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# Financing Human Capital through Income-Contingent Agreements

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The second half of the twentieth century saw an explosion in financial innovation. A wide variety of products for savers, institutional investors, and consumers sprung to life, offering better and cheaper mechanisms for achieving the central roles finance plays in an economy: allocating capital and sharing risk. Even after 2008, when some of these innovations were accused of causing a financial meltdown, their use continues in the trillions of dollars in the United States as of 2017.<sup>1</sup> Most of these products, comprising a now well-understood array of contractual arrangements and practices, are available in connection to investments in tangible assets, such as houses and other real estate. A much smaller fraction targets intangible assets, like research and development. This is not because there are fewer opportunities to invest in intangible projects, but because intangible investments face special financing challenges. Chief among intangible investments is human capital.

Human capital development benefited from some financial innovations during the second half of the twentieth century, but it still received comparably small attention when compared to other areas of the economy, such as housing and retail investing. The main innovations that took place were, for the most part, driven by government through widespread student loan programs rather than private initiatives. Government intervention followed from better understanding of the many barriers that prevent human capital from being fully funded.

Since then, changes in the economic environment, notably in information technology, combined with the successful experience of a few public and private initiatives, have opened the door for new alternatives for funding human capital. Several income-contingent products have been tested now for almost 30 years, and they can transform the way human capital is funded.

In this chapter I revisit the obstacles for funding human capital, explain why recent changes improve the potential for funding, and briefly describe income-contingent innovations that were tested in 2017.

## **WHO SHOULD FUND HUMAN CAPITAL DEVELOPMENT?**

The discussion of emerging innovations in financing human capital must first address who should do the funding. The simplest answer starts with an abstract concept: “capital markets.” This would be an appropriate answer for the question of who should fund a consumer’s car, or who should fund a corporation’s expansion. It is also a valid answer for human capital, although relatively incomplete because capital markets do not include the opportunities for funding that can arise from close relationships between the main stakeholders.

The connection between an employer’s needs and a worker’s training, coupled with a complex interaction between workers, institutions offering training, and employers, provides an answer beyond capital markets. Funding has the potential to achieve better alignment of incentives if it links individuals, training institutions, and employers. Why? Because training providers have information about their own product that trainees do not have, while employers have information about how to use that training. In this circumstance, contracts contingent on outcomes reduce the costs associated with private information by aligning each party’s incentives.

Beyond having an incentive for funding training, employers and society profit from trained individuals and therefore have a reason to not only provide funding but also subsidize it. In the case of employers, this means they pay for part of the training. Similarly, the state has a reason to pay for part of the cost of training, as it benefits from the direct taxation of a more productive workforce and, indirectly, from the reduced costs of unemployment, subemployment, and social challenges derived from them.

The analysis below focuses on interactions between private stakeholders. It begins by explaining why, even though they all benefit, stakeholders are reluctant to participate. The emerging alternatives will

then be addressed, highlighting the opportunities for funding interactions between them.

## **HUMAN CAPITAL INVESTMENT: AN INFORMATION AND CONTRACTUAL CHALLENGE**

The reasons human capital will not be funded at optimal levels have been described amply elsewhere.<sup>2</sup> Before explaining how financial innovations offer new solutions, it is important to revisit the problem. Here I compare investments in human capital and tangible investments, a comparison that is increasingly relevant in light of recent developments in artificial intelligence and robotic technology.

Consider an investment in the “knowledge and skills” of a new crop of robots. Suppose these robots can learn, for every intent and purpose, to perform the same tasks that people do today. They can follow advanced instructions, analyze complex problems, and provide recommendations. They are capable of writing or devising strategic plans for new businesses, and can interact with humans and inspire emotions in them. However, unlike humans, these robots do not have free will: they do what they are told or, more precisely, programmed to do, and when deciding between different alternatives, they act according to an objective chosen by the robot’s programmer according to specific rules.<sup>3</sup> Suppose that these robots can be bought, sold, or rented at will.

Now, say these robots need a new program that will allow them to do a new set of tasks. Even though this investment in “knowledge and skills” is intangible, the effects of that knowledge and those skills are embodied in a tangible object, the robot, which can be rented or sold. Furthermore, because the robots follow objectives given to them, contracts can specify exactly what those objectives should be.

If such robots existed, funding their training would not be different from funding other tangible projects, such as investment in machinery or real estate. Corporations would buy robots, train them, and enjoy their services at a profit. Some robots would be available for rent, in which case funding for their training could be done using the robot as collateral or, similarly, using contracts that specify precisely what the robot will do in certain circumstances.

In such a world, worthwhile opportunities for training—worthwhile in an economic sense, that is, when the lifetime cost of the investment is lower than the lifetime benefits—would be funded by the robot’s owner up to the point where additional training would not yield any extra benefits. Lack of capital would be an issue in the same way that funding capital for new machinery is an issue. Financial intermediaries, or other individuals and firms, would provide capital using the typical arrangements and contracts available for other tangible investments. The cost of capital would closely reflect the opportunity cost of the investment and any risk transfer taking place between the parties.

Firms, to the extent that they can profit from training robots, would contribute to the funding, even if not owning the robot outright. Owners would fund training themselves, or would raise capital based on the robot’s capacity to produce future income. Training institutions would offer only valuable programs, tailored to the needs of the robot’s owners and the firms using them. They would generally be unable to charge tuition fees higher than those justified by the value of the training they offer, and those fees would be partially paid by firms and owners.

In this world, it does not really matter who comes up with the money first—robot owners or the firms who use them—since the possibility of writing contracts between the different parties provides an avenue for ensuring that everyone involved ends up paying some amount and taking a predetermined amount of risk.

## **FREE WILL**

From an economic perspective, investment in human capital is fundamentally different from investing in robots in two important dimensions. First, those acquiring skills and knowledge follow their own objectives, which are generally not known to others, and cannot be forced to work for a particular employer. Second, our robot example supposes that a knowledgeable being, the robot’s owner, decides the robot’s objectives. In reality, individuals choosing training for themselves do not have the information to fully analyze a specific training choice. If they did, they probably would not need training. The consequences of these differences are profound.

Consider, first, unknown objectives. Employers are unsure about an individual's future behavior within the firm and their future performance, and employees are unsure about how much they will enjoy working for a particular employer. Both sources of uncertainty reduce the willingness of employers to fund, and employees to seek, long-term contracts with their employers. Unlike the robot case, where objectives were clearly known, individuals' intentions and behavior cannot be fully contracted on.

Inability to commit to work for a particular employer leads to the same result: employers who might benefit from a highly skilled workforce, even after paying a market wage, will not be willing to pay for training. They fear that once they pay for training, a competitor will poach workers away. The difference when compared to our robot example is that courts will not enforce contracts that commit individuals to work for someone, as such contracts would be akin to indentured servitude.

If firms will not invest in training, then the onus for funding falls on the individual. This observation, attributed to Arthur Cecil Pigou (see, for instance, Acemoglu and Pischke [1998]), leads to the conclusion that individuals will have to finance most of their development, even if their training greatly benefits their employers and society.

Our second problem, the individual's incomplete information, means that those who would have to shoulder the funding are also the ones who, almost by definition, are unable to assess the benefits of the investment. They perhaps understand that the investment opens doors, but are in a position that makes it difficult to assess which program is worthwhile, which one is not, and which one offers a better fit. It is not surprising that many programs of questionable quality spend significant fractions of their budgets in marketing. In a marketplace with incomplete information, institutions that offer training can profit handsomely by shaping perceptions, no matter how removed from reality.

To summarize, training provides knowledge and skills to individuals who cannot commit to behave in a particular way or work for a particular employer. As a result, employers will limit the investment they make in their employees' training. Instead, individuals will pay for their own training. At the same time, individuals do not have the information they need to make the best decisions regarding their training.

Once one accepts that individuals will need to fund their own training, the inalienability of their investment affects the type of funding they will receive as well. Given that the usefulness of a specific set of skills is uncertain, an investment in training will entail some risk. Financing, therefore, will include some type of risk transfer between the individual and the source of capital. In our robot world, the best arrangement would share risk between the robot's owner and those providing capital. Yet, to share risk effectively, the parties involved need to be able to agree on the activities the robot will perform after the investment—its choice of “occupation” (in robot speak) and the intensity of work, for example—and need to contract on the actions the robot is programmed to take to mitigate (or increase) risk. Since individuals' motivations and actions are largely hidden, and therefore cannot be contracted on, an agreement that shares a lot of the risk will be difficult to implement. The result is funding that *does not* transfer risk. This type of funding is essentially a loan.<sup>4</sup> Because these loans will have no collateral, they will be expensive, rationed, or unavailable.

In conclusion, absent arrangements that overcome the problems outlined above, we should expect human capital development to be funded by individuals using loans. We should also expect that training institutions will attempt to impress individuals with offerings that are not necessarily in their best interest. This is what we observe, with the notable difference of the state's intervention to provide funding. Until quite recently, the state mainly offered this funding through loans.

Economists normally label the problems described above as information and agency problems. Information problems are those that stem from employees finding it difficult to judge the quality of different programs, or employers finding it difficult to judge the qualities of an individual. These problems are compounded by agency problems: employers are hesitant to fund an individual's training if they cannot get the employee to commit to work for the employer (which they cannot), and the employee is hesitant to invest in training, given the employer's unwillingness to commit to hire them later at an acceptable wage. These problems are partially addressed by the state's involvement, for in some areas it has an advantage over private funders and providers, but state intervention certainly does not remove all of the obstacles to funding human capital.

The result is insufficient funding, excessive risk taken by individuals, and resources allocated to inappropriate and expensive training.

## **INNOVATIONS OVERCOMING THE CHALLENGES**

The previous discussion paraphrased the standard economic argument explaining limits in the funding of training (and education, more generally). Yet a changing economic environment reduces the previous issues and allows for new arrangements that more closely resemble the efficient investment we witness in tangible assets. The new arrangements are attractive because workers can find funding for their training without taking too much personal risk, and because these arrangements better align the incentives of training institutions and employers with those of employees seeking funding.

A significant change in the economics of human capital investment is the fall in the cost of income-tracking technologies. This is important because whereas it is true that workers cannot commit to work for a particular employer after receiving training, nothing prevents writing a contract contingent on the worker's earnings. In the past such contracting would have been impractical, since reliably tracking an individual's income was virtually impossible. The rise of income taxes during the last 80 years changed this, however, and today high-income economies boast sophisticated income-tracking mechanisms for most of the population. Evasion exists, but it is small enough that governments can reliably count on income taxes to fund their operations. More recently, income information has become even more accessible through information technology that has made income verification a fast and cheap activity.

Better income-tracking technology was a necessary development to enable the use of income-contingent payments around the world. Governments, including that of the United States, have been progressively switching to income-contingent loans for students. New businesses are piggy-backing on this information, creating income-contingent contracts with individuals.

The second, much more recent development, is the growing experience of businesses that enable different types of entities—training

institutions, employers, individuals, and a wide variety of investors—to sign income-contingent contracts with individuals, such as App Academy and Learners Guild. The increased availability of these platforms has made it possible for some training institutions to implement, in effect, income-contingent tuition fees with their students. The triggering event for these new institutions was the lack of available funding from the U.S. government and the realization that offering income-contingent contracts allowed them to attract students. The income-contingent contracts used by these institutions are referred to in this nascent industry as Income Share Agreements (ISAs).

## INCOME SHARE AGREEMENTS

ISAs are contracts whereby a student agrees to pay a percentage of income for a fixed period upon graduation. They are attractive for funding human capital for three reasons:

- 1) ISAs reduce risk for the individual. Since payments are income contingent, the probability that those who use them to pay for training would subsequently suffer from a liquidity crisis due to fixed payments goes down. Since the repayment period is fixed, the total value of the trainee's payments will be proportional to the trainee's earnings, reducing risk on the trainee's postpayments income. In contrast, as described above, loans *increase* the riskiness of a graduate's postpayment lifetime income *and* have the potential to induce a liquidity crisis at some point.
- 2) Institution-funded ISAs align incentives between the institution and students. An institution-funded ISA means training providers have "skin in the game," and the effective tuition paid by the student will be proportional to the institution's capacity to place its graduates in gainful employment situations.
- 3) Employer-funded ISAs improve both the poaching problem and the information problem. An ISA ensures that an employer obtains a return on the investment in the event the worker decides to leave. In principle, the same result can be obtained

with an employer loan, but the ISA improves the contract in two dimensions. First, an ISA protects the employer from a lemon problem: highly valuable employees leave, whereas those offering marginal value stay. An ISA ensures that the upside from an investment remains with the employer. Second, an employer-funded ISA also helps with the information problem, since employers then have an incentive to pay for training only in institutions that offer the type of training employers need.

## ISAs IN TODAY'S ENVIRONMENT

The first modern income-contingent financing of education dates from the mid-1970s, when Yale and other universities pioneered an income-contingent payment scheme for their students. The programs did not last long, as they became redundant following the introduction of the U.S. government's federal loans program. Yet, they inspired income-contingent loan programs in multiple countries. The most notable is Australia's Higher Education Contribution Scheme (HECS), which, packaged with multiple changes in Australia's higher education funding system, has inspired other governments to follow suit. The United States included income-contingent loans as an option in the 1990s, and most recently through its Income-Based Repayment program.

Beyond international public initiatives, and amid concerns in the United States of high tuition fees and increased pressure from labor markets to acquire degrees, a plethora of private initiatives have surfaced in the last decade. These include Purdue's Back-a-Boiler program, as well as funding offers from start-up firms such as Upstart, SOFI, PAVE, Education Investments, Lumni, and Vemo, all of which have funded students using future income potential as criteria for underwriting, rather than immediate credit records, family resources, or other collateralable assets.<sup>5</sup>

From this list, Purdue's Back-a-Boiler program stands out as an institution-based initiative. Purdue's experiment with ISAs is the first undertaken by a large public university in the United States, but multiple smaller initiatives, mostly associated with boot camps, have emerged in

recent years. By receiving payments linked to graduate's income, these boot camps in effect link tuition fees with success in the marketplace. An institution that charges tuition only in case of success is broadcasting its quality, making it easier for potential students to evaluate where to go.

At the time of writing, no large-scale involvement of employers with income-contingent funding has taken place. Yet, this is a natural solution for the problem of employers not being willing to invest because of a worker's inability to commit to work for them. For employers to recover their investment even when employees leave, contracts between both must include features beyond the traditional wage for employment contract. One straightforward mechanism for achieving this is to have a finance contract—one where the employee pays the employer who offered funding, even if the employee then works elsewhere—in addition to the employment contract. In other words, the alternative is to have a financing contract independent of the employment relationship.

In principle, a contract between employer and employee could be structured with many contingencies. Two simple ones are to pay a loan conditional on leaving, and the other is to make the contract income contingent. A loan partially solves the problem but would again expose the worker to risk. An income-contingent contract, in contrast, achieves both risk reduction for the individual while solving the employer's problem.

## **REMAINING CHALLENGES FOR INCOME-CONTINGENT FINANCING**

The well-trained economist will point out fairly quickly that income-contingent financing still suffers from high agency costs. Students signing ISAs can choose to earn less income after their training is completed; those with an inclination to “take it easy” will find the contract particularly attractive and will make the contract more expensive for enterprising ones. These costs stem from the private information students have about their intentions and capabilities, and the disincentives created by the contract for inducing high effort. The development of income-based financing hinges on the success that particular imple-

mentation settings have in keeping those costs relatively low.<sup>6</sup> Indeed, debt is plausibly the instrument with lowest agency costs, but it is also the instrument that concentrates risk on the individual and, in the case of secured loans, asks from them a preexisting stock of assets, coming from parents or previous endeavors. Thus, the mechanism with lowest frictions is, plausibly, the one worst suited for *fairly* funding human capital investments. Income-based repayment offers a better outcome—less risk for the individual with no collateral—but still with costs.

Further improvements in information technology, and increased familiarity with the income-contingent products currently tested by private initiatives and governments, will plausibly reduce those costs, thereby increasing the availability of capital while simultaneously improving risk sharing. However, as with many other economic issues, time along with further research and experience will tell. At stake is individuals getting the training they need in order to take full advantage of new knowledge and technology.

## CONCLUSION

The importance of training cannot be overstated. On a global scale, as long as machines do not develop themselves as humans do, human capital development holds the key for raising productivity growth, ensuring that the economic prosperity of the last few centuries continues uninterrupted. Yet, the fact that owners of human capital cannot write contracts specifying what they will do in the future reduces the amount of funds available for investment and narrows the options for the types of funding available. Concretely, individuals need to look for funding and carry a lot of risk.

Two relatively new developments offer an opportunity for improving this problem. First, better income-tracking and verification technology enables the creation of contracts contingent on income. Second, the emergence of platforms that are facilitating those contracts between training institutions, employers, and individuals, creates an opportunity for a natural economic interaction to take place between the stakeholders involved in training.

## Notes

1. Two such products include mortgage-backed securities and over-the-counter derivatives. Just the outstanding value of mortgage-backed securities in the United States at the end of 2017 was \$2.952 trillion (Board of Governors of the Federal Reserve System 2018). The largest share of over-the-counter derivatives consists of interest rate contracts. The market value of U.S.-denominated interest rate contracts, including FRAs, swaps, options, and other products, was \$1.434 trillion at the end of 2017 (Bank of International Settlements 2018).
2. The literature goes back to Pigou but is discussed extensively as early as 1962 in Becker's (1962) seminal work. More recently, Barr (2001) offers a very accessible discussion.
3. We will not venture in this example on what happens when these robots fail to follow instructions from their programmers and start making decisions based on their own objectives.
4. To the extent that bankruptcy is an option for borrowers, loans do transfer a limited amount of risk. The key word for the context of this essay is *limited*.
5. The author is one of Lumni's cofounders.
6. I have argued elsewhere (Palacios 2014) that these costs have probably been over-emphasized by economists.

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