foreign operation and FP's bargaining power relative that of the host country partner, to the extent that powerful FP can better monitor the foreign partner, we predict that a successful foreign operation without ownership is more likely to occur if FP has an overwhelming bargaining power over HP. This is mostly the case for firms' foreign operations without ownership (fabless operations), which include Nike, Qualcomm, Apple and Arm.

Apple and Foxconn

If low cost foreign operations without FP's ownership can be set up satisfying conditions noted above (complete contracting, no agency problems, no IPR spillover, no moral hazard, etc.) then this mode of FDIs can be an efficient form of foreign expansion.

Implications of a successful fabless operation for FP are numerous and some of them are listed below:

(i)keep most profitable parts of firm operations within the firm, where manufacturing is not one of them;

(ii)assuming that FP has overwhelming bargaining power over sub-contractors, FP can pursue lowering the unit cost of contracted manufacturing operations to a minimum by allowing potential subcontractors to compete with each other;

(iii)in doing so, FP is insulated, for example, from the laws on product liability, environment protection and labor, since FP does not own operations in the host country;

(iv)FP can move such contractual operations to countries where the wages and the unit cost are the lowest, i.e. FP can practice an ideal "multinationals are foot-loose" strategy, pursuing the cheapest workers and cost advantages.

For example, Nike has been successfully practicing this strategy, shifting production sites from Japan, South Korea, China, Indonesia, Pakistan,... Nike's wages are estimated to be 4% of their goods price (Andreff (2008), Harvard Business School (1990). As we pointed above, of the retail value ($299) of a 30-gigabyte video iPod, the cost of labor intensive final assembly was about $4 a unit (Varian (2007)).[11)]

Apple pursues a strategy to increase their bargaining power against suppliers by generally maintaining multiple suppliers for the same components (e.g. Japan Display, LG and Sharp for displays). Multiple sourcing allows Apple to maintain stable supplies of components as well as their bargaining power against their suppliers. Furthermore, given that Apple does not own these suppliers, it would be easy for Apple to change order quantities or even sever relationships with the suppliers. Sankei Newspaper (July 13, 2014) reports much fluctuation in the orders for LCD panels Sharp receives from Apple. This experience appears common to many Apple suppliers and suggest Apple's strong bargaining power against these suppliers.

This line of reasoning also predicts that Apple would attempt to use another assembler like Foxconn for assembling iPhones, etc. This is because relying on a single company like Foxconn for the assembly work weakens Apple's bargaining power against Foxconn, which is now a large manufacturing foundry and does work for Apple's competitors as well. Having multiple clients, particularly Apple's competitors as clients, substantially increases Foxconn's bargaining power against Apple. The fact that Foxconn changed the supplier of some parts from what Apple specified did not please Apple but reflects Foxconn's increasing bargaining power.[12)]

For these reasons it is not surprising that Apple added another assembler, Pegatron, to their supply chain for assembling iPhone 6. It is said that Pegatron has accepted a low profit margin than that for their own operation, which suggests Apple's overwhelming bargaining power against this company. The use of Pegatron clearly increases Apple's bargaining power against Foxconn.[13)] Figure 1 shows Apple's successful containment of Foxconn's production cost to a very minimum. Apple's profit margin is 30%, while Foxconn's is 1.5%.

Also, one of the expected implications of having unrelated third-party contract factories like Foxconn and Pegatron undertake manufacturing for Apple is that Apple might remain insulated from potential abuses of child labor and other human

Figure 1. Profit margins: Apple versus Foxconn

Source: Culoan (2012)

rights abuse in these factories. Since the low-wage host country (China in this case) may be willing to trade employment and above average wages for bad working conditions, such abuses of human rights could be overlooked in the host country as problems of Foxconn. But in reality in the U.S., for example, several NGOs exist[14] watching US firms' involvement overseas and Foxconn's problems often become Apple's problems since Foxconn produces for Apple. (E.g. Armitage (2013), Sakr (2013), Nikkei (April 5, 2012b). Can Apple do anything substantial to change the situation in China? Not likely.[15] To the extent that cost advantages of assemblers like Foxconn and Pegatron rely on many hours of labor input relative to capital equipment, changing the labor capital ratio to reduce labor input and increase capital equipment will imply large increases in the cost of production for Apple. For instance, imagine the cost implications of replacing most of labor input in Foxconn's Chinese factories with robots. (Such capital intensification of capital input has happened in many of auto assembly plants in developed countries where labor costs are high.) We also know that the general cost of labor in China is clearly on the rising trend. These considerations all suggest a tentative conclusion that, at least in the long run, Foxconn's labor-intensive assembly operation is unlikely to be sustainable.[16]

Potential problems that hurt no-ownership strategy over time

Problems occur if some of the above conditions cannot be maintained. For example, so long as FP can maintain their overwhelming bargaining power over contract manufacturers, they can pursue low-cost strategy because the latter have no choice but to accept the contract terms given by FP.

But this may fail to hold if the contractor gains their own bargaining power. We state below related issues that potentially jeopardize Apple's stable production arrangements involving Foxconn.

1. Is the management of Apple's IPR sustainable under the Apple-Foxconn collaborations?

As noted above, potential spillover of Apple's IPR could occur on many fronts. It is unclear at this moment how much of such spillover can be controlled by Foxconn. It is also unclear how much of Foxconn's capacity to design comes from technology spilled over from Apple. (More on this below.)

2. It is of interest to point out that Terry Gou, the Hon Hai / Foxconn CEO, has clearly a vision to go far beyond a simple assembler / EMS. In his interview with Nikkei Electronics held in March 2014, he stated that:

(2a)Foxconn's capacity to design is as good as brand makers.' (2b)Using its high-level design capacity, Foxconn can facilitate brand maker's division of labor. For example, BlackBerry has decided to focus on development and applications of OS

and servers as well as planning for and promoting BlackBerry smartphone, but delegate entire design of all other aspects of the smartphone to Foxconn. Where Foxconn's capacity to design smartphone independently comes from is of interest. (2c)In recent years, Foxconn has been more than just an EMS, in fact Foxconn's activity ranges over broader areas including upstream operations of a supply chain.

Gou specifically summarizes the areas of Foxconn's business areas in the following order with the areas with higher upstream components first, to be followed by areas with decreasing level of upstream contents. IIDM (innovative integrated design manufacturer) -> IDM (integrated design manufacturer) -> ODM (original design manufacturer) -> JODM (joint original design manufacturer) -> JDSM (joint design manufacturer) -> JDVM (joint development manufacturer) -> OEM (original equipment manufacturer). Gou envisions that BlackBery uses Foxconn's IIDM service and also sales and customer support in Asia; Vizio and Motorola Mobility use their IDM service; HP and Dell use their ODM service; and Apple will use Foxconn's JDSM service.[17] In addition, Foxconn provides carious platforms for electronic commerce for both consumers and businesses. Many of these Foxconn's expanded activities, if successful, are likely to bring more value-added to the company. At the same time most of these activities will require business customers (clients) who provide the original plans and designs for products. How newly created value added at Foxconn affects the relationship between clients and Foxconn is of interest. If such relationship changes as Foxconn evolves to be a more powerful manufacturer, it is likely that client firms will also change their organizational forms.

3. If Apple's competitors offer the contract manufacturer like Foxconn contract terms which are better than Apple's, then the contractor may decide to spend more effort on Apple's competitors rather than Apple. For the time being this is not likely because of Apple's large order quantities.

4. As the contractor becomes familiar about the products they assemble, and as they accumulate their capital from their profit, they may start to diversify from manufacturing by designing products like those they are contracted to assemble and also they might be in a position to do their own R&D.[18]

5. This is a learning process that is most likely to take place for successful contract manufacturers. For example, Japan's Denso started as Toyota's electrical products division which was spun off as Nippon Denso company. As electrical and electronics components have become major portions of automobiles' value added, Denso has become a formidable negotiator to Toyota in their decision making over their parts supply to Toyoda (Ahmadjian and Lincoln (2001)).

6. General increases in wages of workers at the contractor may force them to increase their contract cost with Apple to the level which is not acceptable to Apple. To the extent that a low cost contracting is one of the most important features for Apple's fabless operation, the collapse of a low-wage assumption at Foxconn will mean that Apple terminates contract manufacturing at least with Foxconn. This problem can be mediated to some extent by using an alternative assembly manufacturer like Petrogen, as Apple's second contract manufacturer. But since both contractors use Chinese labor, the general rise of wages in China will eventually hurt the competitiveness of both contractors (Wikipedia, 2014, "Petrogen"). At this time, as their workforce wages increase, we might see them being forced to move to the interior of China to reduce their production cost (Armitage (2013), Svensson (2013)). We discussed labor problems Foxconn and Petrogen have been experiencing in their factories. Solving these problems inevitably implies considerable cost increases to Apple. This cost reason and also the fact that these assemblers are unrelated by equity to Apple might prevent Apple from exercising their bargaining power to force Foxconn and Petrogen to solve their labor disputes (i.e. solving labor disputes will result in significant increases in wage costs and hence in the production cost, which Apple is not willing to accept).

7. To the extent that all competitors use the same contract manufacturers such as Foxconn, firm-specific competitive advantages may decline over time. If contract manufacturing costs become higher over time, and if contract manufacturer's

bargaining power increases against the brand maker like Apple, it might become economically viable to return to the form of vertically integrated manufacturing in which the assembler component of a supply chain is absorbed by the head office. This is a traditional vertically integrated electronics manufacturing firm which does product design and R&D, as well as final assembly of their final products. This form may become a viable form of a production firm when some or many of the assumptions that justify foreign operations without ownership fail.

As suppliers become large and powerful in their own way, assembler firms may lose their bargaining power against these suppliers. Denso was originally an electrical division of Toyota Motor Company which was subsequently spun off. Denso became a successful auto supplier and became one of the leading suppliers of electrical and electronic parts in the world. Since electronic components are becoming an increasingly important source of value added for automobiles, Toyota's bargaining power relative to Denso's evidently declined, which Toyota did not regard as desirable for them. To correct this situation, Toyota created their own electronic parts supply division to gain bargaining power of their own (Ahmadjian and Lincoln (2001)). This has happened to Toyota even though Toyota has some equity in Denso. Without any equity participation by their customers, contract manufacturers like Foxconn with increasingly large amounts of relative bargaining power against their customers like Apple may require significant corrective actions. Such changes in relative power balances between fabless customers and their contract manufacturers have not taken place, in part because of customer firms' overwhelming power in the capture of their markets.

CONCLUDING REMAKS

We have presented an analysis of ownership structures that firms choose in designing their foreign operations. In particular we discussed practical implications of complete contracting that allows fabless operations to be optimal for the customer firms like Apple. We also discussed that learning, profitability, cost increases and other factors may change the balance in the relative bargaining power between contract manufacturers / assemblers and the customer firm. If such circumstances occur, fabless operations based on contracts may cease to be optimal; but such circumstances have not happened yet for many powerful Western firms which use contract manufacturing.

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NOTES

1) For example, the product life cycle (PLC) theory suggests innovative firms often reach the stage where they set up foreign direct investment for growth (Vernon (1966), Wells (1969), Nakamura and Fruin (2012, p. 126, Figure 1)).
2) Implications of jointly owned foreign operations are discussed in international business textbooks (e.g. Daniel, Radebaugh and Sullivan (2013)).
3) In 1964 Toshiba received an order from Sears Robuck to produce 100,000 16-inch color television sets over a three-year period under Sears' private brand. Sears could not locate a U.S. manufacturer to satisfy this demand (Ohgai (2004)).
4) This section draws from Nakamura and Xie (1998, pp.574-575), where ownership and spillover costs of IPR are more fully discussed.
5) For example, the use of FP's technology at foreign operations must be accountable and cannot be used to develop derivative technology or improving the licensed technology.
6) Apple figured out how to combine 451 mostly generic parts into a valuable product. They may not make the iPod, but they created it. In the end, that's what really matters. (Varian, 2007.)
7) Nikkei (2012a) also reports that Amazon removed the purchasing rights form Quanta in 2012 so that Amazon themselves controls suppliers and minimize the procurement cost of their Kindle. HP made similar decisions regarding the purchasing rights of connectors and other parts for HP notebooks to improve their

profitability.

8) This is much like Coca-Cola operations in which bottling operations are not considered profitable and hence are kept outside Coca-Cola's ownership where possible.
9) This is also consistent with Coca-Cola's strategy not to own bottlers so long as they perform. They intervene with the management of underperforming bottlers with equity participation as they did in France or Japan (Sellers (1990)).
10) Foxconn Technology Group (Hon Hai Precision Industry Co., Ltd.) is a Taiwanese multinational electronics contract manufacturing company headquartered in Tucheng, New Taipei, Taiwan. Also Datamonitor (2008).
11) Balfour and Culpan (2010) estimate that modest increases in wages at Foxconn will only require 1% in the price of most finished goods; for example, $4 more for a 64-gig iPod touch to offset the added labor costs. At this rate Apple may be able to absorb much more wage increases at Foxconn before their competitive power erodes due to wage increases of Chinese workers.
12) "Foxconn, in its growing heft as the world's largest electronics contract company, was also getting more difficult for Apple to control, with incidents such as changing component sourcing without notifying Apple, people familiar with the matter said. At the same time, Foxconn became frustrated with the growing complexity of Apple products, such as the iPhone 5, which is difficult to make in the volumes Apple needed." (Dou (2013)).
13) Jenny Lai noted: "Hon Hai remains the dominant supplier to Apple but its competitive advantages are shrinking as Pegatron closes the gap on its execution of Apple orders,..., adding that Wistron and Compal, two other Taiwanese contract manufacturers, have started receiving orders for the iPhone 5c and iPad mini." (Clover (2014)).
14) For example, US based China Labor Watch and Fair Labor Association (Armitage (2013)).
15) This type of situation was also experienced by Nike in their contract factories in China.
16) This is consistent with Barboza (2010).
17) It is reported that InFocus, a U.S. manufacturer of LCD projectors and other products, asked Foxconn to R&D, design, production, marketing and other aspects of InFocus's smartphone M810. It began to be sold in Taiwan in July 2014. Foxconn also receives fees from InFocus depending on sales revenue from M801 (Nikkei (August 19, 2014)). Foxconn also sells large screen TV sets which use panesl made by their (and former Sharp) Sakai plant. These two cases seem to point to Foxconn's interest to be a final product producer. Foxconn's such move might contradict their current final product maker clients' interest.
18) Foxconn began designing, producing and selling their own no-brand large-screen 60" color television sets in Taiwan. These LCD screen panels are procured from their Sakai plant they acquired from Sharp and are known to be of high quality among consumers in Taiwan (SankeiBiz (2013)). Mishkin (2013) also notes: "...Foxconn also derives a substantial portion of its sales from PCs, a market that is shrinking. In response, the company has been trying to diversify away from pure manufacturing."

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APPENDIX.

Table A1. Production of color television sets for export markets at Matsushita Electric's Saijo plant (1966 – 1971)

	1966		1967		1968		1969		1970		1971	
production type	#models	output	#models	output	#models	output	#models	output	#models	output	#models	output
own brand	2	12,369	7	15,010	10	58,210	15	90,548	21	165,034	28	281,194
A (OEM)	1	4,532	2	3,126	1	3,001	---	---	---	---	---	---
B (PB)	3	4,189	3	14,553	5	30,975	7	36,777	9	30,544	12	60,423
C (PB)	1	4,257	1	17,642	1	5,315	2	14,034	3	12,058	2	5,962
D (PB)	1	983	1	4,518	2	5,902	---	---	---	---	---	---
E (PB)	---	---	1	1,503	1	700	---	---	---	---	---	---
F (PB)	---	---	1	2,003	2	11,081	4	15,846	7	27,101	6	15,748
G (OEM)	---	---	3	5,506	8	11,845	11	18,834	4	6,674	4	9,336
total	8	26,650	19	63,861	39	127,029	39	176,039	44	241,411	52	372,663
%own/total		46.4		23.5		45.8		51.4		68.4		75.5
%OEM/PB		53.6		76.5		54.2		48.6		31.6		24.5
av. output		3,331		3,361		4,234		4,514		5,487		7,167

Source: Ohgai (2004, Table 10). English translation is author's.

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