

## Follow the money, how does industry pay programmers' salaries when the required intellectual property is offshored?

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**Abstract:** There has been much discussion about offshoring of jobs in the computer and data-processing industries. Specifically, the issue of job shifts due to globalization in the software industry has been addressed in a 2006 ACM report [ACM:06]. Missing from those discussions is the role of intellectual property (IP), the capital complement of the labor and capital balance which drives our high-technology industries. The underlying economic model -- involving taxation and reimbursement of workers from the revenues that their products generate -- has not been explicated and is largely unknown in our community. This article presents the issue of software income allocation and the role played by IP when offshoring jobs. We also explain why there is such a lack of insight into the economics of software, from the investments made to the profits being accumulated and capital becoming available for job creation.

The intent of this article is to make computer scientists aware that preceding any flow of jobs there is actually a flow of IP, since the ability to create valuable software greatly depends on prior technological prowess. The processes that allow IP to be moved offshore are formally legal, although the resulting accumulation of massive capital in tax havens is drawing governmental attention and putting pressure to change tax regulations [ACM:06, pp.39, 256]. However, the changes proposed in the wake of those discussions ignore the crucial role of IP in generating such capital. The article concludes with some suggestions which would affect the outflow of IP and the movement of high-tech jobs in the future.

This article does not address the risk of misappropriation of IP when offshoring, a related but orthogonal issue; it only covers processes that are fundamentally legal. That risk is addressed throughout the ACM report [ACM:06, pp.11+25]. Tax incentives, a much larger economic factor for businesses than IP loss, are cited in the report, but the role of taxhavens is ignored [ACM:06, pp.35,41,112,177, 188].

**Introduction:** Programmers and the computer scientists supporting their work have traditionally focused on producing quality high performance software on time and at an affordable cost [Boehm:81]. They have rarely been concerned with the sales and pricing of software, and only question financial policies when the company that employs them goes broke. There is actually a strong contingent in the profession who feel that software should be a free good [Gay:02]. Implicit in that view is that government, universities, and foundations should pay for software development, rather than the users. In that model, programmers see themselves as creative artists, creating beauty and benefits for mankind.

However, consider the size of the software industry. Its revenue is \$121B per year in the U.S. alone, well over 1% of the US GDP [Compustat:02]. An even larger amount is spent in non-software companies for business-specific software development and maintenance. Over 4.8 million people are employed in this and directly related fields, earning nearly \$333B annually [BLS:07]. It is hence unlikely that universal free software is an achievable and even a desirable goal. Appropriately, open source initiatives actually focus on software that deserves wide public use and should be freely available to students and innovators, as editors, compilers, and operating systems.

Since the focus of this article is on economics, and the economic model of free software is not well understood, this article is limited to the flow of money related to commercial software; i.e., software written to make a profit, either by selling it or by making enterprises more efficient. Part of the income generated by such software sales is used to pay the programmers' salaries. Other portions go to grow the business and to taxes that are due and support the needed infrastructure. Figure 1 sketches the major components.

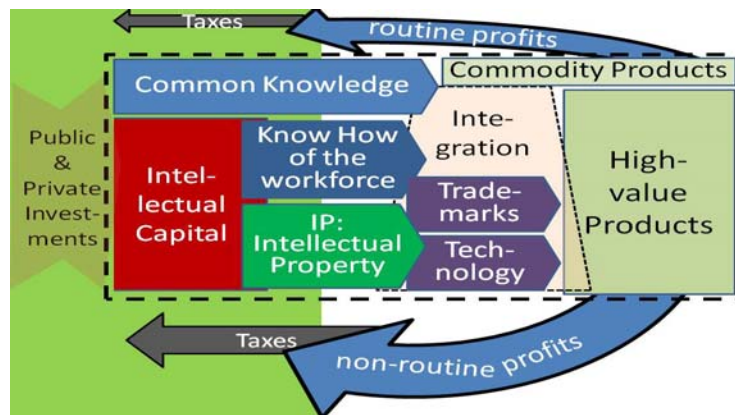


Figure 1. Components of the economic loops for software.

**Definitions:** Since the revenue aspect of software economics is relatively novel topic, this article has to describe some concepts from the literature of business economics and intellectual property generation and exploitation [SmithP:05]. Within the context of software, many general definitions can be simplified. For instance, we can ignore manufacturing costs, since software products are easy to copy. We also ignore the costs of the materials when developing and producing software. For tangible products, say computers, material costs are significant, but for software the cost of its tangible media is negligible. The value of software is hence assignable solely to the intellectual efforts of its designers, implementors, and marketers. The contents of a tangible master file or a memory of a cellphone is still considered to be an intangible. Everything inside the dashed lines of Figure 1 is intangible, only the money is real.

If the owner of the software protects that ownership, that software is considered intellectual property. To protect its intellectual property an enterprise will disallow purchasers of copies to make further copies that might be sold. The means of protection vary, and include asserting

copyrights, registering trademarks, making copying difficult, only releasing binary images of the code, and threatening prosecution. The intellectual property held within the owning enterprise is primarily protected by keeping the source code secret.

Employees and contractors in the software industry are routinely required to sign non-disclosure agreements (NDAs) in order to protect trade secrets. Trade secrets cover the majority of the intellectual property (IP) owned by companies that develop software. Patents can protect visible processes, as one-click-ordering. But patenting of internal processes that contribute to create quality software would require revealing the methods, records, and documents employed. Those are best protected as trade secrets [Damodaran:06]. For companies that market software a complementary component of corporate IP are its trademarks. Trademarks are visible and will be registered and their use defended. The value of trademarks derives from a combination of having excellent products in the market, marketing methods to further spread their use, and investing in advertising to spread the word. For products that benefit from ongoing sales customer lists are also of value; those will also be protected as a trade secret. A motivation for employees to keep trade secrets is the contribution to their joint job security that these constraints provide.

Without protected IP the income of a company would reduce to the routine level provided by commodity products, with margins after production and distribution of say 10%, insufficient to invest in innovation. Protected IP and the knowledge and expertise of staff within a company are the intangibles that together represent the intellectual capital of an enterprise. The employees that know how to exploit its IP complement the IP; the integration is essential for a successful enterprise. Having IP without a knowledgeable staff to exploit the IP is equally futile. When a high-tech company is acquired, there is typically a requirement that senior staff remain until its processes are solidly embedded inside the purchaser. Even a startup, without any identifiable IP, will have some specific ideas and concepts in the minds of its founders that form the seed of growth, and that they will not share with potential competitors. It will take time and money for that seed to mature into salable products, a delay referred to as the economic gestation time [Wiederhold:08].

### **Intellectual property and Jobs**

All subsequent developers on a software product benefit from the work that has gone on before, that is from the Intellectual Property (IP) that is in place. That IP complements the knowledge due to education and prior experience that new employees bring to the job.

The importance of IP to employee productivity becomes very clear when companies grow to a size that off-shore outsourcing of jobs is being considered. The new workers, be they testers to provide quality assurance, maintenance programmers, sales staff, or call center employees, will receive material representing IP that exists in the parent company at that time. Even offshore researchers will build on requirements and experience collected by the parent company.

## Splitting the intellectual capital

The intellectual capital is the workforce and the intellectual property (IP) it has generated. As a company matures the IP grows and becomes its major asset. Risks from turnover of employees become less critical. To gain financial flexibility a company can identify and isolate its IP. The rights to identified IP can be moved to a distinct subcorporation. Separating the IP is an initial phase in setting up an offshored operation whenever significant IP is involved [WTGS:09]. To be productive the extant IP still has to be made available to the creative workers, and that is done by having the productive corporate divisions pay license fees to the subcorporation holding the IP. An illustration will clarify the process of splitting rights from the property itself.

A company *USco* may sell its headquarters building to a real-estate enterprise *REco*, with a provision that the *REco* will lease the building back to *USco*. If *USco* has received a fair value for the building, *USco's* total tangibles remain unchanged until it starts spending the money it received for the sale. *REco* may offer an attractive lease because it is located in a taxhaven. Actually, *REco* can be set up by *USco* and remain under control of *USco*, also its tenant. Nobody moves and few employees will notice a change. There may be a new brass plaque on the building and a sign `REco' on the door to the rooms housing the people who maintain the building. The public consolidated annual report of *USco* needs only to list the name and location of the controlled subcorporation *REco*, the assets of both are combined. Since the lease receipts and payments cancel out the more complex financial flow is invisible.

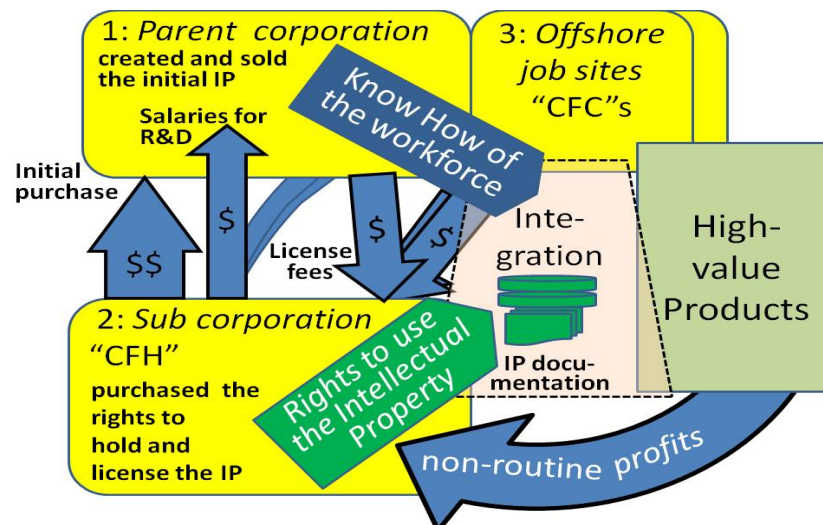


Fig.2 Rights to the IP isolated in a subcorporation

Such transfer-of-rights transactions are yet simpler when applied to intellectual property. The rights to a company's IP, or to an arbitrary fraction of that IP, can be sold to a controlled foreign holding company, a CFH, set up in a taxhaven. Once the rights to the IP are in the CFH the flow of income and expenses changes. The fraction of net income that is attributable to the IP held in the CFH is collected in an account held there. One way of collecting such income is to

charge royalties or license fees for the use of the intellectual property at the sites where the workers create saleable products, both at home and at offshore sites. There is no risk of IP loss at the CFH, because nothing is actually kept there. To reduce the risk of IP loss where the work is performed, new offshore sites are set up as Controlled Foreign Corporations (CFC's) rather than using contractors [WTGS:09]. Since the IP is crucial to making non-routine profits the royalties can be substantial, and will greatly reduce the profitability at the parent and at the CFCs from worldwide software product sales.

Now much flexibility is gained by the overall enterprise. Work can be shifted wherever it appears to be effective, perhaps where new incentives are being provided, and the needed IP can be made available there, as long as the license fees are paid to the CFH [Rahn:09]. Paying royalties on profits is preferred, since reported profits will adjust automatically to changing profit margins due to poor sales or to high margins due to cheap labor.

The actual IP contents needed to perform creative work is transferred via a combination of paths: documents, code, and personal interaction by staff interchanges among the remote sites and the originating location. Most transfers are mediated by the Internet, which allows rapid interaction and feedback. The CFH does not get involved at all.

There are hence three types of parties involved in IP creation and use as illustrated in Figure 2: the parent, the CFH, and the CFCs. Employees reside and create IP the parent and the CFCs. Large multinational corporations will actually establish many dozens of controlled entities, to take advantage of different regulations and incentives for certain activities in various countries.

### **Valuing the transferred IP.**

The CFH subcorporation that obtains the rights to the IP, and will profit from fees for the use of that IP, must initially purchase that IP from the prior owner. But setting a fair price is difficult. If the IP is overvalued the company selling the IP to the CFH will have gained too much income, on which it has to pay taxes. If it is undervalued, excessive profits will accrue to the CFH.

How is the value of the transferred IP documented? The annual reports to stockholders and the 10K reports submitted annually to the SEC rarely provide estimates of the value of a company's intangible property. Only when one company acquires another high-tech company are assessments of the IP obtained made. Three methods to assess the value of the transferred IP are in use: the IP share of the company's total market capitalization [Becker:02], the specific income expected from its products [Wiederhold:06], and the expected margin on R&D investments [GrossmanH:01]. All three methods leave uncertainty. Using more than one method helps in gaining confidence in the resulting valuation of the IP.

While the valuation of all the IP in a company is certainly a challenge, for the purpose of off-shoring software IP some simplification of confounding items is possible. Tangible property is relatively small in a high tech company. The value of the workforce can be assessed by

comparing acquisitions of similar companies without IP. For work that is offshored the new workers do not contribute prior proprietary knowledge, but only contribute IP subsequently. The benefits of marketing expenses tend to be short-lived. However, IP created by efforts in product improvement, that drive revenue with little delay, is often intermixed with novel R&D results that take a long time to get to the market.

### Taxhavens

Offshoring of jobs is greatly motivated by being able to reduce taxes on income by moving rights to the intellectual property into low-tax jurisdictions, i.e., into taxhavens. There are two types: semi-taxhavens -- countries that want to attract jobs through active external investments - - and primary taxhavens. Semi-taxhavens provide mainly temporary tax benefits. Countries intent on growth, as Israel and Ireland have offered tax holidays to enterprises setting up activities there; India provides incentives for companies that export. Slovenia has recently established a 0% rate for investments funds and other Eastern European countries are considering similar initiatives. To set up an operation in a semi-taxhaven requires some financial capital and significant corporate IP, so that the workers can become rapidly productive.

Primary tax havens are countries with small populations that focus on features that attract companies that will not invest in actual activities. No local personnel will be hired. Services needed for a remote holding company, as registration with the local government, mail forwarding, and arranging board-of-directors meetings is offered efficiently by branches of global accounting firms. For example, a single 5-story building in the Cayman Islands is the address for 18,000 holding companies, and the entire country, with less than 50,000 inhabitants, hosts over 90,000 registered companies and banks. The income from annual registration fees for that many companies allows the Cayman Islands not to impose any taxes on anybody. Even the beach resorts, available for meetings, are not taxed.

Definitions of what makes a country a prime tax haven varies, but always include negligible taxation and lack of transparency. A few dozen jurisdictions actively solicit and lobby for business, citing their taxhaven advantages. Often no reporting of income and assets is required. Advantages can be combined. For instance, the rule that Cayman-based corporations must have one annual meeting in the Cayman Islands can be overcome by having a Cayman company be resident in Bermuda. For a CFH fully controlled by another corporation, there would anyhow be only one stockholder. Cayman companies need not to have external directors on their boards and optional board meetings can be held anywhere. Neither audits nor annual reports are required, but for criminal cases records will be made available. At the extreme end are countries identified by the OECD as uncooperative taxhavens, which even shelter fraud [Makhlouf:02]. The use of primary taxhavens causes a loss to the U.S. of over \$100B annually, a substantial amount compared to the \$370 actually collected by the U.S. treasury as corporate tax [Cray:09]. Actually, only \$16B was paid by multinational corporations [PIRG:09]. An annual revenue loss due to taxhaven use of about \$125B has been estimated for developing nations.

### Use of assets in a taxhaven

After an IP transfer to a primary taxhaven there are two types of assets in the taxhaven CFH, the more visible financial assets, derived from licensing and royalties for use of the IP, and the IP itself. Both will grow steadily as shown in Figure 2. Those assets are now freely available to initiate and grow projects in any semi-taxhaven. The IP in the primary taxhaven is made available by charging license fees to those semi-taxhavens, providing immediate income to the CFH. Once the projects have generated products for sale, royalties on those sales provide further income to the CFH.

Initially the income at the CFH will have to be used reimburse the parent company for the assumed value of the IP transferred [LeveyWC:06]. That amount is typically paid over several years. Moving the IP early in the life of a company, when there is little IP, increases the leverage of the approach. The income of the CFH will also be used to pay for the cost of ongoing R&D creation, i.e., for the programmers at the parent company and in any actual productive offshore location [Weissler:02]. U.S. taxes will have to be paid on funds repatriated to the U.S., since they represent income. Similarly, if work is performed in other countries they can levy income taxes at their rates. The funds not needed to support R&D, often more than half after the initial payback, can remain in the CFH. In each yearly cycle yet more funds will flow to the holding company in the taxhaven. Additional funds may be repatriated when the U.S. offers tax amnesties for capital repatriation or when the U.S. companies shows losses, so that corporate income tax can be avoided [Clausing:04], [ACM:06, p.256].

The payments by the CFH for creative work assure that the resulting IP will belong to the CFH. While the value of the initial IP purchased diminishes over time, the total IP held in the CFH increases as the product is improved.

### Effect of having major assets in a taxhaven.

There are several effects that should be of concern to computer professionals, even though those effects are indirect. Three major elements are: instability of work, imbalance of large versus small companies, and loss of infrastructure support.

Having funds in a taxhaven provides to multinational corporations much flexibility to take advantage of global opportunities. Whenever and wherever there are business opportunities and incentives the funds can be rapidly deployed. Of course, moving work to semi-taxhavens is more advantageous than supporting work in countries that tax at typical rates. When semi-taxhaven countries attract investments in tangibles, say, a car factory, benefits are retained after the tax holiday, but IP investments can be rapidly redeployed. Only a few senior people may have to move physically. Governments setting up a semi-taxhaven may not realize how rapidly corporations can close facilities that depend primarily on IP, so that their incentives do not provide the long-term benefits these countries expected in return for the tax losses.

Smaller companies, that have not had the opportunity to employ taxhavens, are disadvantaged, even though they are seen by most economists as the major drivers of growth and jobs. In many countries, including the U.S., funds disbursed for R&D are eligible for government tax credits, providing yet more benefits to mature corporation that are able to offset R&D labor costs against taxes remaining on their profits. Since most large firms have already established tax havens, tax consulting firms intent on their growth are now marketing the use of taxhavens to medium-sized businesses as well.

The tax avoidance enabled by accumulating IP and funds in any taxhaven reduces ability of governments of the countries where the actual work is performed to support the infrastructure needed for a healthy economy. That infrastructure includes public roads and transportation, health services, and education for the next generation. Such scarcities can be seen in Silicon Valley, Silicon Gulch, and Electronics City, Bangalore [ACM:06, p.50].

### Lack of transparency

The creators of the software, even if they do care where their paycheck comes from and where the IP they produce goes, cannot follow the paths [Lev:01]. Many intermediate corporate structures get involved, so that tracing the sources of the programmer's income becomes wellnigh impossible. Of course, academics do not see on their paycheck stubs what part of their salary comes from DARPA, NSF, ONR, or their university. Even corporate directors, although in the end responsible, will not be aware of specifics, other than having agreed to a tax reduction scheme operated by their accountants. Investors and shareholders will not find in consolidated annual reports or 10-K filings any direct evidence of taxhaven usage, since regulations devised to reduce paperwork hide amounts and internal transactions among controlled corporations. Funds transferred for R&D and dividends from taxhavens are first deposited in corporate income accounts, and then taxed, but may still be eligible in many countries for government tax credits for corporate research. The taxpayers in those countries are not aware that benefits beyond salaries, as income from profitable IP, will not accrue to the country providing those research credits [Rashkin:07].

Tax avoidance processes have been sketched in "Perfectly Legal", but not applied there to corporate IP transfer [Johnston:03]. Recently their promoters, perhaps to gain more business, have provided some general documentation, and even address the risks of misvaluation of IP and of faulty royalty rates [LeveyWC:06]. The complexity of the arrangements makes it easy to cross the boundaries of legality. Misvaluations can greatly magnify the effect of IP exports and consequent tax losses. The firms that provide the advice for setting up tax shelters have the required broad competencies [ACM:06, p.246]. Their staff often function as directors of their customers' CFH, again invisibly. Most such advising organizations protect themselves from legal liability by splitting themselves formally into distinct companies for each country where they operate. Then those companies rejoin by becoming members of a 'club', set up under Swiss laws (*Vereinsgesetz*). The member companies of such a club do not assume responsibilities for each others work and advice, even if given to the same multi-national

corporation. But the club can share resources, information, and income among the member companies, and allow them to function as one unit.

But similar sharing of information is restricted for U.S. government officials. Rules put in place to protect corporate privacy prohibit sharing of information among IRS staff regarding legal processes used by specific taxpayers to avoid taxes. Even a recent US government report had to rely on survey data, and could not use corporate filings [GAO:09]. A thorough study into IP and capital flow would require changes in the restricting regulations.

### **A radical suggestion to change the flow**

If change of the flow of funds and IP via taxhavens is called for, any implementation will not be easy. More transparency will be needed before any substantial political effort can be motivated. Having a more equitable tax structure for companies at home has been advocated, but global companies already profit from tax benefits anywhere in the world [ACM:06, p.207]

A radical solution would be to do away with corporate taxation altogether, and compensate for the loss of government income by increasing taxes on dividends and capital gains, i.e., impose taxes only when corporate profits flow to the individuals who consume the benefits. The net effect on total tax revenues in the U.S. might be modest, since, because of effective tax avoidance, corporations now contribute as little as 8% to total U.S. tax revenue [Clausing:04]. Such a radical change would reduce the motivation for many distortions now seen in corporate behavior. Small businesses that cannot afford the fees and complexity of dealing with taxhavens would no longer be disadvantaged.

The fact that current corporate law equates a corporation with a person, when people have such different morals, motivations, and obligations is certainly a philosophical mistake [Gore:07]. Humans can not, without creating corporate entities, split themselves into multiple clones that take advantage of differing taxation regimes. In practice, not taxing corporations is such a radical change affecting so many other aspects of the economy and its public perception that any such change is as unlikely as many other tax reforms that have been proposed [Cray:09].

### **Why should the computer science community care about IP and taxhavens?**

We are proud to be part of the knowledge-based society, having brought forth a new revolution of human productivity in the last 50 years, moving well beyond the industrial revolution that started more than century earlier. Globalization is held forth as a means to distribute its benefits widely. But the growth of assets in taxhavens deprives workers world-wide of reasonably expected benefits. Those hidden assets have grown to be greater than annual industry revenues, and may already exceed the assets held in the countries where the IP is being created. Determining and publicizing the magnitude will require transparency regarding IP and financial assets held globally.

The presence of significant IP in tax havens provides global corporations with great flexibility to invest capital anywhere, and avoid income due to that IP from being taxed anywhere. The

combination of reduced support for education, government research funding, and physical infrastructure, the increased motivation to start new initiatives in semi-taxhavens, and the imbalance of small businesses versus global corporations is bound to affect the future of jobs in countries that initiated high-tech industries, although the rate and final magnitude cannot be predicted now. The better educated scientists will be less affected, and feel the effects more slowly. But any industry requires a mix of related competencies. It took 50 years for the U.S. car industry to be reduced to its current state. The velocity of change, when intangibles are involved instead of tangible capabilities, may well be greater. Discussions and actions affecting future knowledge-based industry growth, job creation, protection of retirement benefits, and the required infrastructure are futile if the creators are uninformed.

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