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## Introduction

### **Valuation, the Old-Fashioned Way: or, a Thousand Years in Essex**

Colin Matthews was vexed. To have valuers crawling all over his airport was the last thing he wanted. But after three years, it could no longer be stopped.

It was the summer of 2012. For three years he had been fighting the UK competition authorities' attempts to break up British Airports Authority (BAA), the company he ran and which owned most of Britain's large airports. He had exhausted his legal options and was giving up.

So now the men and women with suits and spreadsheets and high-viz vests were going round his airports, working out how much they were worth to potential buyers. Accountants and lawyers and surveyors and engineers measured and counted, and bit by bit, they came up with a value for the whole of Stansted, Britain's fourth-busiest airport, to the northeast of London.

They priced up the tarmac, the terminal, the baggage equipment. There was an agreed value for the parking lots, the bus station, and the airport hotel. There was some argument about the underground fuel pumps, but the calculation was not out of the ordinary for BAA's accountants: the cost of the asset less its depreciation, with some adjustment for inflation. Sure enough, when Stansted was sold in 2013 (for £1.5 billion), the price was pretty close to what the accountants had valued the business at.

In one sense, the valuation of Stansted looked like a quintessentially twenty-first-century scene. There was the airport itself. What could be a better emblem of globalized high modernity than an

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airport? There was the troupe of accountants and lawyers, those ubiquitous servants of financial capitalism. And, of course, there was the economic logic of the process: from the privatization that put BAA in the private sector in the first place, to the competition policy that caused the breakup, to the infrastructure funds that circled to buy the assets after breakup; all very modern.

But at the same time, the valuation of Stansted was the kind of thing that had been going on for centuries. The business of working out how much something was worth by counting up and measuring physical stuff has a long and noble tradition.

Nine and a quarter centuries before, Stansted, then just another country village, had played host to a similar scene. Reeves and messengers, the eleventh-century forerunners of the accountants and lawyers that had so vexed Colin Matthews, had converged on the place to assess its value for Domesday Book, the vast survey of England's wealth carried out by William the Conqueror. Using tally-sticks rather than laptops, they carried out their own valuation. They talked to people and counted things. They recorded that Stansted had a mill, sixteen cows, sixty pigs, and three slaves. Then they measured what they counted and valued the manor of Stansted at £11 per year.<sup>1</sup>

And although the value they put on the medieval village of Stansted was rather less than the £1.5 billion BAA got for selling the airport in 2013, the reeves and envoys who did the measuring for William the Conqueror were doing something fundamentally similar to what Colin Matthews's accountants were doing.

For centuries, when people wanted to measure how much something ought to be worth—an estate, a farm, a business, a country—they counted and measured *physical* stuff. In particular, they measured things with lasting value. These things became the fixed assets on accountants' balance sheets and the investments that economists and national statisticians counted up in their attempts to understand economic growth.

Over time, the nature of these assets and investments changed: fields and oxen became less important, animals gave way to machinery and factories and vehicles and computers. But the idea that assets are for the most part things you could touch, and that investment means building or buying physical things was as true

for twentieth-century accountants and economists as it was for the scribes of Domesday Book.

## Why Investment Matters

The nature of investment is important to all sorts of people, from bankers to managers. Economists are no exception: investment occupies a central place in much economic thought. Investment is what builds up capital, which, together with labor, constitutes the two measured inputs to production that power the economy, the sinews and joints that make the economy work. Gross domestic product is defined as the sum of the value of consumption, investment, government spending, and net exports; of these four, investment is often the driver of booms and recessions, as it tends to rise and fall more dramatically in response to monetary policy and business confidence. The investment element of GDP is where the animal spirits of the economy bark, and where a recession first bites.

As a result, the statisticians whose job it is to work out national income have put long and sustained efforts into measuring how much businesses invest, year after year, quarter after quarter. Since the 1950s, national statistical agencies have sent out regular questionnaires to businesses to find out how much businesses are investing. Periodic studies are done to understand how long particular assets last and, especially for high-tech investments like computers, how much they are improving over time.

Until very recently, the investments that national statistical offices measured were all tangible assets. Although these investments represented the modern age in all its industrial glory (in 2015 in the UK, for example, businesses invested £78bn in new buildings; £60bn in IT, plant, and machinery; and £17bn in vehicles<sup>2</sup>), the basic principle that investment was about physical goods would have made sense to William the Conqueror's reeves.

## The Dark Matter of Investment

But, of course, the economy does not run on tangible investment alone. Stansted Airport, for example, owned not just tarmac and

terminals and trucks, but also things that were harder to see or touch: complex software; valuable agreements with airlines and retailers; internal know-how. All these things had taken time and money to build up and had a lasting value to whoever owned the airport, but they consisted not of physical stuff but of ideas, knowledge, and social relations. In the language of economists, they were *intangible*.

The idea that an economy might come to depend on things that were immaterial was an old one. Futurists like Alvin Toffler and Daniel Bell had begun to talk about the “post-industrial” future as long ago as the 1960s and 1970s. As the power of computers and the Internet became more apparent in the 1990s, the idea that immaterial things were economically important became increasingly widely accepted. Sociologists talked of a “network society” and a “post-Fordist” economy. Business gurus urged managers to think about how to thrive in a knowledge economy. Economists began to think about how research and development and the ideas that resulted from it might be incorporated into their models of economic growth, an economy parsimoniously encapsulated by the title of Diane Coyle’s book *The Weightless World*. Authors like Charles Leadbeater suggested we might soon be “living on thin air.”

The bursting of the dot-com bubble in 2000 dampened some of the wilder claims about a new economy, but research continued among economists to understand what exactly was changing. It was in this context that a group of economists assembled in Washington in 2002 at a meeting of the Conference on Research in Income and Wealth to think about how exactly to measure the types of investment that people were making in what they were calling “the new economy.” At this conference and afterwards, Carol Corrado and Dan Sichel of the US Federal Reserve Board and Charles Hulten of the University of Maryland developed a framework for thinking about different types of investment in the new economy.

To get an idea of what these sorts of investment are, consider the most valuable company in the world at the time of the conference: Microsoft. Microsoft’s market value in 2006 was around \$250bn. If you looked at Microsoft’s balance sheet, which records its assets, you would find a valuation of around \$70bn, \$60bn of which was cash and various financial instruments.<sup>3</sup> The traditional

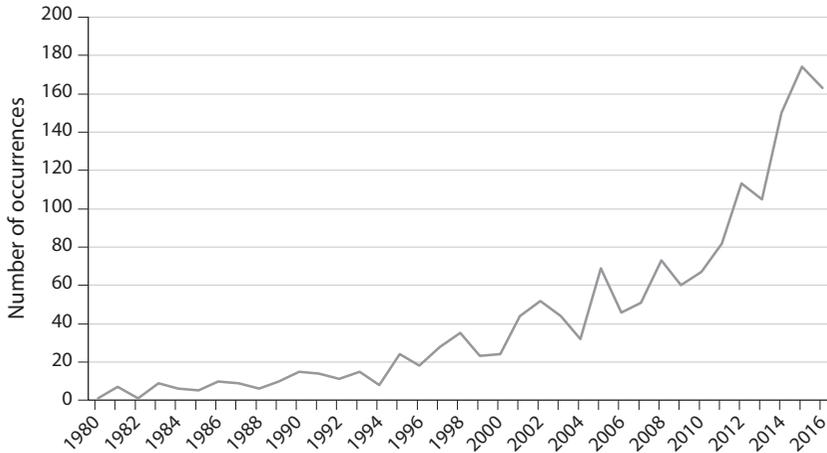
assets of plant and equipment were only \$3bn, a trifling 4 percent of Microsoft's assets and 1 percent of its market value. By the conventional accounting of assets then, Microsoft was a modern-day miracle. This was capitalism without capital.

Not long after the conference, Charles Hulten combed through Microsoft's accounts to explain why it was worth so much (Hulten 2010). He identified a set of intangible assets, assets that "*typically involve the development of specific products or processes, or are investments in organizational capabilities, creating or strengthening product platforms that position a firm to compete in certain markets.*" Examples included the ideas generated by Microsoft's investments in R&D and product design, the value of its brands, its supply chains and internal structures, and the human capital built up by training.

Although none of these intangible assets are physical in the way that Microsoft's office buildings or servers are, they all share the characteristics of investments: the company had to spend time and money on them up-front, and they delivered value over time that Microsoft was able to benefit from. But they were typically hidden from company balance sheets and, not surprisingly, from the nation's balance sheet in the official National Accounts. Corrado, Hulten, and Sichel's work provided a big push to develop ways to estimate intangible investment across the economy, using surveys, existing data series, and triangulation.

### **A Funny Thing Happened on the Way to the Future**

And so the intangibles research program developed. In 2005 Corrado, Hulten, and Sichel published their first estimates of how much American businesses were investing in intangibles. In 2006 Hulten visited the UK and gave a seminar on their work at Her Majesty's Treasury, which immediately commissioned a team (that included one of this book's authors) to extend the work to the UK. Work also began in Japan. Agencies like the Organisation for Economic Co-operation and Development (OECD), which were very early on the intangible scene (see, e.g., Young 1998), promoted the idea of intangible investment in policy and political circles, and the idea attracted some attention among commentators and the emerging economic blogosphere. As figure 1.1 shows,



**Figure 11.** “Intangibles” references in scientific journals. Data are the number of mentions of the word “intangible” in the Abstract, Title, or Keyword in academic journals in the field “Economics, Econometrics and Finance” recorded in the database ScienceDirect. Source: authors’ calculations from ScienceDirect.

mention of “intangible” became steadily more fashionable even in dry academic journals.

But then something happened that changed the economic agenda: the global financial crisis. Economists and economic policymakers were, quite reasonably, less interested in understanding a purported new economy than in preventing the economy as a whole from collapsing into ruin. Once the most dangerous part of the crisis had been averted, a set of new and rather bleak problems came to dominate economic debate: how to fix a financial system that had so calamitously failed, the growing awareness that inequality of wealth and income had risen sharply, and how to respond to a stubborn stagnation in productivity growth. To the extent that the idea of the new economy was still discussed, it was mostly framed in pessimistic, even dystopian terms: Had technological progress irreversibly slowed, blasting our economic hopes? Would technology turn bad, producing robots that would steal everyone’s jobs, or give rise to malign and powerful forms of artificial intelligence?

But while these grim challenges were dominating public debate on economics in op-ed columns and blogs, the project to measure new forms of capital was quietly progressing. Surveys and analyses

were undertaken to produce data series of intangible investment, first for the United States, then for the UK, and then for other developed countries. Finance ministries and international organizations continued to support the work, and national statistical agencies began to include some types of intangibles, notably R&D, in their investment surveys. Historical data series were built, estimating how intangible investment had changed over time. And, as we shall see, intangible investment has, in almost all developed countries, been growing more and more important. Indeed, in some countries, it now outweighs tangible investment.

### Why Intangible Investment Is Different

Now, there is nothing inherently unusual or interesting from an economic point of view about a change in the types of things businesses invest in. Indeed, nothing could be more normal: the capital stock of the economy is always changing. Railways replaced canals, the automobile replaced the horse and cart, computers replaced typewriters, and, at a more granular level, businesses retool and change their mix of investments all the time. *Our central argument in this book is that there is something fundamentally different about intangible investment, and that understanding the steady move to intangible investment helps us understand some of the key issues facing us today: innovation and growth, inequality, the role of management, and financial and policy reform.*

We shall argue there are two big differences with intangible assets. First, most measurement conventions ignore them. There are some good reasons for this, but as intangibles have become more important, it means we are now trying to measure capitalism without counting all the capital. Second, the basic economic properties of intangibles make an intangible-rich economy behave differently from a tangible-rich one.

#### *Measurement: Capitalism without Capital*

As we will discuss, conventional accounting practice is to not measure intangible investment as creating a long-lived capital asset. And this has something to be said for it. Microsoft's investment

in a desk and an office building can be observed, and the market for secondhand office equipment and renting office space tells you more or less daily the value of that investment. But there is no market where you can see the raw value of its investment in developing better software or redesigning its user interface. So trying to measure the “asset” that’s associated with this investment is a very, very hard task, and accountants, who are cautious people, typically prefer not to do so, except in limited circumstances (typically when the program has been successfully developed and sold, so there is an observable market price).

This conservative approach is all very well in an economy where there is little investment in this type of good. But as such investment starts to exceed tangible investment, it leaves larger and larger areas of the economy uncharted.

*Properties of Intangibles:  
Why the Economy Is Becoming So Different*

The shift to intangible investment might be a relatively minor problem if all that was at stake was mismeasurement. It would be as if we were counting most of the new trucks in the economy but missing some of them: an interesting issue for statistics bureaus, but little more.

But there is, we will argue, a more important consequence of the rise of intangibles: intangible assets have, on the whole, quite different economic characteristics from the tangible investment that has traditionally predominated.

First of all, intangible investment tends to represent a *sunk* cost. If a business buys a tangible asset like a machine tool or an office block, it can typically sell it should it need to. Many tangible investments are like this, even large and unusual ones. If you’ve ever fancied one of those giant Australian mining tractors, you can buy them secondhand at an online auction site called Machinery Zone; World Oils sells gently used drilling rigs; and a business called UVI Sub-Find deals in secondhand submarines. Intangible assets are harder to sell and more likely to be specific to the company that makes them. Toyota invests millions in its lean production systems, but it would be impossible to separate these investments

from their factories and somehow sell them off. And while some research and development gives rise to patents that can in some cases be sold, far more of it is tailored to the specific needs of the business that invests in it, certainly sufficiently so to make intellectual property markets very limited.

The second characteristic of intangible investments is that they generate *spillovers*. Suppose you run a business that makes flugelbinders, and you own a tangible asset in the form of a factory, and an intangible asset in the form of an excellent new design for a flugelbinder. It's almost trivially easy to make sure that your firm gets most of the benefits from the factory: you put a lock on the door. If someone asks to use your factory for free, you politely refuse; if they break in, you can call the police and have them arrested; in most developed countries, this would be an open-and-shut case. Indeed, making sure you get the benefit from tangible assets you own, like a factory, is so simple that it seems a silly question to ask. The designs, however, are a different business altogether. You can keep them secret to prevent their being copied, but competitors may be able to buy some flugelbinders and reverse-engineer them. You might be able to obtain a patent to discourage people from copying you, but your competitors may be able to "invent around" it, changing just enough aspects of the product that your patent offers no protection. Even if your patent is secure, getting redress against patent infringement is far more complicated than getting the police to sling intruders out of your factory—you may be in for months or years of litigation, and you may not win in the end. After their world-leading first flight, the Wright brothers spent much of their time not developing better aircraft, but fighting rival developers who they felt were infringing on their patents. The tendency for others to benefit from what were meant to be private investments—what economists call spillovers—is a characteristic of many intangible investments.

Intangible assets are also more likely to be *scalable*. Consider Coke: the Coca Cola Company, based in Atlanta, Georgia, is responsible for only a limited number of the things that happen to produce a liter of Coke. Its most valuable assets are intangible: brands, licensing agreements, and the recipe for how to make the syrup that makes Coke taste like Coke. Most of the rest of the

business of making and selling Coke is done by unrelated bottling companies, each of which has signed an agreement to produce Coke in its part of the world. These bottlers typically own their own bottling plants, sales forces, and vehicle fleets. The Coca Cola Company of Atlanta's intangible assets can be scaled across the whole world. The formula and the Coke brand work just the same whether a billion Cokes are sold a day or two billion (the actual number is currently about 1.7 billion). The bottlers' tangible assets scale much less well. If Australians dramatically increase their thirst for Coke, Coca Cola Amatil (the local bottler) will likely need to invest in more trucks to deliver it, bigger production lines, and eventually new plants.

Finally, intangible investments tend to have *synergies* (or what economists call complementarities) with one another: they are more valuable together, at least in the right combinations. The MP3 protocol, combined with the miniaturized hard disk and Apple's licensing agreements with record labels and design skills created the iPod, a very valuable innovation. These synergies are often unpredictable. The microwave oven was the result of a marriage between a defense contractor, which had accidentally discovered that microwaves from radar equipment could heat food, and a white goods manufacturer, which brought appliance design skills. Tangible assets have synergies too—between the truck and the loading bay, say, or between a server and a router, but typically not on the same radical and unpredictable scale.

## Conclusion

These unusual economic characteristics mean that the rise of intangibles is more than a trivial change in the nature of investment. Because intangible investments, on average, behave differently from tangible investments, we might reasonably expect an economy dominated by intangibles to behave differently too.

In fact, once we take into account the changing nature of capital in the modern economy, a lot of puzzling things start to make sense. In the rest of this book, we'll look at how the shift to intangible investment helps us understand four issues of great concern to anyone who cares about the economy: secular stagnation, the

long-run rise in inequality, the role of the financial system in supporting the nonfinancial economy, and the question of what sort of infrastructure the economy needs to thrive. Armed with this understanding we then see what these economic changes mean for government policymakers, businesses, and investors. Our journey will take us past the appraisers of old into the unmapped territory that is modern intangible investment.