

John Maynard Keynes,  
Economic Possibilities for our Grandchildren  
(1930)\*

## I

We are suffering just now from a bad attack of economic pessimism. It is common to hear people say that the epoch of enormous economic progress which characterised the nineteenth century is over; that the rapid improvement in the standard of life is now going to slow down—at any rate in Great Britain; that a decline in prosperity is more likely than an improvement in the decade which lies ahead of us.

I believe that this is a wildly mistaken interpretation of what is happening to us. We are suffering, not from the rheumatics of old age, but from the growing-pains of over-rapid changes, from the painfulness of readjustment between one economic period and another. The increase of technical efficiency has been taking place faster than we can deal with the problem of labour absorption; the improvement in the standard of life has been a little too quick; the banking and monetary system of the world has been preventing the rate of interest from falling as fast as equilibrium requires. And even so, the waste and confusion which ensue relate to not more than  $7\frac{1}{2}$  per cent of the national income; we are muddling away one and sixpence in the £, and have only 18s. 6d., when we might, if we were more sensible, have £1; yet, nevertheless, the 18s. 6d. mounts up to as much as the £1 would have been five or six years ago. We forget that in 1929 the physical output of the industry of Great Britain was greater than ever before, and that the net surplus of our foreign balance available for new foreign investment, after paying for all our imports, was greater last year than that of any other country, being indeed 50 per cent greater than the corresponding surplus of the United States. Or again—if it is to be a matter of comparisons—suppose that we were to reduce our wages by a half, repudiate four fifths of the national debt, and hoard our surplus wealth in barren gold instead of lending it at 6 per cent or more, we should resemble the now much-envied France. But would it be an improvement?

The prevailing world depression, the enormous anomaly of unemployment in a world full of wants, the disastrous mistakes we have made, blind us to what is going on under the surface to the true interpretation of the trend of things. For I predict that both of the two opposed errors of pessimism which now make so much noise in the world will be proved wrong in our own time—the pessimism of the revolutionaries who think that things are so bad that nothing can save us but violent change, and the pessimism of the reactionaries who consider the balance of our economic and social life so precarious that we must risk no experiments.

My purpose in this essay, however, is not to examine the present or the near future, but to disembarass myself of short views and take wings into the future. What can we reasonably expect the level of our economic life to be a hundred years hence? What are the economic possibilities for our grandchildren?

From the earliest times of which we have record—back, say, to two thousand years before Christ—down to the beginning of the eighteenth century, there was no very great change in the standard of life of the average man living in the civilised centres of the earth. Ups and downs certainly. Visitations of plague, famine, and war. Golden intervals. But no progressive, violent change. Some periods perhaps 50 per cent better than others at the utmost 100 per cent better—in the four thousand years which ended (say) in A. D. 1700.

This slow rate of progress, or lack of progress, was due to two reasons—to the remarkable absence of important technical improvements and to the failure of capital to accumulate.

The absence of important technical inventions between the prehistoric age and comparatively modern times is truly remarkable. Almost everything which really matters and which the world possessed at the commencement of the modern age was already known to man at the dawn of history. Language, fire, the same domestic animals which we have today, wheat, barley, the vine and the olive, the plough, the wheel, the oar, the sail, leather, linen and cloth, bricks and pots, gold and silver, copper, tin, and lead-and iron was added to the list before 1000 B.C.-banking, statecraft, mathematics, astronomy, and religion. There is no record of when we first possessed these things.

At some epoch before the dawn of history perhaps even in one of the comfortable intervals before the last ice age-there must have been an era of progress and invention comparable to that in which we live today. But through the greater part of recorded history there was nothing of the kind.

The modern age opened; I think, with the accumulation of capital which began in the sixteenth century. I believe-for reasons with which I must not encumber the present argument-that this was initially due to the rise of prices, and the profits to which that led, which resulted from the treasure of gold and silver which Spain brought from the New World into the Old. From that time until today the power of accumulation by compound interest, which seems to have been sleeping for many generations, was re-born and renewed its strength. And the power of compound interest over two hundred years is such as to stagger the imagination.

Let me give in illustration of this a sum which I have worked out. The value of Great Britain's foreign investments today is estimated at about £4,000,000,000. This yields us an income at the rate of about 6½ per cent. Half of this we bring home and enjoy; the other half, namely, 3¼ per cent, we leave to accumulate abroad at compound interest. Something of this sort has now been going on for about 250 years.

For I trace the beginnings of British foreign investment to the treasure which Drake stole from Spain in 1580. In that year he returned to England bringing with him the prodigious spoils of the *Golden Hind*. Queen Elizabeth was a considerable shareholder in the syndicate which had financed the expedition. Out of her share she paid off the whole of England's foreign debt, balanced her Budget, and found herself with about £40,000 in hand. This she invested in the Levant Company—which prospered. Out of the profits of the Levant Company, the East India Company was founded; and the profits of this great enterprise were the foundation of England's subsequent foreign investment. Now it happens that £40,000 accumulating at 3f per cent compound interest approximately corresponds to the actual volume of England's foreign investments at various dates, and would actually amount today to the total of £4,000,000,000 which I have already quoted as being what our foreign investments now are. Thus, every £1 which Drake brought home in 1580 has now become £100,000. Such is the power of compound interest!

From the sixteenth century, with a cumulative crescendo after the eighteenth, the great age of science and technical inventions began, which since the beginning of the nineteenth century has been in full flood—coal, steam, electricity, petrol, steel, rubber, cotton, the chemical industries, automatic machinery and the methods of mass production, wireless, printing, Newton, Darwin, and Einstein, and thousands of other things and men too famous and familiar to catalogue.

What is the result? In spite of an enormous growth in the population of the world, which it has been necessary to equip with houses and machines, the average standard of life in Europe and the

United States has been raised, I think, about fourfold. The growth of capital has been on a scale which is far beyond a hundredfold of what any previous age had known. And from now on we need not expect so great an increase of population.

If capital increases, say, 2 per cent per annum, the capital equipment of the world will have increased by a half in twenty years, and seven and a half times in a hundred years. Think of this in terms of material things—houses, transport, and the like.

At the same time technical improvements in manufacture and transport have been proceeding at a greater rate in the last ten years than ever before in history. In the United States factory output per head was 40 per cent greater in 1925 than in 1919. In Europe we are held back by temporary obstacles, but even so it is safe to say that technical efficiency is increasing by more than 1 per cent per annum compound. There is evidence that the revolutionary technical changes, which have so far chiefly affected industry, may soon be attacking agriculture. We may be on the eve of improvements in the efficiency of food production as great as those which have already taken place in mining, manufacture, and transport. In quite a few years—in our own lifetimes I mean—we may be able to perform all the operations of agriculture, mining, and manufacture with a quarter of the human effort to which we have been accustomed.

For the moment the very rapidity of these changes is hurting us and bringing difficult problems to solve. Those countries are suffering relatively which are not in the vanguard of progress. We are being afflicted with a new disease of which some readers may not yet have heard the name, but of which they will hear a great deal in the years to come—namely, *technological unemployment*. This means unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour.

But this is only a temporary phase of maladjustment. All this means in the long run *that mankind is solving its economic problem*. I would predict that the standard of life in progressive countries one hundred years hence will be between four and eight times as high as it is. There would be nothing surprising in this even in the light of our present knowledge. It would not be foolish to contemplate the possibility of a far greater progress still.

## II

Let us, for the sake of argument, suppose that a hundred years hence we are all of us, on the average, eight times better off in the economic sense than we are today. Assuredly there need be nothing here to surprise us.

Now it is true that the needs of human beings may seem to be insatiable. But they fall into two classes—those needs which are absolute in the sense that we feel them whatever the situation of our fellow human beings may be, and those which are relative in the sense that we feel them only if their satisfaction lifts us above, makes us feel superior to, our fellows. Needs of the second class, those which satisfy the desire for superiority, may indeed be insatiable; for the higher the general level, the higher still are they. But this is not so true of the absolute needs—a point may soon be reached, much sooner perhaps than we are all of us aware of, when these needs are satisfied in the sense that we prefer to devote our further energies to non-economic purposes.

Now for my conclusion, which you will find, I think, to become more and more startling to the imagination the longer you think about it.

I draw the conclusion that, assuming no important wars and no important increase in population, the *economic problem* may be solved, or be at least within sight of solution, within a hundred years. This means that the economic problem is not-if we look into the *future-the permanent problem of the human race*.

Why, you may ask, is this so startling? It is startling because-if, instead of looking into the future, we look into the past-we find that the economic problem, the struggle for subsistence, always has been hitherto the primary, most pressing problem of the human race-not only of the human race, but of the whole of the biological kingdom from the beginnings of life in its most primitive forms.

Thus we have been expressly evolved by nature-with all our impulses and deepest instincts-for the purpose of solving the economic problem. If the economic problem is solved, mankind will be deprived of its traditional purpose.

Will this be a benefit? If one believes at all in the real values of life, the prospect at least opens up the possibility of benefit. Yet I think with dread of the readjustment of the habits and instincts of the ordinary man, bred into him for countless generations, which he may be asked to discard within a few decades.

To use the language of today-must we not expect a general “nervous breakdown”? We already have a little experience of what I mean -a nervous breakdown of the sort which is already common enough in England and the United States amongst the wives of the well-to-do classes, unfortunate women, many of them, who have been deprived by their wealth of their traditional tasks and occupations--who cannot find it sufficiently amusing, when deprived of the spur of economic necessity, to cook and clean and mend, yet are quite unable to find anything more amusing.

To those who sweat for their daily bread leisure is a longed—for sweet-until they get it.

There is the traditional epitaph written for herself by the old charwoman:—

Don't mourn for me, friends, don't weep for me never,  
For I'm going to do nothing for ever and ever.

This was her heaven. Like others who look forward to leisure, she conceived how nice it would be to spend her time listening-in-for there was another couplet which occurred in her poem: —

With psalms and sweet music the heavens'll be ringing,  
But I shall have nothing to do with the singing.

Yet it will only be for those who have to do with the singing that life will be tolerable and how few of us can sing!

Thus for the first time since his creation man will be faced with his real, his permanent problem-how to use his freedom from pressing economic cares, how to occupy the leisure, which science and compound interest will have won for him, to live wisely and agreeably and well.

The strenuous purposeful money-makers may carry all of us along with them into the lap of economic abundance. But it will be those peoples, who can keep alive, and cultivate into a fuller perfection, the art of life itself and do not sell themselves for the means of life, who will be able to enjoy the abundance when it comes.

Yet there is no country and no people, I think, who can look forward to the age of leisure and of abundance without a dread. For we have been trained too long to strive and not to enjoy. It is a fearful problem for the ordinary person, with no special talents, to occupy himself, especially if he no longer has roots in the soil or in custom or in the beloved conventions of a traditional society. To judge from the behaviour and the achievements of the wealthy classes today in any quarter of the world, the outlook is very depressing! For these are, so to speak, our advance guard-those who are spying out the promised land for the rest of us and pitching their camp there. For they have most of them failed disastrously, so it seems to me-those who have an independent income but no associations or duties or ties-to solve the problem which has been set them.

I feel sure that with a little more experience we shall use the new-found bounty of nature quite differently from the way in which the rich use it today, and will map out for ourselves a plan of life quite otherwise than theirs.

For many ages to come the old Adam will be so strong in us that everybody will need to do some work if he is to be contented. We shall do more things for ourselves than is usual with the rich today, only too glad to have small duties and tasks and routines. But beyond this, we shall endeavour to spread the bread thin on the butter-to make what work there is still to be done to be as widely shared as possible. Three-hour shifts or a fifteen-hour week may put off the problem for a great while. For three hours a day is quite enough to satisfy the old Adam in most of us!

There are changes in other spheres too which we must expect to come. When the accumulation of wealth is no longer of high social importance, there will be great changes in the code of morals. We shall be able to rid ourselves of many of the pseudo-moral principles which have hag-ridden us for two hundred years, by which we have exalted some of the most distasteful of human qualities into the position of the highest virtues. We shall be able to afford to dare to assess the money-motive at its true value. The love of money as a possession -as distinguished from the love of money as a means to the enjoyments and realities of life -will be recognised for what it is, a somewhat disgusting morbidity, one of those semicriminal, semi-pathological propensities which one hands over with a shudder to the specialists in mental disease. All kinds of social customs and economic practices, affecting the distribution of wealth and of economic rewards and penalties, which we now maintain at all costs, however distasteful and unjust they may be in themselves, because they are tremendously useful in promoting the accumulation of capital, we shall then be free, at last, to discard.

Of course there will still be many people with intense, unsatisfied purposiveness who will blindly pursue wealth-unless they can find some plausible substitute. But the rest of us will no longer be under any obligation to applaud and encourage them. For we shall inquire more curiously than is safe today into the true character of this "purposiveness" with which in varying degrees Nature has endowed almost all of us. For purposiveness means that we are more concerned with the remote future results of our actions than with their own quality or their immediate effects on our own environment. The "purposive" man is always trying to secure a spurious and delusive immortality for his acts by pushing his interest in them forward into time. He does not love his cat, but his cat's kittens; nor, in truth, the kittens, but only the kittens' kittens, and so on forward forever to the end of cat-dom. For him jam is not jam unless it is a case of jam to-morrow and never jam today. Thus by pushing his jam always forward into the future, he strives to secure for his act of boiling it an immortality.

Let me remind you of the Professor in *Sylvie and Bruno*:

"Only the tailor, sir, with your little bill," said a meek voice outside the door.

“Ah, well, I can soon settle his business,” the Professor said to the children, “if you’ll just wait a minute. How much is it, this year, my man?” The tailor had come in while he was speaking.

“Well, it’s been a-doubling so many years, you see,” the tailor replied, a little gruffy, “and I think I’d like the money now. It’s two thousand pound, it is!”

“Oh, that’s nothing!” the Professor carelessly remarked, feeling in his pocket, as if he always carried at least that amount about with him. “But wouldn’t you like to wait just another year and make it four thousand? Just think how rich you’d be! Why, you might be a *king*, if you liked!”

“I don’t know as I’d care about being a king,” the man said thoughtfully. “But it dew sound a powerful sight o’ money! Well, I think I’ll wait-“

“Of course you will!” said the Professor. “There’s good sense in you, I see. Good-day to you, my man!”

“Will you ever have to pay him that four thousand pounds?” Sylvie asked as the door closed on the departing creditor.

“Never, my child!” the Professor replied emphatically. “He’ll go on doubling it till he dies. You see, it’s always worth while waiting another year to get twice as much money!”

Perhaps it is not an accident that the race which did most to bring the promise of immortality into the heart and essence of our religions has also done most for the principle of compound interest and particularly loves this most purposive of human institutions.

I see us free, therefore, to return to some of the most sure and certain principles of religion and traditional virtue-that avarice is a vice, that the exaction of usury is a misdemeanour, and the love of money is detestable, that those walk most truly in the paths of virtue and sane wisdom who take least thought for the morrow. We shall once more value ends above means and prefer the good to the useful. We shall honour those who can teach us how to pluck the hour and the day virtuously and well, the delightful people who are capable of taking direct enjoyment in things, the lilies of the field who toil not, neither do they spin.

But beware! The time for all this is not yet. For at least another hundred years we must pretend to ourselves and to every one that fair is foul and foul is fair; for foul is useful and fair is not. Avarice and usury and precaution must be our gods for a little longer still. For only they can lead us out of the tunnel of economic necessity into daylight.

I look forward, therefore, in days not so very remote, to the greatest change which has ever occurred in the material environment of life for human beings in the aggregate. But, of course, it will all happen gradually, not as a catastrophe. Indeed, it has already begun. The course of affairs will simply be that there will be ever larger and larger classes and groups of people from whom problems of economic necessity have been practically removed. The critical difference will be realised when this condition has become so general that the nature of one’s duty to one’s neighbour is changed. For it will remain reasonable to be economically purposive for others after it has ceased to be reasonable for oneself.

The pace at which we can reach our destination of economic bliss will be governed by four things-our power to control population, our determination to avoid wars and civil dissensions, our willingness to entrust to science the direction of those matters which are properly the concern of science, and the rate of accumulation as fixed by the margin between our production and our consumption; of which the last will easily look after itself, given the first three.

Meanwhile there will be no harm in making mild preparations for our destiny, in encouraging, and experimenting in, the arts of life as well as the activities of purpose.

But, chiefly, do not let us overestimate the importance of the economic problem, or sacrifice to its supposed necessities other matters of greater and more permanent significance. It should be a matter for specialists-like dentistry. If economists could manage to get themselves thought of as humble, competent people, on a level with dentists, that would be splendid!

\* Scanned from John Maynard Keynes, *Essays in Persuasion*, New York: W.W.Norton & Co., 1963, pp. 358-373.

Capitalism, Socialism and Democracy by Joseph Schumpeter

Chapter VII: The Process of Creative Destruction (p. 81-86)

<http://sergioberumen.files.wordpress.com/2010/08/schumpeter-joseph-a-capitalism-socialism-and-democracy.pdf>

The theories of monopolistic and oligopolistic competition and their popular variants may in two ways be made to serve the view that capitalist reality is unfavorable to maximum performance in production. One may hold that it always has been so and that all along output has been expanding in spite of the secular sabotage perpetrated by the managing bourgeoisie. Advocates of this proposition would have to produce evidence to the effect that the observed rate of increase can be accounted for by a sequence of favorable circumstances unconnected with the mechanism of private enterprise and strong enough to overcome the latter's resistance. This is precisely the question which we shall discuss in Chapter IX. However, those who espouse this variant at least avoid the trouble about historical fact that the advocates of the alternative proposition have to face. This avers that capitalist reality once tended to favor maximum productive performance, or at all events productive performance so considerable as to constitute a major element in any serious appraisal of the system; but that the later spread of monopolist structures, killing competition, has by now reversed that tendency.

First, this involves the creation of an entirely imaginary golden age of perfect competition that at some time somehow metamorphosed itself into the monopolistic age, whereas it is quite clear that perfect competition has at no time been more of a reality than it is at present. Secondly, it is necessary to point out that the rate of increase in output did not decrease from the nineties from which, I suppose, the prevalence of the largest-size concerns, at least in manufacturing industry, would have to be dated; that there is nothing in the behavior of the time series of total output to suggest a "break in trend"; and, most important of all, that the modern standard of life of the masses, evolved during the period of relatively unfettered "big business." If we list the items that enter the modern workman's budget and from 1899 on observe the course of their prices not in terms of money but in terms of the hours of labor that will buy them - i.e., each year's money prices divided by each year's hourly wage rates - we cannot fail to be struck by the rate of the advance which, considering the spectacular improvement in qualities, seems to have been greater and not smaller than it ever was before. If we economists were given less to wishful thinking and more to the observation of facts, doubts would immediately arise as to the realistic virtues of a theory that would have led us to expect a very different result. Nor is this all. As soon as we go into details and inquire into the individual items in which progress was most conspicuous, the trail leads not to the doors of those firms that work under conditions of comparatively free competition but precisely to the doors of the large concerns - which, as in the case of agricultural machinery, also account for much of the progress in the competitive sector - and a shocking suspicion dawns upon us that big business may have had more to do with creating that standard of life than with keeping it down.

The conclusions alluded to at the end of the preceding chapter are in fact almost completely false. Yet they follow from observations and theorems that are almost completely<sup>1</sup> true. Both economists and popular writers have once more run away with some fragments of reality they

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<sup>1</sup> As a matter of fact, those observations and theorems are not completely satisfactory. The usual expositions of the doctrine of imperfect competition fail in particular to give due attention to the many and important cases in which, even as a matter of static theory, imperfect competition approximates the results of perfect competition. There are other cases in which it does not do this, but offers compensations which, while not entering any output index, yet contribute to what the output index is in the last resort intended to measure - the cases in which a firm defends its market by establishing a name for quality and service for instance. However, in order to simplify matters, we will not take issue with that doctrine on its own ground.



happened to grasp. These fragments themselves were mostly seen correctly. Their formal properties were mostly developed correctly. But no conclusions about capitalist reality as a whole follow from such fragmentary analyses. If we draw them nevertheless, we can be right only by accident. That has been done. And the lucky accident did not happen.

The essential point to grasp is that in dealing with capitalism we are dealing with an evolutionary process. It may seem strange that anyone can fail to see so obvious a fact which moreover was long ago emphasized by Karl Marx. Yet that fragmentary analysis which yields the bulk of our propositions about the functioning of modern capitalism persistently neglects it. Let us restate the point and see how it bears upon our problem.

Capitalism, then, is by nature a form or method of economic change and not only never is but never can be stationary. And this evolutionary character of the capitalist process is not merely due to the fact that economic life goes on in a social and natural environment which changes and by its change alters the data of economic action; this fact is important and these changes (wars, revolutions and so on) often condition industrial change, but they are not its prime movers. Nor is this evolutionary character due to a quasi-automatic increase in population and capital or to the vagaries of monetary systems of which exactly the same thing holds true. The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates.

As we have seen in the preceding chapter, the contents of the laborer's budget, say from 1760 to 1940, did not simply grow on unchanging lines but they underwent a process of qualitative change. Similarly, the history of the productive apparatus of a typical farm, from the beginnings of the rationalization of crop rotation, plowing and fattening to the mechanized thing of today - linking up with elevators and railroads - is a history of revolutions. So is the history of the productive apparatus of the iron and steel industry from the charcoal furnace to our own type of furnace, or the history of the apparatus of power production from the overshot water wheel to the modern power plant, or the history of transportation from the mail-coach to the airplane. The opening up of new markets, foreign or domestic, and the organizational development from the craft shop and factory to such concerns as U.S. Steel illustrate the same process of industrial mutation - if I may use that biological term - that incessantly revolutionizes<sup>2</sup> the economic structure *from within*, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live in. This fact bears upon our problem in two ways.

First, since we are dealing with a process whose every element takes considerable time in revealing its true features and ultimate effects, there is no point in appraising the performance of that process *ex visu* of a given point of time; we must judge its performance over time, as it unfolds through decades or centuries. A system - any system, economic or other - that at *every* given point of time fully utilizes its possibilities to the best advantage may yet in the long run be inferior to a system that does so at *no* given point of time, because the latter's failure to do so may be a condition for the level or speed of -long-run performance.

Second, since we are dealing with an organic process, analysis of what happens in any particular part of it - say, in an individual concern or industry - may indeed clarify details of mechanism

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<sup>2</sup> Those revolutions are not strictly incessant; they occur in discrete rushes which are separated from each other by spans of comparative quiet. The process as a whole works incessantly however, in the sense that there always is either revolution or absorption of the results of revolution, both together forming what are known as business cycles.

but is inconclusive beyond that. Every piece of business strategy acquires its true significance only against the background of that process and within the situation created by it. It must be seen in its role in the perennial gale of creative destruction; it cannot be understood irrespective of it or, in fact, on the hypothesis that there is a perennial lull.

But economists who, *ex visu* of a point of time, look for example at the behavior of an oligopolist industry - an industry which consists of a few big firms - and observe the well-known moves and countermoves within it that seem to aim at nothing but high prices and restrictions of output are making precisely that hypothesis. They accept the data of the momentary situation as if there were no past or future to it and think that they have understood what there is to understand if they interpret the behavior of those firms by means of the principle of maximizing profits with reference to those data. The usual theorist's paper and the usual government commission's report practically never try to see that behavior, on the one hand, as a result of a piece of past history and, on the other hand, as an attempt to deal with a situation that is sure to change presently - as an attempt by those firms to keep on their feet, on ground that is slipping away from under them. In other words, the problem that is usually being visualized is how capitalism administers existing structures, whereas the relevant problem is how it creates and destroys them. As long as this is not recognized, the investigator does a meaningless job. As soon as it is recognized, his outlook on capitalist practice and its social results changes considerably.<sup>3</sup>

The first thing to go is the traditional conception of the *modus operandi* of competition. Economists are at long last emerging from the stage in which price competition was all they saw. As soon as quality competition and sales effort are admitted into the sacred precincts of theory, the price variable is ousted from its dominant position. However, it is still competition within a rigid pattern of invariant conditions, methods of production and forms of industrial organization in particular, that practically monopolizes attention. But in capitalist reality as distinguished from its textbook picture, it is not that kind of competition which counts but the competition from the new commodity, the new technology, the new source of supply, the new type of organization (the largest-scale unit of control for instance) - competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives. This kind of competition is as much more effective than the other as a bombardment is in comparison with forcing a door, and so much more important that it becomes a matter of comparative indifference whether competition in the ordinary sense functions more or less promptly; the powerful lever that in the long run expands output and brings down prices is in any case made of other stuff

It is hardly necessary to point out that competition of the kind we now have in mind acts not only when in being but also when it is merely an ever-present threat. It disciplines before it attacks. The businessman feels himself to be in a competitive situation even if he is alone in his field or if, though not alone, he holds a position such that investigating government experts fail to see any effective competition between him and any other firms in the same or a neighboring field and in consequence conclude that his talk, under examination, about his competitive sorrows is all make-believe. In many cases, though not in all, this will in the long run enforce behavior very similar to the perfectly competitive pattern.

Many theorists take the opposite view which is best conveyed by an example. Let us assume that there is a certain number of retailers in a neighborhood who try to improve their relative position

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<sup>3</sup> It should be understood that it is only our appraisal of economic performance and not our moral judgment that can be so changed. Owing to its autonomy, moral approval or disapproval is entirely independent of our appraisal of social (or any other) results, unless we happen to adopt a moral system such as utilitarianism which makes moral approval and disapproval turn on them *ex definitione*

by service and “atmosphere” but avoid price competition and stick as to methods to the local tradition - a picture of stagnating routine. As others drift into the trade that quasi-equilibrium is indeed upset, but in a manner that does not benefit their customers. The economic space around each of the shops having been narrowed, their owners will no longer be able to make a living and they will try to mend the case by raising prices in tacit agreement. This will further reduce their sales and so, by successive pyramiding, a situation will evolve in which increasing potential supply will be attended by increasing instead of decreasing prices and by decreasing instead of increasing sales.

Such cases do occur, and it is right and proper to work them out. But as the practical instances usually given show, they are fringe-end cases to be found mainly in the sectors furthest removed from all that is most characteristic of capitalist activity.<sup>4</sup> Moreover, they are transient by nature. In the case of retail trade the competition that matters arises not from additional shops of the same type, but from the department store, the chain store, the mail-order house and the supermarket which are bound to destroy those pyramids sooner or later.<sup>5</sup>

Now a theoretical construction which neglects this essential element of the case neglects all that is most typically capitalist about it; even if correct in logic as well as in fact, it is like *Hamlet* without the Danish prince.

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<sup>4</sup> This is also shown by a theorem we frequently meet with in expositions of the theory of imperfect competition, viz., the theorem that, under conditions of imperfect competition, producing or trading businesses tend to be irrationally small. Since imperfect competition is at the same time held to be an outstanding characteristic of modern industry we are set to wondering what world these theorists live in, unless, as stated above, fringe-end cases are all they have in mind.

<sup>5</sup> The mere threat of their attack cannot, in the particular conditions, environmental and personal, of small-scale retail trade, have its usual disciplining influence, for the small man is too much hampered by his cost structure and, however well he may manage within his inescapable limitations, he can never adapt himself to the methods of competitors who can afford to sell at the price at which he buys.

Michael Cooper, “Lost in Recession, Toll on Underemployed and Underpaid” (About 2 pages)  
<http://www.nytimes.com/2012/06/19/us/many-american-workers-are-underemployed-and-underpaid.html>

Throughout the Great Recession and the not-so-great recovery, the most commonly discussed measure of misery has been unemployment. But many middle-class and working-class people who are fortunate enough to have work are struggling as well, which is why Sherry Woods, a 59-year-old van driver from Atlanta, found herself standing in line at a jobs fair this month, with her résumé tucked inside a Bible.

She opened it occasionally to reread a favorite verse from Philippians: “And my God will meet all your needs according to the riches of his glory in Christ.”

Ms. Woods’s current job has not been meeting her needs. When she began driving a passenger van last year, she earned \$9 an hour and worked 40 hours a week. Then her wage was cut to \$8 an hour, and her hours were drastically scaled back. Last month she earned just \$233. So Ms. Woods, who said that she had been threatened with eviction for missing rent payments and had been postponing an appointment with the eye doctor because she lacks insurance, has been looking for another, better job. It has not been easy.

“I’m looking for something else, anything else,” she said. “More hours. Better pay. Actual benefits.”

These are anxious days for American workers. Many, like Ms. Woods, are underemployed. Others find pay that is simply not keeping up with their expenses: adjusted for inflation, the median hourly wage was lower in 2011 than it was a decade earlier, according to data from a forthcoming book by the [Economic Policy Institute](#), “[The State of Working America, 12th Edition](#).” Good benefits are harder to come by, and people are staying longer in jobs that they want to leave, afraid that they will not be able to find something better. Only 2.1 million people [quit their jobs](#) in March, down from the 2.9 million people who quit in December 2007, the first month of the [recession](#).

“Unfortunately, the wage problems brought on by the recession pile on top of a three-decade stagnation of wages for low- and middle-wage workers,” said Lawrence Mishel, the president of the Economic Policy Institute, a research group in Washington that studies the labor market. “In the aftermath of the financial crisis, there has been persistent high unemployment as households reduced debt and scaled back purchases. The consequence for wages has been substantially slower growth across the board, including white-collar and college-educated workers.”

Now, with the economy shaping up as the central issue of the presidential election, both President Obama and Mitt Romney have been relentlessly trying to make the case that their policies would bring prosperity back. The unease of voters is striking: in a [New York Times/CBS News poll](#) in April, half of the respondents said they thought the next generation of Americans would be worse off, while only about a quarter said it would have a better future. And household wealth is dropping. The Federal Reserve [reported](#) last week that the economic crisis left the median American family in 2010 with no more wealth than in the early 1990s, wiping away two decades of gains. With stocks too risky for many small investors and savings accounts paying little interest, building up a nest egg is a challenge even for those who can afford to sock away some of their money.

Expenses like putting a child through college — where tuition has been [rising faster](#) than inflation or wages — can be a daunting task. When Morgan Woodward, 21, began her freshman year at the University of California, Berkeley, three years ago, her parents paid about \$9,000 a year in tuition and fees. Now [they pay](#) closer to \$13,000, and they are bracing for the possibility of another jump next year. With their incomes flat, though, they recently borrowed money to pay for her final year, and to begin paying the tuition of their son, who plans to start college this fall.

“You know there is going to be small incremental increases in tuition, but not the 8, 10, 12 percent increase every year we’ve seen,” said Ms. Woodward’s father, Cliff Woodward, 52, who lives in Pleasanton, Calif., and is an independent sales representative for an eyeglass company. So the Woodwards, who drive cars with 150,000 and 120,000 miles on them, have cut back. “No vacations, no big screens,” Mr. Woodward said. “We’ve cut down on going out a little bit, but it’s worth it.”

People with college degrees still get jobs with better pay and benefits than those without, but many recent college graduates are finding it hard to land the kinds of jobs they had envisioned. David Thande, 27, who graduated from the University of California, Los Angeles, five years ago, works part time as a clerk in an Apple Store.

“I’m not even full time, so I spend about 45 minutes every day begging people for hours, checking if someone canceled, struggling to make it work,” Mr. Thande said, adding that he had fallen behind on paying back his [student loans](#).

Garland Miller, 28, who has degrees in finance and accounting from the University of Georgia and Kennesaw State University, had hoped to land a job at a big accounting firm, and to have been able to buy a home by now. Instead he finds himself working as the lead server at a steakhouse. But he has not given up on trying to move into the field that he prepared himself for: This month, he attended a jobs fair in Duluth, a suburb of Atlanta, organized by the University of Georgia for its alumni.

“I’m not in a job where I’m using all of my skills,” Mr. Miller said. He said that with many baby boomers unable to retire as early as they had hoped, there are fewer opportunities for younger workers to move up and take their places. “Instead you have everybody competing for entry-level positions,” he said.

Things are much worse for people without college degrees, though. The real entry-level hourly wage for men who recently graduated from high school fell to \$11.68 last year, from \$15.64 in 1979, [according to data](#) from the Economic Policy Institute. And the percentage of those jobs that offer health insurance has plummeted to 22.8 percent, from 63.3 percent in 1979.

Though inflation has stayed relatively low in recent years, it has remained high for some of the most important things: college, health care and even, recently, food. The [price of food in the home rose](#) by 4.8 percent last year, one of the biggest jumps in the last two decades.

Sam Chea, 38, who lives in Oakland and works nights delivering pizzas for Domino’s, said that he had been feeling the pinch at grocery stores, and worried that his lack of a college education was making it harder for him to find decent work. The other day he went to the nearby city of El Cerrito to apply for a second job at Nation’s Giant Hamburgers, a regional chain.

“I’ll be more secure with another job,” he said. “It’s scary. I don’t have an education, and I’m worried about my rent.”

“Everything’s gone up. Rent went up, gas went up, food went up, milk went up, cheeseburgers went up, even cigarettes went up,” said Mr. Chea, who had stopped at the barbershop to spiff up before his job interview. “I’m used to getting a haircut for \$6 or \$7, but they charged me \$9. Even haircuts have gone up.”

Michael Spence, *The Next Convergence: The Future of Economic Growth in a Multispeed World*, P. 225-235

The modern electronic digital computer is a creature of World War II. Thomas Watson, the former CEO of IBM, famously estimated in the early postwar period that the long-run demand for computers would be about three a year. In fairness, the existing computers, which by today's standards were considerably less powerful than your cell phone, were physically huge, they bristled with vacuum tubes that kept burning out in spite of the massive air-conditioning systems that were deployed to keep them cool, and they were very expensive. But Watson's estimate was wrong mainly because he (along with many others) didn't anticipate what would happen to costs, and to computing power.

With U.S. Defense Department funding, the semiconductor device was invented, and it successfully replaced vacuum tubes. The main objective really wasn't cost so much as portability and durability. DOD wanted computers in airplanes, missiles, and tanks, not just on a full floor of a large office building. A major driver of growth and productivity was created for reasons that had nothing to do with either. This is not uncommon.

Moore's law (the number of transistors that can be placed inexpensively on a semiconductor device doubles every eighteen months) took over, and the costs of digital information processing and computing began a long and rapid downward march, one that is still going on.

Cost reductions were therefore achieved mainly by making the devices smaller and smaller, and at the same time faster and faster. Reduced size and portability came along with the cost declines. So you could put the device (call it a computer) in an office, and then a home, and then a briefcase, and then in a handheld device.

As computers proliferated in offices and then on desktops and then in homes, one might have expected some fairly broad-based (across sectors of the economy) productivity gains to show up in the economic data. It didn't. Notwithstanding the declining cost and size, and rising investment by businesses, and eventually by regular people like us, economists' attempts to measure the impact on productivity yielded disappointing results: essentially there wasn't any effect for many years.

Then the pattern changed in the 1980s, when the productivity effects started to show up. They rose in the nineties and are very significant from the mid-nineties to the present. We now know that the big gains in productivity are associated not with powerful computers per se but with the network.

The Internet was developed within the Department of Defense to provide researchers and scientists with the ability to communicate electronically and to transfer data—another example of a key innovation not motivated by its potential economic impact. In fact, the latter was largely unanticipated.

Commercial access to the Internet was allowed for the first time in 1988, and with the introduction of Netscape, a user-friendly piece of software to access the World Wide Web, business and personal use of the Internet and the Web took off. Internet service providers (ISPs) provided access initially over telephone lines. Broadband came with a lag as the chicken-and-egg problem of applications creating demand and broadband access creating incentives for broadband service worked its way through.

It turns out that it was the connectivity that created the large and growing economic (and, indeed, social) impact of networked computers and information technology. The mundane day-to-day activities of acquiring information and completing transactions or interacting and coordinating activity are costly and use up a lot of time. And at some very basic level, all the network did was lower the costs and increase the speed of performing these functions. It sounds mundane, but it is not. The reductions in time and cost are so large that they are changing the informational structure of markets and the world in which we live.

### **The Economic Impacts of Network-Based Information Technology**

In a network-based system, computers talk to computers. Information is stored digitally in electronic databases, and because the computers are connected, this means that every electronic database (numbers, documents, Web pages, libraries) in the world is, in principle, accessible from anywhere else in the world by anyone with the authority to access it. All this happens at very high speed, so there are only insignificant lags. It really doesn't matter where the person and the data are located. In this "virtual" part of the world, the information and communication layer, proximity doesn't matter anymore, and delays are minimal. Increasingly we live in a world in which the binding constraint is not how much information we can find, but how much information we can process.

Network-based information technology makes possible dramatic reductions in the costs of day-to-day activities—what economists call transaction costs. A simple example will illustrate. We Californians own a lot of cars, and we drive a lot. It is not uncommon for a household to own two (or more) cars so that couples can get to work. Cars are required to get just about anywhere, including to buy a loaf of bread. These cars are registered once a year at the Department of Motor Vehicles. Pre-Internet, this required a one-to-two-hour trip to the DMV office, one for each car, and only on a weekday, meaning a workday, because that is the only time the DMV is open. You can still do it that way. But the alternative is about two minutes on the Internet after receiving an access code in the mail, and can be done anytime, including weekends.

It is pretty easy to see that the productivity gains from this one relatively minor application of the Internet and the Web, in this case in delivering a government service, are very large. Then, if you start to multiply them by the thousands of areas in which the process involves information, data, and communications, the elimination of wasted time and loss of productivity is breathtakingly large. Even the subcomponent and side effects—namely, the reduced use of gasoline and the resulting positive effect on air quality, the environment, and CO<sub>2</sub> emissions—are large.

Lying behind this is a feature of networks that has to do with the number of people, or, in the case of the Internet, the numbers of people and computers, connected to the network. (Remember that computers talk to each other.) It is called Metcalfe's law. It says that the value of a network is approximately proportional to the square of the number of users (people plus machines) connected to it. This creates something close to a tipping point: at a certain number of users, the value exceeds the cost for the majority of potential users, and they start multiplying rapidly, increasing the value in total, and to other individual users.

This phenomenon was observed with telephones, and then with faxes. The rate of growth of Internet users was extremely rapid, in part because of the original base of scientific, defense, and academic users, a group that was essentially subsidized. But the other main driver was that the computers and servers and related databases also counted as users, from the point of view of value creation. The result was that within a period of ten to fifteen years, every major



organization on the planet was connected to the Internet and the World Wide Web, providing information and access to data and services.

The economic impact of network-based computers came in overlapping, but different, trends. They can be thought of as the following:

- Automation of information and data processing, initially within firms, and then extending out to supply chains.
- The migration of information acquisition activities, search, and transactions to the Internet and the World Wide Web as the databases and other stores of information were connected to the network.
- Accessing valuable human resources (regardless of where they are located) and productively employing them in the market processes and supply chains that interconnect the global economy.

## **Automation**

Before the Internet started to spread to businesses and the general public, companies realized that a large fraction of their human resources were devoted to storing and processing information. With computers, the data shifted from paper to electronic storage, but the necessary storage facilities (databases) were scattered geographically. These were updated manually.

As soon as computers were networked, innovators in this field realized that for much of the required information processing and storage activities, the human component wasn't needed. Over time it was just eliminated.

The elimination of manual processing of information reduced labor, time, cost, and errors. The aggregate effect was, and is, enormous. It is what economists call labor-saving technological change. Its anticipation caused distinguished economists like the late Wassily Leontief (Nobel Prize in Economics, 1973) to speculate that the productivity gains and the reduction in employment would be so large that there could be an extended unemployment problem. This did not materialize because the resultant growth and absorptive capacity of the economy turned out to be sufficient, and also because the automation process didn't happen overnight.

Three things become clear when you look at this process from a strictly economic point of view, ignoring the details of the technological underpinnings. This first wave of automation was a productivity-enhancing form of technological progress that was massively labor-saving. This is not an unfamiliar concept. In the course of industrialization, incomes rise and labor gets expensive. Innovators create technologies that substitute capital for this more expensive labor. The value added per worker rises, and the displaced workers do other activities where their added value is also higher, activities that require judgment and analysis.

But before the network-based computers, this hadn't happened much in the portion of the economy that processes information. This layer came to be called the information layer, or the virtual part of the economy. Whatever you call it, it is the essential part that coordinates and controls the underlying economic processes, the production and movement of goods. The productivity effect of the Internet and the automation process was large because the coordination and control functions are required in every industry and sector and company in the economy. A major innovation in the chemical industry may increase productivity in that sector by a lot, but it is only 3 percent of the economy. If you have a major productivity gain in a horizontal function

that runs across every vertical sector, then the impact is much larger. That is what happened in this case.

The economic impact of networked computers ultimately came from a dramatic reduction in transaction costs. These are mundane costs that go along with and are required for an economy to function. Economic theory assumes that buyers know the various products on offer, their characteristics, and their prices. For understanding market resource allocation and pricing, there is nothing particularly wrong with this assumption. That's what we teach in intermediate price theory and microeconomics. But in reality people don't magically know products and prices; they have to expend time and effort to find them out. This is just one example of transaction costs. They are everywhere, and as long as they don't change much, they may be safely ignored (well, almost). Oliver Williamson received the Nobel Prize in Economics in 2009 for his research on organizations and markets. When is resource allocation best done by markets and when are nonmarket allocation mechanisms within companies to be preferred? How does the boundary between firms and the market get set? Traditional theory assumes that that boundary is predetermined. In fact, it is endogenous and is determined by competitive pressure to reduce transaction costs of a variety of kinds.

But transaction costs cannot safely be ignored when they are changing rapidly, because, as we shall see, those shifts cause not only large macroeconomic effects on productivity and incomes but also major changes in the microeconomic structural composition and connectedness of the global economy.

### **Search, Information, and Transactions**

For those whose jobs were unaffected by the automation wave, that trend went largely unnoticed. Information processing, coordination, and control are rather like plumbing: as long as it works, one doesn't pay it much mind. The second trend was different. It was noticed by, and affected, everyone directly. The World Wide Web was created by scientists with the goal of publishing academic papers quickly and efficiently. A related benefit was that the papers would be easier to find as well. It turned out that this second part was the main event. You can publish anything on the Web: newspapers, analyst reports, annual reports and financial filings, catalogues, books, articles, journals, music, films, medical information. The volume of "stuff" published electronically grew exponentially and at unheard-of rates. And the central challenge became *finding* things in this mass of information—institutional websites, online stores, books, papers, numerical data, pictures, films. The core technology required to realize the benefits is search. It is a service, and the delivery mechanism is the search engine. This is a rapidly evolving and sophisticated technology and field, and the business models that generate revenue and profits for providing the service are also in a state of rapid change.

With this rapid evolution, the Web became the platform for a range of services that are knowledge intensive and which do not require proximity to be carried out. It turns out that the list of activities that fit this description is incredibly long and comprehensive: e-banking, e-bill pay, e-investing, e-government, e-learning, e-research, e-procurement, e-commerce, e-business, e-citizenship, e-politics, e-publishing, e-news, and e-commentary, to name just a small subset.

What drives all of this is the dramatic reduction in the costs of finding information, communicating, and transacting—that is, in transaction costs, broadly defined. The aggregate effect is staggeringly large in two dimensions. One is the reduction in the time required to do these things. Before the Internet, the costs of doing many of these things were so high that they simply didn't get done. So while in formal economic terms it is correct to say that what we are

seeing is the result of reduced transaction costs for information-intensive activities that do not require physical proximity, the practical effect is to increase knowledge, access to information, the power of consumers (via the knowledge effect), and the efficiency and effectiveness of decision making.

I briefly mentioned the business of renewing car registration above. Let's now consider another example, one close to home. Many economists, myself included, need data and information to carry out their research. I would guess that pre-Internet, we would spend on average more than half our research time (maybe 70 percent) locating information and data, and the rest of the available work time on analyzing it. Post-Internet, the percentages are roughly reversed. What is that worth?

Well, I suppose the answer depends on what you think of the quality of the research. But what is indisputable is that the wasted time spent on the cumbersome mechanics of gathering information has been reduced tremendously. For example, if you are interested, in about five minutes you can find out the population, GDP, and incomes for every country in the world. If you pick a specific country and spend another ten minutes, you can find out its size, the major industries in its economy, and its energy consumption and carbon emissions. Over time, low-cost access to relevant information about the global economy and landscape will enable most people (and not just specialists) to become increasingly knowledgeable. The hope (and at this stage it is just a hope) is that broader understanding will eventually result in an informed public and form one of the building blocks of a more effective system of global governance.

Can we measure all these effects? Well, the automation trend that started earlier does produce measurable benefits in the form of reduced labor costs in the information and control layer of the economy. In the second category of search, information acquisition, and transactions, the truth is that we do not know how to measure the effects quantitatively, at least not yet. The likelihood is that pieces will be measured, but adding them all up will be a challenge. Farmers in developing countries will increase their output with better market and weather information, for example. Schoolchildren in much of the world will have access to a library for the first time. It is hard to know how to quantify these effects. Broad areas will remain resistant to quantification, but that does not diminish their importance. If less time is spent on what might be called the mechanics of life, it can be spent on reading or study or sports or interacting with friends-in leisure. Income data won't capture very well these shifts in the quality of life.

### **Is There a Downside to All This?**

There is. Pretty much anything can be made more efficient with these powerful informational tools, and that includes money laundering, terrorism, snooping, coordinating criminal activity, and identity theft. In the early days of the growth of public use of the Internet, a young professor at NYU referred to the potential privacy-loss effect as the result of the "collapse of inconvenience." Privacy is threatened not just because of "hacking" but more importantly because the costs of collecting information are so much lower than they were before. You can find out where I live, how many houses I have, what they are worth, and so on, with very little investment of time, and without breaching any "private" databases. In principle, pre-Internet, you could collect this same information, but in practice the costs were prohibitive. Hence the collapse of inconvenience.

Misinformation can be propagated and disseminated at low cost. Some people worry that there are few mechanisms beyond the laws related to liability and slander to "edit" the information and commentary for bias. Others celebrate the democratization of the world of comment and

analysis. All of us who are the consumers of information are on a learning curve, upping our skepticism and revising the filters we use to sort out reliable information from that which is unreliable, and at times plain malicious.

There is a sense among many that the constant connectivity is a burden, not a boon. I cannot count the number of times I have heard people say the main benefit of flying is that the cell phone and the BlackBerry don't work "up there" -at least not yet. The walls of the last refuge from bits and bytes may come tumbling down soon. As with filtering information, managing time and controlling constant connectivity so that it doesn't take over your life is a learning process (individual and social) that takes time. One hopes that, in time, etiquette will make it rude to read your e-mail while talking over lunch. All of this is so very new.

## **The Internet Bubble**

When investors (and, more broadly, people in general) started to see the potential scope of the impact of this technology, a moment of temporary irrational exuberance occurred. Business and engineering students with venture-capital backing started just about every imaginable type of Internet company. Some of these start-ups would, it was said, put traditional retailers out of business: brick-and-mortar retailers would be a thing of the past. Others would increase the quality and efficiency of search. Many failed, but not all. Some new enterprises, like eBay, Amazon, Yahoo, and Google thrived and became important companies. Meanwhile the suppliers of computers and networks that are the nervous system of the network came about as close as you can get in business to printing money. But at the time, investors and the markets didn't discriminate very well among the new ventures. Prices were set by individual investors and day traders, many of whom would have flunked a quiz on what the companies actually produced or did, if such a quiz had been administered. Valuations escalated into the stratosphere. Conventional valuation approaches, based on earnings and growth, could not provide an underpinning that made any sense. In fact, they were not even close.

Many companies never produced a profit, and a nontrivial fraction never produced any revenues; nevertheless, at the height of the enthusiasm for this new world, they managed to "go public" with an IPO. Selling the future without a track record of any kind actually worked for a while. Because it was a new world, historical data didn't apply. It was an environment in which imaginations unconstrained by data could soar again, for a while. But with the passing of months, and then a few years, data did start to come in. The valuations were evidently too high and the markets plunged.

To much of the general public this signaled that the whole enterprise had been a gigantic mistake, another tulip bubble: that the lofty visions of transformation of business, knowledge, consumer power, supply chains, and the global economy were just that—visions, and not much more. This is, to be sure, the simplest interpretation of the bursting of the bubble. But it is probably not the right interpretation. In fact, the visions, while somewhat exaggerated, were in many respects accurate, and the unfolding reality over the longer term is not all that dissimilar to the forecasts. The problem with the valuations wasn't the vision. It was, as is so often the case, a misunderstanding of the time scale on which revolutionary change occurs. The investors predicted months, while the reality is that transformations take years, even decades. People and organizations don't change their behavior overnight. Implementation is hard and faces a host of technical obstacles. Thousands of legacy systems had to be integrated to achieve the full set of envisioned benefits. There are embedded interests in any system that are threatened by change. Aunt Millie may not be bowled over by Steve Jobs extolling the virtues of the Internet, but she does respond to her nieces' and nephews' pressure to get on e-mail or Skype.

It is important not to lose sight of both lessons. Revolutionary change takes time, and that time is commonly underestimated, to the regret of investors. But the fact that it takes time doesn't mean it won't happen.

### **Accessing Human Talent Globally**

The defining characteristics of the Internet are connectivity, speed, the irrelevance of location, and asynchronous communication (like e-mail and fax, and unlike the telephone and surfing the Web) when needed or desirable. The "participants" on the network are people and computers, and the latter are talking to each other all the time. On one level, this means that databases are linked; activities that are scattered geographically can be controlled and coordinated and made efficient. Global supply chains have the advantage of using low-cost resources around the world—that is not new. They have historically also had the disadvantage that management and control over a geographically distributed domain used to be costly and prone to delays, miscommunication, errors, time-zone issues, and inefficiency. Much of that disadvantage is in the process of disappearing. Of course transportation costs have not disappeared (though they have declined), and when things have to be moved around, those costs have to be factored in—unless, that is, what is being moved around is information.

This brings us to perhaps the most significant long-run effect of the spread of the Internet. Human potential is scattered around the world pretty much randomly. In an increasing portion of the world, that human potential is being turned into valuable talent by combining it with education and the learning that goes with productive employment. But much of that human talent is inaccessible. In the global economy, goods and capital are quite mobile, but labor (that is, people) is much less so. To make use of human talent, jobs can move to people or people can move to jobs. In most healthy national economies, both happen. But in the global economy, people face high barriers when it comes to moving to jobs: the more important process is jobs moving to people. And that is what has been happening.

There is an important set of services that people uniquely provide, and these are both information processing and knowledge intensive. By definition, of course, they are labor intensive. With the need for physical proximity removed by information technology, the markets for these services (and the labor markets that support their provision) are becoming global. The jobs are moving to the people, wherever they are located. Because the delivery of the service involves bits and bytes, the disadvantage of remoteness is negligible. Human resources that formerly were inaccessible because of the need for proximity have joined the labor market. To put it differently, for this class of information (knowledge and human-capital-intensive services), the geographic boundaries of labor markets are collapsing and the formerly disparate geographic markets are integrating and becoming global.

Outsourcing is a part but certainly not all of this. Many of these services are provided inside organizations (business, government, and nonprofit). This subgroup is sometimes referred to as insourcing. We have outsourcing and insourcing in a growing array of service sectors: management of IT systems, software development, business processes, customer service and support. And the list is getting longer. Functions in the medical area such as analysis of X-rays and MRI scans are being carried out remotely. Surgery with remote expert input is also being experimented with. Editing of video for TV is a new area. The expanding scope also includes surprising, and even funny, areas: writing political speeches for semiliterate politicians, grading exams for teachers who are too lazy to grade their own, and so on. As the list lengthens, the volume is growing at 30 percent a year. It is probably the fastest-growing area in international

trade. It is surely one of the primary drivers of growth in India, which has been in the forefront of this trend, in part because English is an official language.

Interestingly, the origins of the remote provision of services were not international but domestic. Before international trade in services blossomed, banks and credit card companies in the United States and Europe were performing services from states and provinces with educated, but remote, and therefore relatively inexpensive, labor. These initial forays tended to be customer service centers. One might object that customer service centers require only phone connections, and have nothing to do with the Internet. Actually, that isn't true. For service to be high quality, the service providers require real-time access to the corporate customer databases so that they actually know with whom they are talking and what they are talking about. That access is made possible at low cost by the networked databases and the Internet.

It is interesting that the first major impact of network-based information technology was automation and labor-saving technical change. There were of course other benefits in speed, accuracy, ability to coordinate activity over great distances, and the like. The third category, accessing valuable human resources, brings people back into the picture and in a sense is the opposite of the first category. It is about functions and activities that are inherently labor intensive, because there is no known substitute for people. Rather than replacing people, this trend is about finding and utilizing highly skilled human resources all over the world for what are inherently labor-intensive activities. The markets in highly skilled labor are becoming more global as technology brings down the costs that formerly made proximity important. There are limits to this. As noted earlier *in* thinking about urbanization, the value of proximity has not declined to zero. What those limits are we do not yet know. But we are on a journey in which they will be discovered.

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## Freaks, Geeks, and GDP

Why hasn't the Internet helped the American economy grow as much as economists thought it would?

By Annie Lowrey

[http://www.slate.com/articles/business/moneybox/2011/03/freaks\\_geeks\\_and\\_gdp.html](http://www.slate.com/articles/business/moneybox/2011/03/freaks_geeks_and_gdp.html)

If you have attended any economists' cocktail parties in the past month or so—lucky you!—then you have probably heard chatter about Tyler Cowen's e-book, *The Great Stagnation*. The book seeks to explain why in the United States median wages have grown only slowly since the 1970s and have actually declined in the past decade. Cowen points to an innovation problem: Through the 1970s, the country had plenty of "low-hanging fruit" to juice GDP growth. In the past 40 years, coming up with whiz-bang, life-changing innovations—penicillin, free universal kindergarten, toilets, planes, cars—has proved harder, pulling down growth rates across the industrialized world.

*But wait!* you might say. In the 1970s, American businesses started pumping out amazing, life-changing computing technologies. We got graphing calculators, data-processing systems, modern finance, GPS, silicon chips, ATMs, cell phones, and a host of other innovations. Has the Internet, the most revolutionary communications technology advance since Gutenberg rolled out the printing press, done nothing for GDP growth? The answer, economists broadly agree, is: Sorry, but no—at least, not nearly as much as you would expect.

A quarter century ago, with new technologies starting to saturate American homes and businesses, economists looked around and expected to find computer-fueled growth everywhere. But signs of increased productivity or bolstered growth were few and far between. Sure, computers and the Web transformed thousands of businesses and hundreds of industries. But overall, things looked much the same. The [GDP growth rate](#) did not tick up significantly, nor did [productivity](#). As economist Robert Solow put it in 1987: "You can see the computer age everywhere but in the productivity statistics."

An overlapping set of theories emerged to explain the phenomenon, often termed the "productivity paradox." Perhaps the new technologies advantaged some firms and industries and disadvantaged others, leaving little net gain. Perhaps computer systems were not yet [easy enough](#) to use to reduce the amount of effort workers need to exert to perform a given task. Economists also wondered whether it might just take some time—perhaps a lot of time—for the gains to show up. In the past, information technologies tended to need to incubate before they produced gains in economic growth. Consider the case of Gutenberg's printing press. Though the technology radically transformed how people recorded and transmitted news and information, economists have [failed to find](#) evidence it sped up per-capita income or GDP growth in the 15<sup>th</sup> and 16<sup>th</sup> centuries.

At one point, some economists thought that an Internet-driven [golden age](#) might have finally arrived in the late 1990s. Between 1995 and 1999, productivity growth rates actually exceeded those during the boom from 1913 to 1972—perhaps meaning the Web and computing had finally brought about a "[New Economy](#)." But that high-growth period faded quickly. And some studies found the gains during those years were not as impressive or widespread as initially thought. Robert Gordon, a professor of economics at Northwestern, for instance, has found that computers and the Internet mostly helped boost productivity in durable goods manufacturing—that is, the production of things like computers and semiconductors. "Our central theme is that computers and the Internet do not measure up to the Great Inventions of the late nineteenth and early twentieth century, and in this do not merit the label of Industrial Revolution," he [wrote](#).

Gordon's work leads to another theory, one espoused by Cowen himself. Perhaps the Internet is just not as revolutionary as we think it is. Sure, people might derive endless pleasure from it—its tendency to improve people's quality of life is undeniable. And sure, it might have revolutionized how we find, buy, and sell goods and services. But that still does not necessarily mean it is as transformative of an economy as, say, railroads were.

That is in part because the Internet and computers tend to push costs toward zero, and have the capacity to reduce the need for labor. You are, of course, currently reading this article for free on a Web site supported not by subscriptions, but by advertising. You probably read a lot of news articles online, every day, and you probably pay nothing for them. Because of the decline in subscriptions, increased competition for advertising dollars, and other Web-driven dynamics, journalism profits and employment have dwindled in the past decade. (That Cowen writes a freely distributed blog and published his ideas in a \$4 e-book rather than a \$25 glossy airport hardcover should not go unnoted here.) Moreover, the Web- and computer-dependent [technology sector](#) itself does not employ that many people. And it does not look set to add workers: The Bureau of Labor Statistics [estimates](#) that employment in information technology, for instance, will be lower in 2018 than it was in 1998.

That the Internet has not produced an economic boom might be hard to believe, Cowen admits. "We have a collective historical memory that technological progress brings a big and predictable stream of revenue growth across most of the economy," he writes. "When it comes to the web, those assumptions are turning out to be wrong or misleading. The revenue-intensive sectors of our economy have been slowing down and the big technological gains are coming in revenue-deficient sectors."

But revenue is not always the end-all, be-all—even in economics. That brings us to a final explanation: Maybe it is not the growth that is deficient. Maybe it is the yardstick that is deficient. MIT professor Erik Brynjolfsson [explains](#) the idea using the example of the music industry. "Because you and I stopped buying CDs, the music industry has shrunk, according to revenues and GDP. But we're not listening to less music. There's more music consumed than before." The improved choice and variety and availability of music must be worth something to us—even if it is not easy to put into numbers. "On paper, the way GDP is calculated, the music industry is disappearing, but in reality it's not disappearing. It is disappearing in revenue. It is not disappearing in terms of what you should care about, which is music."

As more of our lives are lived online, he wonders whether this might become a bigger problem. "If everybody focuses on the part of the economy that produces dollars, they would be increasingly missing what people actually consume and enjoy. The disconnect becomes bigger and bigger."

But providing an alternative measure of what we produce or consume based on the value people derive from Wikipedia or Pandora proves an extraordinary challenge—indeed, no economist has ever really done it. Brynjolfsson says it is possible, perhaps, by adding up various "[consumer surpluses](#)," measures of how much consumers would be willing to pay for a given good or service, versus how much they do pay. (You *might* pony up \$10 for a CD, but why would you if it is free?) That might give a rough sense of the dollar value of what the Internet tends to provide for nothing—and give us an alternative sense of the value of our technologies to us, if not their ability to produce growth or revenue for us.



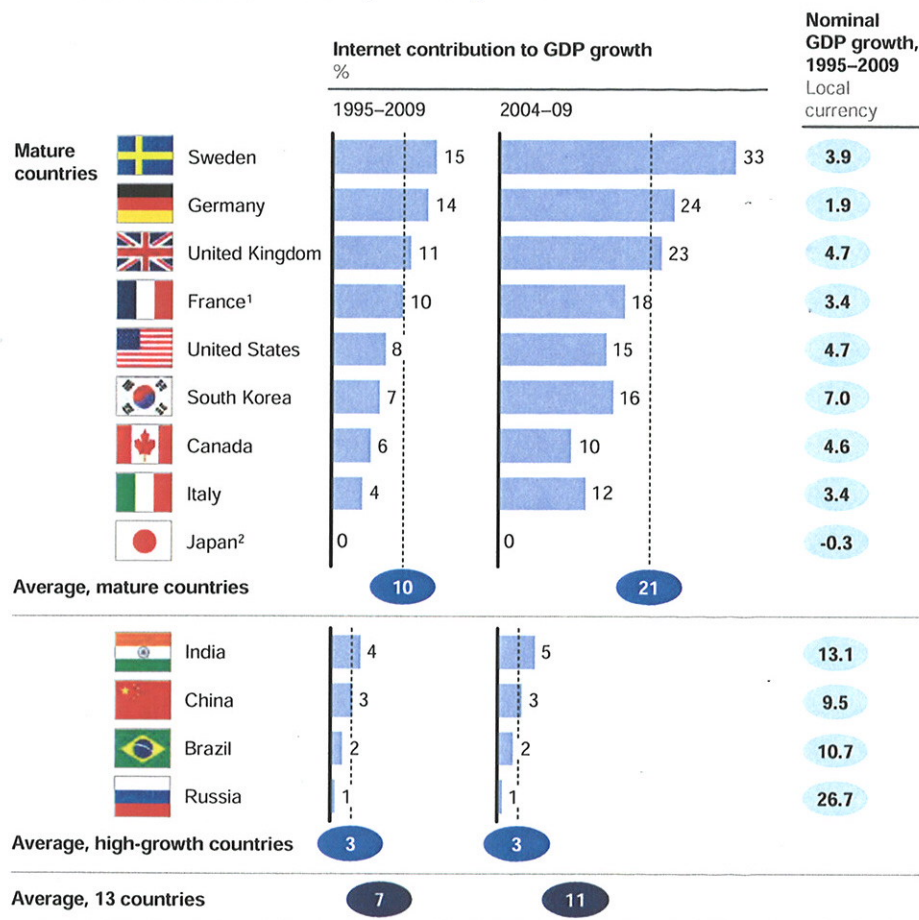
Of course, if our most radical and life-altering technologies are not improving incomes or productivity or growth, then we still have problems. Quality-of-life improvements do not put dinner on the table or pay for Social Security benefits. Still, even Cowen does not see all doom and gloom ahead, with incomes stagnating endlessly as we do more and more online and bleed more and more jobs and money. Who knows what awesome technologies might be just around the bend?

## THE INTERNET GENERATES GROWTH

Our analysis further shows that the Internet has been a major driver to economic growth and is getting stronger. Over the past 15 years, the Internet accounted for 7 percent of our 13 countries' combined economic growth. Its influence is expanding. Looking at the past five years, the contribution to GDP growth reaches 11 percent. When we look at mature countries, we see that the Internet contributed 10 percent of their growth over the past 15 years and doubled to 21 percent in the past five years. In the United Kingdom, which mirrors the typical experience of a mature country, the Internet contributed 11 percent to the country's growth rate over the past 15 years and 23 percent over the past five years (Exhibit 5).

### Exhibit 5

#### The Internet contribution to GDP growth has been an average 21 percent in mature countries over the past five years



<sup>1</sup> For France, the Internet contribution to growth from 2009-10 was 25 percent.

<sup>2</sup> Negative growth due to deflation.

SOURCE: National accounts, Organisation for Economic Cooperation and Development; McKinsey analysis

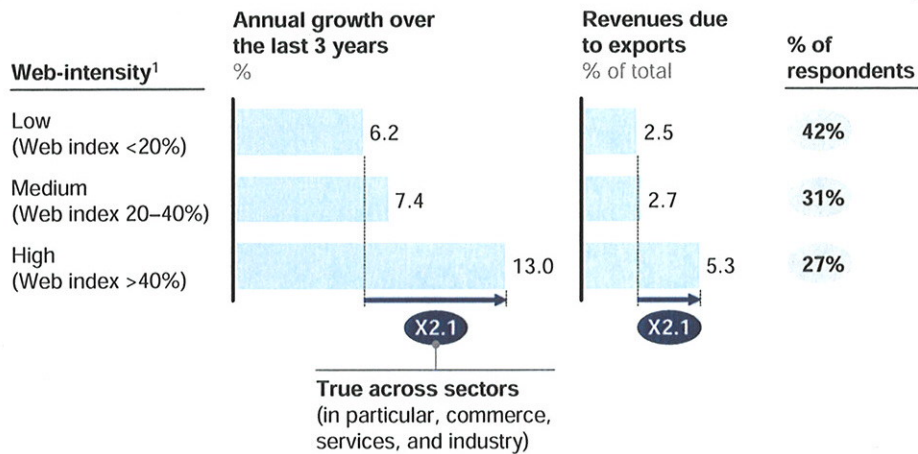
These results are reflected at a microeconomic level where the evidence is abundantly clear that Internet usage triggers a significant increase in performance in businesses at all levels and particularly among SMEs and other entrepreneurial endeavors. We surveyed more than 4,800 SMEs in 12 countries (our study group excluding Brazil) and found that those utilizing Web technologies grew more than twice as fast as those with a minimal presence (Exhibit 6). The results hold across all sectors of the economy. Further, Web-savvy SMEs brought in more than twice as much revenue through exports as a percentage of total sales than those that used the Internet sparingly. These Web-knowledgeable enterprises also created more than twice the jobs as companies that are not heavy users of the Internet (see Box 2, "SMEs capture a broad range of advantages"). When we look closely at individual sectors, we see that this is true across sectors from retail to manufacturing. Manufacturing is one of the sectors enjoying most impact from Internet.

On average, the survey showed that the Internet enabled a 10 percent increase in profitability across countries. The impact on profits came half from increased revenues, and half from lower costs of goods sold and lower administrative costs.

**Exhibit 6**

**Small and medium-sized enterprises using Web technologies extensively are growing more quickly and exporting more widely**

Growth and exports of SMEs analyzed by cluster of maturity of Internet  
 Analysis includes 12 countries and more than 4,800 SMEs



<sup>1</sup> McKinsey Web index defined according to the number of technologies possessed by companies and the penetration of those technologies (i.e., the number of employees/ customers or suppliers having access to those technologies).  
 SOURCE: McKinsey SME Survey

## **Box 2. SMEs capture a broad range of advantages**

Accelerated growth and a more accessible export market are just two of the many advantages the Internet brings to SMEs that invest in a substantial Web presence.

We produced an index reflecting the penetration and usage of Internet technologies, called the SME Internet Maturity Index. This index shows penetration of Internet technology and its usage by employees, clients, and suppliers. On the basis of the Index, we placed each of the companies in our sample into one of three categories: low Web intensity, medium Web intensity, and high Web intensity.

Our survey of more than 4,800 SMEs in 12 countries showed that on average, companies using Internet with a high intensity grow twice as quickly as low-Web-intensity companies, export twice as much as they do, and create more than twice as many jobs.

In addition—and not surprisingly—we found that countries where a greater proportion of SMEs have a strong presence on the Internet are also those with a greater contribution from the Internet to the national economy. For example, in the United Kingdom our survey showed that about 71 percent of the SMEs use the Internet with high or medium intensity, and our analysis concluded that the Internet contributes about 5.4 percent to the British GDP. In Russia, on the other hand, only about 41 percent of SMEs have high or medium Internet engagement, and the Internet contributes about 0.8 percent to the Russian GDP.

## INTERNET MATURITY CORRELATES WITH A RISING STANDARD OF LIVING

Leveraging endogenous growth theory, we were able to assess the Web's impact on per capita GDP increase within the countries surveyed. The analysis showed a clear correlation between per capita GDP growth and a country's Internet maturity based on its e3 index.

We developed the e3 index to reflect Internet maturity of a country, measuring **e-engagement**, **e-nvironment**, and **e-xpenditure**, which are themselves largely based on numbers provided by the World Economic Forum and OECD. Weighing these three components, the e3 index represents the depth of a country's maturity in access infrastructure and Internet usage by individuals, businesses, and governments. Scandinavian and North American countries, three north European countries (the Netherlands, Switzerland, and the United Kingdom), and South Korea capture the top ten positions in our e3 rankings.

A positive correlation has been established in the past between broadband penetration and per capita GDP growth. However, for the first time, to our knowledge, using the e3 index as an indicator of Internet maturity, we have been able to show statistically that the Internet correlates positively with net per capita GDP growth and therefore to increasing standards of living in the countries we examined. Our e3 index also correlates with labor productivity growth. Another regression we ran, based on the total Internet expenses of individuals, businesses, and government in a country, shows the same result (see Box 3, "Statistical approach"). Combined with very strong statistical evidence, these two regressions clearly show that use of the Internet correlates with higher growth in both per capita GDP and labor productivity.

Using the results of these correlations, a simulation shows the Internet has enabled an increase in real per capita GDP of \$500 on average in mature countries over the last 15 years. The Industrial Revolution took 50 years to achieve the same result.<sup>10</sup> This analysis shows both the magnitude of the positive impact of the Web at all levels of society and the speed of the benefits it brings.

Of course, these are just correlations. Causality still needs to be fully proved and we welcome additional work in this field.

Our conclusions are consistent with earlier academic studies that explored the Internet's impact on economies. For example, a 2003 study at Myongji University in South Korea examined 207 countries and found Internet penetration has a positive impact on economic growth.<sup>11</sup> A more recent study by professors at the University of Munich in 2009 found a clear path from the introduction of broadband and its increased penetration to per capita GDP, concluding that every 10-percentage-point increase in broadband penetration adds 0.9 to 1.5 percentage points to per capita GDP growth.<sup>12</sup>

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10 Angus Maddison, *The World Economy: Historical Statistics*, Paris: OECD, 2003.

11 Changkyu Choi and Myung Hoon Yi, *The effect of the Internet on economic growth: Evidence from cross-country panel data*, 2003.

12 Nina Czernich, Olivier Falck, Tobias Kretzchmer, and Ludger Woessmann, *Broadband infrastructure and economic growth*, CESIFO working paper, December 2009.

### Box 3. Statistical approach

To complete our bottom-up analysis of the contribution of the Internet to GDP based on the expenditure approach, we used statistical analysis to correlate the evolution of Internet economy with per capita GDP in a given country.

The analysis was based on three main rationales:

- Confirm, using econometrical analysis, our first macroeconomic methodology on the contribution of the Internet to GDP growth.
- Isolate the net contribution of the Internet from the substitutive effect between the Internet and non-Internet spending (e.g., e-commerce) that could have been included in our contribution of the Internet to GDP.
- Determine the spillover effect from the Internet economy to the non-Internet economy. Some spillover, for instance, could be retail purchases that result from online price comparisons and searches, while many free services bundled with access contracts, such as e-mail, are driving some amount of economic productivity.

We ran two regressions to determine the net link between growth and Internet usage.

#### Methodology

The model relies on economic growth theory and extends a total factor productivity growth equation with Internet-specific data used as an additional factor of production.

Assuming a macroeconomic function between per capita GDP and input of production of Cobb-Douglas:

$$Y = AK^aL^b$$

where Y is the per capita GDP, A is the state of technology, K is physical capital per capita, and L is human capital.

Assuming that A is a combination of Internet contribution and a fixed effect, we can write growth of per capita GDP as a linear combination between Internet usage, physical capital growth, and human capital growth:

- As a measure of growth, we used real per capita GDP growth (in 2005 US dollars) provided by the World Bank database.
- As a measure of Internet use in a country, we used our McKinsey e3 index, which indicates Internet maturity.
- For measuring contribution of capital and labor, we used growth of fixed capital per capita (in 2005 US dollars) and growth of labor per capita, both provided by the World Bank database.
- We also applied controlling variables, such as lagged level of per capita GDP 2005 and dummy variable per years.

The second regression replaces the e3 index with total Internet expenses in each country,<sup>1</sup> leveraging endogenous growth theory and using Internet-related ICT as an extra factor of production in Cobb-Douglas equation.

We examined nine countries (the 13 countries is our study sample, excluding China, Brazil, India, and Russia, where some data were unavailable) and five years for regression for a total of 45 data points.

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<sup>1</sup> ICT expenses given by Gartner each year to which we apply Internet ratios to derive Internet expenses.

### **Box 3. Statistical approach (continued)**

#### **Findings**

Both equations provide the same magnitude of impact of the Internet to GDP and show positive correlation between per capita GDP growth and Internet maturity of a country:

The first regression gives results statistically significant, with an R square of 89 percent and a Tstat of 2.3 for the contribution of  $e3$  to growth. Statistical contribution of  $e3$  to growth is evaluated at 2.6 percent. This would mean that an increase of 10 points of  $e3$  would result in an increase of real per capita GDP growth of 0.26 percentage point.

The second regression gives the same statistically significant results with an R square of 91 percent and Tstat = 3.2 for the contribution of Internet expenses to per capita GDP growth. For every 10 percent increase in Internet expenses, real per capita GDP grows an additional 1.2 percentage point.

When comparing this statistical approach with a macroeconomic approach, we see that the two approaches converge and show that the Internet creates net value to an economy through GDP growth.

However, we see some differences between the two approaches at the country level:

In some countries (e.g., South Korea and Sweden) the statistical contribution of the Internet to growth is lower than under the macroeconomic approach, showing a substitutive effect of e-commerce.

In some countries (e.g., Canada and the United States) the statistical contribution to growth is higher than under the macroeconomic approach, showing strong spillover effects on the non-Internet economy.

### **THE INTERNET CREATES JOBS**

Common wisdom tends to consider that the Web has a negative or neutral impact on employment. This is derived from the idea that the Internet has favored massive disintermediation. But this is a misconception. As we have demonstrated, the Internet is a contributor to net job creation in the sample countries. While some jobs have been destroyed by the emergence of the Internet, many more have been created during the same period, including jobs directly linked to the Internet such as software engineers and online marketers as well as more traditional jobs, for example in logistics to deliver online purchases.

A detailed analysis of France over the past 15 years shows that the Internet created 1.2 million jobs and destroyed 500 000 jobs, creating a net 700,000 jobs or 2.4 jobs for every one destroyed. This result is also reflected in our survey of more than 4,800 SMEs in the countries we studied, which shows that 2.6 jobs were created for every one destroyed, confirming the Internet's capacity for creating jobs across all sectors. Further, companies that have fully integrated the technology and use it extensively create more than twice as many jobs as the average, while the Internet has a neutral to slightly negative effect on companies using it only sparingly or not at all.

## THE INTERNET IS A MODERNIZATION FACTOR FOR THE WHOLE ECONOMY

Although the Internet has resulted in significant value shifts between sectors in the economy, our study demonstrates that all industries have benefited from the Web.

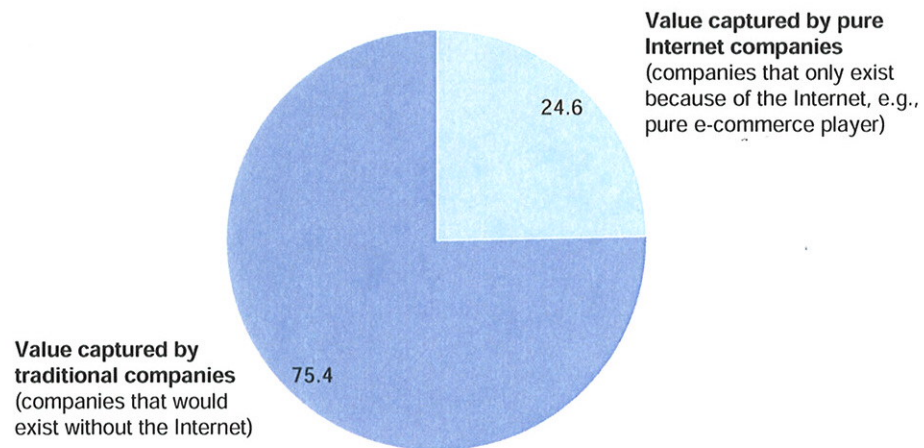
Perhaps surprisingly, the vast majority of the economic value created by the Internet is derived from industries not directly linked to ICT. About 75 percent of the economic impact of the Internet is happening at companies in more traditional industries that have witnessed significant productivity increases (Exhibit 7). SMEs in particular obtain a strong boost from using the Internet.

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### Exhibit 7

#### Traditional industries capture 75 percent of the value of the Internet

Share of Internet profitability gain between companies  
100% = Total Internet value for all companies



SOURCE: McKinsey SME Survey

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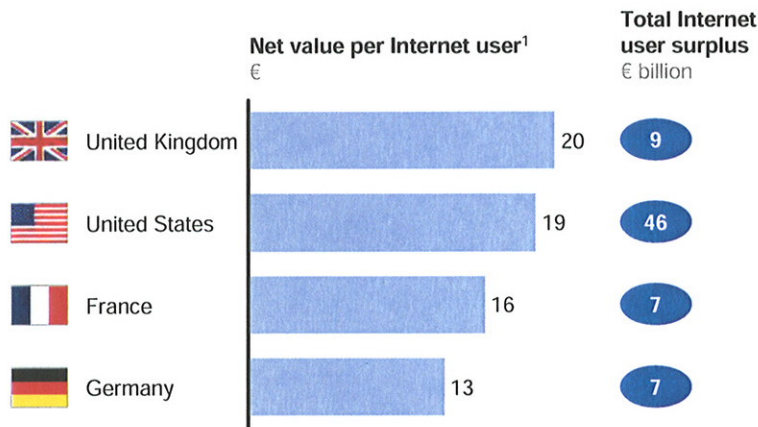


## THE INTERNET GOES BEYOND GDP, GENERATING CONSUMER SURPLUS

The Internet has changed our lives, giving us access to a large set of free services from e-mail and browsing to information services and search, or collaborative services such as wikis, blogs, and social networks. This access has given users substantial surplus value beyond the impact of the Internet on GDP. Our research shows that this value ranges from €13 (\$18) a month per user in Germany to €20 (\$28) in the United Kingdom (Exhibit 8). All told, the Internet generated substantial annual consumer surpluses, from €7 billion (\$10 billion) in France to €46 billion (\$64 billion) in the United States.

### Exhibit 8

**The value of the surplus accruing to users of the Internet varies between €13 and €20 per user per month in each country**



<sup>1</sup> All in the same currency based on Organisation for Economic Cooperation and Development exchange rates.  
SOURCE: McKinsey study (with Internet Advisory Board); Yankee; McKinsey analysis

In general, this surplus is generated from the exceptional value users place on Internet services such as e-mail, social networks, search facilities, and online reservation services, among many others. This value far outweighs the costs, both actual costs such as access and subscription fees and annoyances such as spam, excessive advertising, and the need to disclose personal data for some services. In the United States, for example, research conducted with the Interactive Advertising Board<sup>13</sup> found that consumers placed a value of almost €61 billion on the services they got from the Internet, while they would pay about €15 billion to get rid of the annoyances, suggesting a net consumer surplus of about €46 billion.

<sup>13</sup> Internet Advertising Board, *Assessing the consumer benefits of online advertising*, July 2010.

# WHERE THE JOBS ARE: THE APP ECONOMY

Research by Dr. Michael Mandel  
South Mountain Economics, LLC

## EXECUTIVE SUMMARY

How can the U.S. dig itself out of the current job drought? Government policy can temporarily boost employment. The ultimate answer, though, is innovation: The creation of new goods and services that spur the growth of new industries capable of employing tens or hundreds of thousands of workers.<sup>1</sup>

Nothing illustrates the job-creating power of innovation better than the App Economy. The incredibly rapid rise of smartphones, tablets, and social media, and the applications—“apps”—that run on them, is perhaps the biggest economic and technological phenomenon today. Almost a million apps have been created for the iPhone, iPad and Android alone, greatly augmenting the usefulness of mobile devices. Want to play games, track your workouts, write music? There are a plethora of apps to choose from, many of them free.

On an economic level, each app represents jobs—for programmers, for user interface designers, for marketers, for managers, for support staff. But how many? Conventional employment numbers from the Bureau of Labor Statistics are not able to

track such a new phenomenon. So in this paper we analyze detailed information from The Conference Board Help-Wanted OnLine® (HWOL) database,<sup>2</sup> a comprehensive and up-to-the-minute compilation of want ads, to estimate the number of jobs in the App Economy.

This analysis—conducted for TechNet by Dr. Michael Mandel of South Mountain Economics, LLC—shows that the App Economy now is responsible for roughly 466,000 jobs in the United States, up from zero in 2007 when the iPhone was introduced. This total includes jobs at ‘pure’ app firms such as Zynga, a San Francisco-based maker of Facebook game apps that went public in December 2011. App Economy employment also includes app-related jobs at large companies such as Electronic Arts, Amazon, and AT&T, as well as app ‘infrastructure’ jobs at core firms such as Google, Apple, and Facebook. In addition, the App Economy total includes employment spillovers to the rest of the economy.

Moreover, we find that App Economy jobs are spread around the country. The top metro area

for App Economy jobs, according to our research, is New York City and its surrounding suburban counties, although San Francisco and San Jose together substantially exceed New York. And while California tops the list of App Economy states, states such as Georgia, Florida, and Illinois get their share as well. In fact, more than two-thirds of App Economy employment is outside of California and New York. Our results also suggest that the App Economy is still growing at a rapid clip, which shouldn't be a surprise to anyone.

## BACKGROUND

'App', in the sense that we mean it today, did not exist before the iPhone was introduced in 2007. Apps are relatively lightweight programs, specifically designed to run on mobile platforms such as the iPhone and Android phones. In the past couple of years, the term 'app' has been extended to Facebook applications as well. In the prospectus for its initial public offering, Zynga described the App Economy in this way:

In order to provide users with a wider range of engaging experiences, social networks and mobile operating systems have opened their platforms to developers, transforming the creation, distribution and consumption of digital content. We refer to this as the "App Economy." In the App Economy, developers can create applications accessing unique features of the platforms, distribute applications digitally to a broad audience and regularly update existing applications"<sup>3</sup>

It must be noted, of course, that the App Economy is only four years old and extremely fluid. Both the location and number of app-related jobs are likely to shift greatly. It should also be noted that the figures presented in this paper are estimates, based on innovative techniques developed for this project. Finally, these may represent "jobs not lost" rather than net jobs gained.

Yet the basic principle holds. Innovation creates jobs, and in this case, lots of them.

The term 'App Economy' started coming into use in early 2009, and was popularized by a prescient November 2009 BusinessWeek cover story.<sup>4</sup>

The combination of ease of development and ease of delivery makes possible a stunning variety of apps. To just give some examples: You can take verbal notes; make your voice sound like a robot; schedule plane flights; play a baseball simulation; have customized news delivered to your device; create a digitized voodoo doll; and edit Microsoft Word documents.

But the App Economy is much more than a better delivery channel for software. From the economic perspective, we can think of the App Economy as a collection of interlocking innovative ecosystems. Each ecosystem consists of a core company, which creates and maintains a platform and an app marketplace, plus small and large companies that produce apps and/or mobile devices for that

platform. Businesses can belong to multiple ecosystems and usually do.

The key platforms in the App Economy today are

- Android, anchored by Google;
- Apple iOS, anchored by Apple;
- Blackberry, anchored by RIM;
- Facebook, anchored by Facebook;
- Windows Phone and Windows Mobile, anchored by Microsoft

## SIZING THE APP ECONOMY

The App Economy lends itself to several types of metrics. For example, it's relatively easy to count the number of apps in a particular app store, how many different developers, and even how many times apps have been downloaded. For example, the Apple App store had 529,550 active apps as of December 12, 2011, according to 148apps.biz, uploaded by 124,475 active publishers.<sup>5</sup>

Another important metric is revenue. By one estimate, the App Economy generated almost \$20 billion in revenue in 2011.<sup>6</sup> This includes app downloads, in-app revenues, sales of virtual goods, and sales of physical goods and services.

Sizing the number of jobs generated by the App Economy is much more difficult, however. Any particular app could be created by a single teenager programmer, or by a large team at a big company.

Every major consumer-facing company, and many business-facing companies, has discovered that they need an app to be the public face of the business. In some sense, that makes the App Economy the construction sector of the 21st century, building a new front door to everyone's house and in some cases constructing a whole new house.

The process of updating and maintaining popular apps can be a hidden but a labor-intensive process. Finally, the construction and maintenance of the app infrastructure creates jobs as well.

One study of app-related jobs focused only on Facebook.<sup>7</sup> Three academics estimated the number of jobs created by Facebook apps using data on number of downloads and number of developers. They estimated that "the number of employees employed by third party developers [of Facebook apps] to be 53,434." Then they calculated a range of spillover effects into the national economy, leading them to conclude that "a conservative estimate of the employment impact of developers building apps on the Facebook Platform in the United States in 2011 is 182,744 full time jobs."

## METHODOLOGY

This paper takes a different, more general approach to estimating the number of jobs in the App Economy. We want to understand the whole labor market built up around apps—not just at the third party developers, but at the core firms as well. And we want a methodology that cuts across all the different ecosystems.

If the App Economy was more mature, we might be able to use the data that comes from the government statisticians at the Bureau of Labor Statistics. With a few years lag, the government updates its industry categories to reflect changes in the economy. For example, there is now a relatively new industry category labeled “Internet publishing and broadcasting and web search,” which includes companies such as Google, Yahoo, and Facebook.

However, the App Economy is far too new to show up in the government statistics. Instead, we use The Conference Board HWOL database, a compilation of online help-wanted ads that reflects “the full universe of all online advertised vacancies which are posted directly on internet job boards or through newspaper online ads.”<sup>8</sup>

This database has many advantages for a detailed look at new industries. It’s updated daily to reflect new ads, so it’s completely up to date. The ads are categorized by occupational category that matches the BLS occupational categories, so the number of want ads can be compared to BLS occupational

data. The database includes information on location and employers.

And perhaps most important, the database includes access to the full text of the ads, which allows keyword searches. This enables us to clearly identify those want ads that belong to the App Economy, with the right set of keywords.

Our procedure for estimating the number of App Economy jobs has several steps (see Table 1).

1. We identified a set of keywords that characterize want ads for App Economy computer and mathematical occupations, which for convenience we will call ‘tech jobs’;
2. We used historical relationships to estimate the ratio between the number of want ads for tech occupations and the actual level of tech employment;
3. We examined a sample of third-party app developers to estimate the ratio of tech jobs to non-tech jobs in the App Economy;
4. We drew from the literature to derive a conservative estimate of the spillover effects to the broader economy;
5. We used the location data in The Conference Board database to estimate App Economy jobs by metro area and by state.

## Table 1: Methodology Summary

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Non-duplicated help-wanted ads for app economy jobs

Using The Conference Board Help-Wanted Online database, we identified want ads for computer and mathematical occupations containing one of the following key words or phrases: Android, app, Blackberry, “Facebook API”, iOS, iPhone, “Windows Mobile,” “Windows Phone”.

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Want-ad to employment ratio

We calculate the ratio between the number of want ads and the level of employment for app economy jobs, using 4 years of monthly data for computer and mathematical occupations from The Conference Board and from the BLS.

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Tech employment to total employment ratio

We calculate the ratio between the number of tech jobs and total jobs in an App Economy company, using The Conference Board data on want ads for a sample of pure app economy companies.

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Job creation multiplier

We estimate the total number of jobs created given the spillover effects of app economy jobs, based on our judgmental assessment of research on job multipliers.

## RESULTS

The first step was to choose a set of key words and phrases that would give us a fair representation of tech jobs in the App Economy.<sup>9</sup> The key words and phrases we chose were:

- Android
- App
- Blackberry
- iOS
- iPhone
- “Facebook API”
- “Windows Mobile”
- “Windows Phone”

We identified all want ads for tech jobs—computer and mathematical occupations—which appeared online in the 90 days ending December 31, 2011, and contained at least one of these key words and phrases. In other words, this filter would capture an ad for a software engineer with iOS experience, or with knowledge of the Facebook API.

In order to verify that this filter was identifying the right want ads, we examined a sample of identified ads, and compared them to ads being run by well-known third party developers. For example, an ad by one App developer looking for an iOS development engineer and requiring “1–2+ years of iOS development experience” clearly was appropriate.

Over the 90-day period ending December 31, 2011, we identified roughly 44,400 non-duplicated ads for computer and mathematical occupations, and containing one or more of the above keywords.

These are ads for U.S. jobs. By comparison, there were 952,000 want ads for all computer and mathematical occupations over the same period. As a result, App Economy want ads made up 4.7% of the tech job total.<sup>10</sup>

Now we need to establish a ratio between actual employment and want ads. Obviously this ratio varies depending on whether companies are hiring or not. It will also vary across occupations, since hiring practices are different depending on the type of job. For example, companies are more likely to run want ads for computer programmers than for managers, relative to the total level of employment.

However, an examination of the past four years of data of want ads for computer and mathematical occupations, in particular, suggests that tech jobs and tech want ads tend to move together, except for anomalous periods such as 2009, at the bottom of the downturn. In particular, roughly 3.5 million workers were employed in tech jobs (computer and mathematical occupations) in the fourth quarter of 2011, a period which also saw roughly 1 million tech want ads. That suggests a ratio of roughly 3.5 tech jobs for each tech want ad (90-day unduplicated).

We derived this 3.5 ratio for the broad category of computer and mathematical occupations (tech jobs). The major assumption of this paper is that the same ratio holds for tech jobs and tech want ads in the App Economy.<sup>11</sup>

Based on this ratio, our analysis suggests that there were 155,000 tech jobs in the App Economy as of December 2011. This number would include developer and tech support jobs at both dedicated app developers and at large companies who create apps for them or for others.

The next step is to calculate the ratio of non-tech jobs to tech jobs at App Economy enterprises. Obviously new startups in the tech area are weighted very heavily towards tech jobs—computer software engineers, developers and the like. But as companies grow, they add human resources, sales, marketing, and all sorts of other non-tech function. A careful examination of want ads placed by mid-size app developers suggests that a 1 to 1 ratio between tech jobs and non-tech jobs is not unreasonable.

## SPILOVERS

There's a very long history of economic studies calculating the job market impact of various activities, from Wall Street to real estate to exports to broadband. Within the context of these studies, it's traditional to use a multiplier to estimate the combination of the direct and indirect job creation, such as the number of restaurant jobs created in New York by each investment banker job.

While the general principle of a multiplier is obvious, there's a lot of dispute about how big it should be. The Facebook job study mentioned above, for example, assumed that the multiplier should lie

That assumption implies that there are roughly 311,000 jobs in App Economy firms, not accounting for spillover effects into the rest of the economy (see Table 2). These include tech jobs, which require app-related skills, and the corresponding non-tech jobs.

Is 311,000 a big number or a small number? Figure 1 compares the App Economy employment (not including spillovers) with employment in several key tech industries. We see that App Economy employment is slightly larger than the number of jobs in the software publishing industry, at least as reported by the BLS. That makes the App Economy a significant force. (Remember that App Economy jobs are embedded within these industries, and are not a separate industry themselves).

between 2.4 and 3.4, based on past studies of the job impact of broadband (it's also traditional to use previous estimates of the multiplier, no matter how outrageous they are.)

For the purpose of this study, we use a conservative multiplier of 1.5. Based on this multiplier, every app economy job generates another 0.5 jobs in the rest of the economy. This may be unduly conservative, but it suggests that in the aggregate, roughly 466,000 jobs have been created by the App Economy since the iPhone was introduced in 2007.

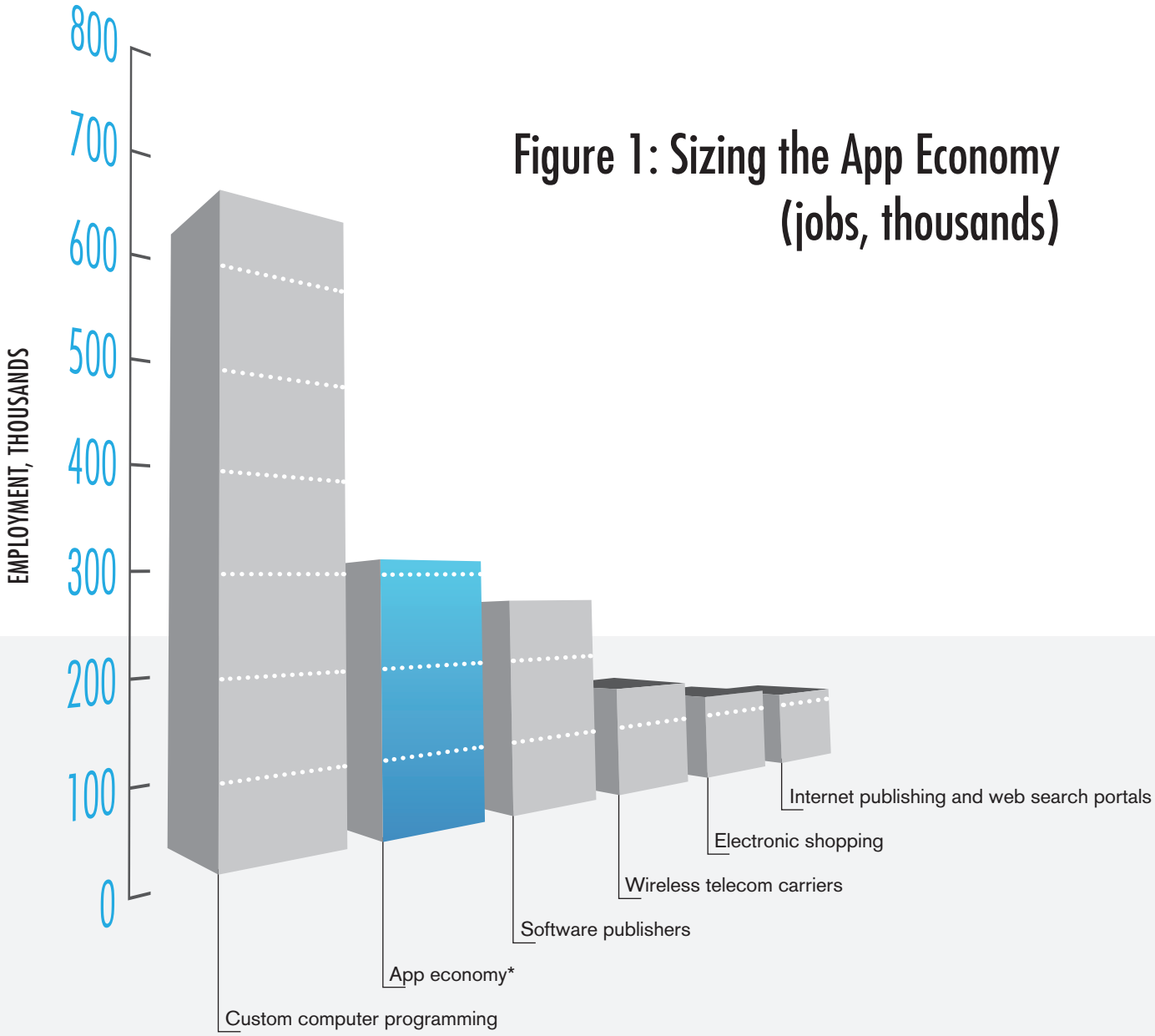


## Table 2: Estimating the Size of the App Economy, December 2011\*

SOURCE	NUMBER (thousands)
Non-duplicated help-wanted ads for app economy jobs (computer and mathematical occupations only)	44.4
Want-ad to employment ratio for computer and mathematical occupations	x 3.5
Estimated computer and mathematical employment in App Economy	=155.4
Tech to total employment ratio	x 2
Total jobs in App Economy	=310.8
Multiplier for job creation outside the app companies	x 1.5
Total economic impact	=466.1

\*90 days ending December 31, 2011. Numbers may be rounded.  
Data: The Conference Board, South Mountain Economics LLC.

### Figure 1: Sizing the App Economy (jobs, thousands)



\*App economy employment, not including spillovers. Based on 90 days ending December 31, 2011. Industry employment as of November 2011. App economy jobs are distributed across all industries. Data: The Conference Board, BLS

## GEOGRAPHIC DISTRIBUTION

People think of the App Economy as being centered in Silicon Valley, because that's the headquarters of the core firms—Apple, Google, and Facebook. What's more, the most visible pure app company, Zynga, is located in San Francisco.

But judging by the location of want ads, the App Economy is widely distributed around the country. Table 3 shows the top 10 metro regions for distribution of App Economy jobs across metro areas, with the New York metro area accounting for 9.2% of the total, followed closely by San Francisco and San Jose metro areas.

Probably one reason for New York's prominence is the concentration of media, advertising, and finance in the region. These are all sectors where major companies have been virtually forced to create apps or be left behind. Indeed, the App Economy may be playing a key role in keeping the New York City economy afloat during the downturn.

Not surprisingly, App Economy employment in San Francisco and San Jose together exceeds New York's total. Other non-NY and non-Silicon Valley

metro areas on the top ten list include Seattle, Los Angeles, Washington DC, Chicago, and Boston. These are all areas where the App Economy presence is significant.

We can do the same analysis on a state level, as shown in Table 4. App Economy jobs are concentrated in California, which has almost one-quarter of the total. The next four states are New York, Washington, Texas, and surprisingly, New Jersey.

## Table 3: Location of App Economy Jobs by Metro Area

MSA	PERCENTAGE OF APP ECONOMY JOBS, DECEMBER 2011*
New York-Northern New Jersey-Long Island	9.2%
San Francisco-Oakland-Fremont	8.5%
San Jose-Sunnyvale-Santa Clara	6.3%
Seattle-Tacoma-Bellevue	5.7%
Los Angeles-Long Beach-Santa Ana	5.1%
Washington-Arlington-Alexandria	4.8%
Chicago-Naperville-Joliet	3.5%
Boston-Cambridge-Quincy	3.5%
Atlanta-Sandy Springs-Marietta	3.3%
Dallas-Fort Worth-Arlington	2.6%
San Diego-Carlsbad-San Marcos	2.3%
Philadelphia-Camden-Wilmington	1.9%
Portland-Vancouver-Beaverton	1.8%
Minneapolis-St. Paul-Bloomington	1.6%
Denver-Aurora	1.3%
Detroit-Warren-Livonia	1.1%
Phoenix-Mesa-Scottsdale	1.1%
Austin-Round Rock	1.1%
Baltimore-Towson	0.9%
Miami-Fort Lauderdale-Miami Beach	0.9%
Houston-Sugar Land-Baytown	0.8%

\*Based on 90 days of unduplicated want ads, ending December 31, 2011.  
Data: The Conference Board, South Mountain Economics LLC

## Table 4: Top Ten States for App Economy Jobs

STATE	PERCENTAGE OF APP ECONOMY JOBS
California	23.8%
New York	6.9%
Washington	6.4%
Texas	5.4%
New Jersey	4.2%
Illinois	4.0%
Massachusetts	3.9%
Georgia	3.7%
Virginia	3.5%
Florida	3.1%

Data: The Conference Board, South Mountain Economics LLC.

## GROWTH

Has App Economy employment topped out, or can we expect it to grow further? To get an idea of the labor market trends in the App Economy, we look at the number of want ads for computer and mathematical occupations that use the word 'app'. That won't be a completely accurate measure—since some ads use the word 'app' simply as an abbreviation for any software application—but it does give a good idea of growth.

In Figure 2 we see that the growth in the App Economy has followed the classic S-shape. The

figure shows a slight dip in early 2009, reflecting the deep overall recession. That was followed by a dramatic acceleration in 2009, 2010 and early 2011, and then a relative slowing of growth.

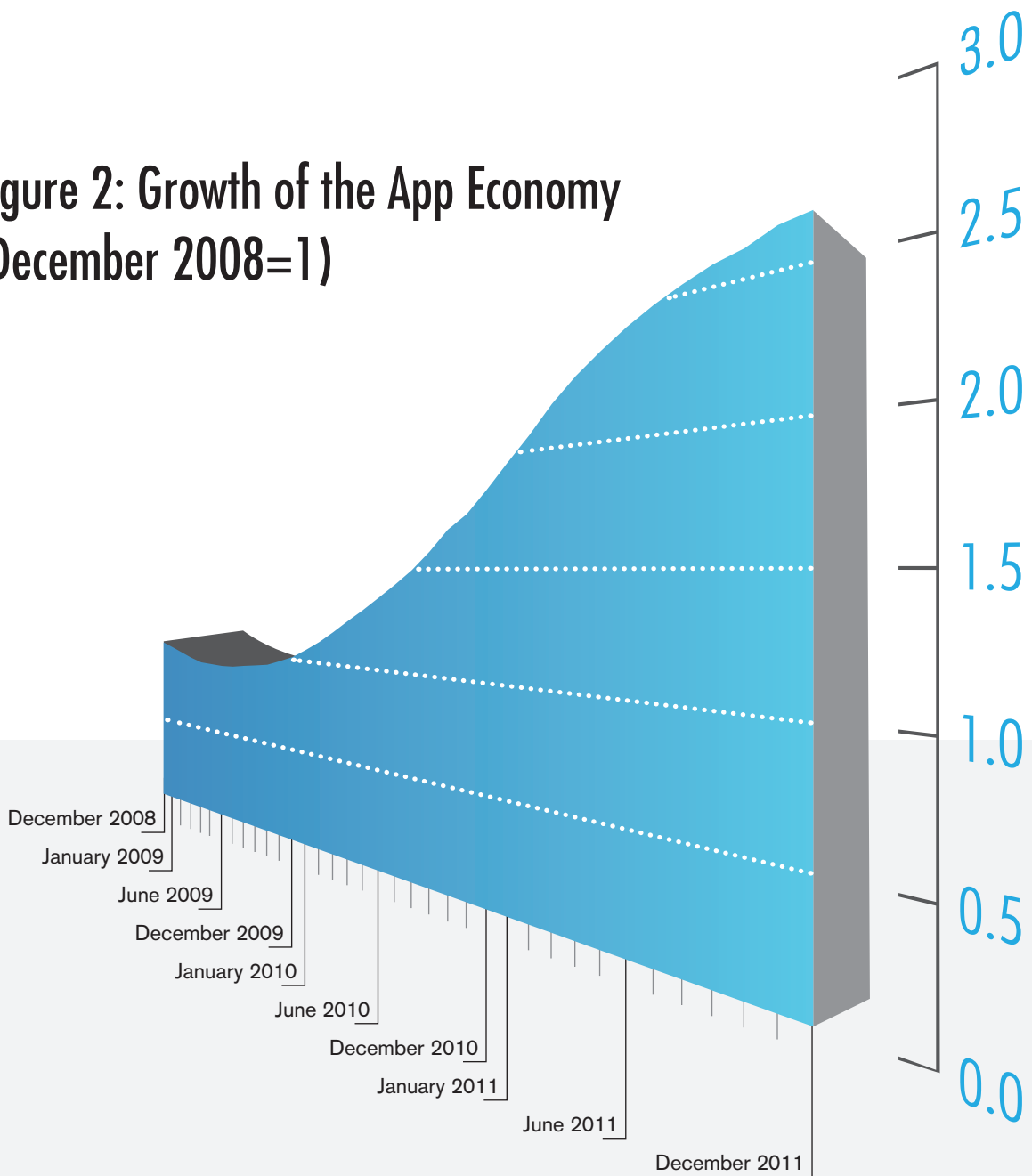
However, the key word here is 'relative'. In the year ending December 2011, the average number of tech want ads containing the word 'app' was still 45% higher than the previous year. That's rapid expansion by anyone's standards.

## FUTURE GROWTH AND CONCLUSIONS

We have taken a snap shot of the App Economy, using The Conference Board HWOL database as our illumination. According to our analysis, the App Economy has created roughly 466,000 jobs since the iPhone was introduced in 2007.

How big can the App Economy get? That depends in many ways on the future of wireless and social networks. If wireless and social network platforms continue to grow, then we can expect the App Economy to grow along with them.

**Figure 2: Growth of the App Economy  
(December 2008=1)**



Help-wanted ads for computer and mathematical occupations that contain the word 'app'; 12-month moving average  
Data: The Conference Board

## ENDNOTES

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- 1 See, for example, the July 2010 paper from the Progressive Policy Institute: "The Coming Communications Boom? Jobs, Innovation and Countercyclical Regulatory Policy".
- 2 We thank June Shelp and The Conference Board for use of their well-organized Help Wanted OnLine® (HWOL) database. The Conference Board bears no responsibility for the analysis in this report.
- 3 Zynga prospectus, filed 12/15/11
- 4 "Inside the App Economy," *BusinessWeek*, November 2, 2009.
- 5 <http://148apps.biz/app-store-metrics/>
- 6 "How Big is the US App-Economy? Estimates and Forecasts 2011-2015" by Appnation and Rubinson Partners, Inc., November 2011
- 7 "The Facebook App Economy," Il-Horn Hann, Siva Viswanathan and Byungwan Koh, University of Maryland, September 2011
- 8 The monthly public release can be found at <http://www.conference-board.org/data/helpwantedonline.cfm>
- 9 At this stage we are focused solely on tech jobs, which are computer and mathematical occupations. This category includes software and web developers; database and network administrators; computer support specialists; statisticians; and related technicians. We can identify non-tech App Economy want ads from The Conference Board database if we know the employer is a pure app company such as Zynga. More generally, however, an ad for a human resources job at an app developer cannot be distinguished from other HR jobs.
- 10 If we look at shorter periods, the number of non-duplicated want ads goes down, of course. For example, in the week ending December 15, there were 10585 non-duplicated want ads for App Economy tech jobs, roughly 4.1% of the total for all tech want ads for that week.
- 11 When we look at individual app developers, this ratio seemed roughly correct.