# The coming great transformation<sup>☆</sup>

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## 1. Introduction

The world is changing rapidly, and in ways that seem to be leaving many people behind, with large fractions of the population in advanced countries seeing their standards of living stagnate, or even decline, during the past quarter of a century. Fears about the future, and discontent with economic changes in recent decades—particularly globalization—played an important role in the U.S. election of 2016 as well as in the Brexit referendum earlier that year. The retort that globalization is not to blame, but rather technical change, provides little comfort; indeed, even if the rules of globalization were "fixed," the worry is that technical change will continue to make matters worse.

Those looking forward see the possibility—or even likelihood—of a far greater transformation, as robots equipped with artificial intelligence replace humans. Robots are stronger. They can act with more precision. They can process more information faster. They can even learn. We do not know the limits of these robots and our reactions to them, or how fast AI robotization will occur. The Japanese have invented robots for eldercare—lifting an aged patient and gently giving him a bath. Presumably, we could program the robot to sing or talk to the patient in a way that was optimally soothing. The focus of concern, however, is not the virtues of these robots but their impacts on jobs. There is, for instance, a growing view that in truck driving, driverless vehicles

will take over, possibly as soon as five years. The worry is that our market economy will not, on its own, be able to create new jobs with comparable pay for those who are losing their jobs.

How will our society evolve? Will it be a society in which, freed further from the burden of providing the basic necessities of life, men and women are finally able to do what they want to do—to reach their full creative potential? And what will happen to those who lack either the ability or the interest to reach their creative potential? Will they be satisfied playing video games or whatever forms of "bread and circus" the elites can provide for them?

Over the past 300 years, the world has managed several great transformations, to borrow the title of Karl Polanyi's famous book.[1] The society and economy of the United States and other advanced countries, for instance, have moved from being agrarian to manufacturing-based and from being rural to urban. Obtaining the necessities of survival, which used to consume all of a family's efforts, now takes but a few hours a week. Many advanced countries have transformed from authoritarian regimes to democratic pluralistic societies. Seemingly similar societies have managed these transformations differently, and almost surely, different societies will respond to the challenges posed by this next transformation, which may truly be called "the Great Transformation," differently.[2] How countries respond will, however, have profound consequences for the nature of society in the twenty-first century. It will affect not only disparities in well-being (the degree of inequality) but also the magnitude of social tensions—and even the pace of innovation going forward.

Economists do not have a crystal ball, so they cannot tell whether the pace of innovation will decrease (as some have suggested[3]) or not. They cannot tell how fast and to what extent robots and artificial intelligence will replace humans. They cannot even provide clear links between the ways in which society responds to robotization and the future pace of innovation. But economic research in recent years has provided a framework for assessing alternative possibilities and policies—a rough guide to their likely consequences. We are not totally rudderless. Indeed, I will argue that the worst nightmares—a world run by and for robots in which humans become the servants of the machines—are science fiction. We have it in our means to make sure that such a world does not emerge.

## 2. Past failures

To shed light on how these dramatic changes will play out, and how we can manage them, it helps to look back at what has happened in the somewhat less dramatic changes that have marked the last three centuries. Globalization is particularly salient.

### 2.1. Broken promises

The promise was that globalization, together with liberalization, lowering tax rates, and advances in technology, would make everyone better off, presumably through some form of trickle-down economics. As the national pie got larger, everyone would get a bigger piece, even if certain groups' fractions went down. Even those at the bottom of the income distribution would be better off. If that had happened, globalization would be greeted enthusiastically by people in all parts of the world. Instead, one of the main themes uniting civil society around the globe

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[1] Polanyi (1944).
[2] Thus, this paper is inspired by Polanyi's earlier work. See also Stiglitz (2001).
[3] See Gordon (2016). For the alternative view, see Mokyr (2014).

has been an opposition to globalization. And some of this opposition is understandable. When I wrote *Globalization and Its Discontents* (2002), I argued that the system was stacked against developing countries. The poorest of the poor were faring particularly badly. Even then, though, some countries figured out how to manage this seemingly unfair system to their advantage. China and other countries of East Asia moved hundreds of millions out of poverty and into the middle class. Branko Milanovic's data[4] show that, apart from the global top 1%, those at the middle of the global income distribution prospered the most over the past quarter of a century.

Now, globalization's discontents in the developing world have been joined by the discontents in the developed world in believing that the system is rigged against them. How can it be that it is rigged against both workers in developing and developed countries? Simple: it is rigged in favor of global corporations. It creates a race toward the bottom among workers, with each country seeking to attract work away from another by offering labor at lower prices. Indeed, standard economic theory explains why economic integration leads to lower wages of less-skilled workers in the advanced countries. And if the United States keeps its agricultural subsidies, the poorest workers—agricultural workers barely living above subsistence—can also see their incomes fall. Most of the so-called free trade agreements are not really about free trade. They are instead managed trade agreements—managed for the benefit of corporate interests in the US. Donald Trump has suggested that America's negotiators got outsmarted. Anyone who has watched trade negotiation closely as I have over the past quarter century knows how ridiculous such claims are. Our negotiators got most of what they wanted—and virtually everything of importance. The problem is not that they were bad negotiators, but that they wanted the wrong thing. They sought to fulfill America corporate's wish list, such as making it difficult for any government to impose environmental regulations. They were not attempting to ensure that the incomes of America's workers would increase, or even that GDP would increase.[5]

Citizens were told to accept certain changes in the rules of the game because it would make them better off. Now in many countries workers are told they have to accept cutbacks in wages and public services *in order to compete in our globalized world.* The disparity between promises and what has happened has deepened distrust of elites (including in politics and academia) and democratic politics.

## 3. What economics teaches us

Economic science was more honest. It only said that *under certain conditions* winners *could* compensate losers, not that they would—or more formally, that the "utility possibilities curve," giving the maximum level of well-being of one individual given the levels of well-being of all others, was shifted out (Fig. 1). Even this was not true if the assumed perfect market conditions were not satisfied. For instance, with incomplete risk markets, liberalization of trade and capital markets could lead to Pareto-inferior equilibria (Newbery & Stiglitz, 1984; Stiglitz, 2008). With costly redistributions, winners may not be able to compensate losers. With macroeconomic disequilibria (unemployment), jobs in import-competing sectors may be destroyed faster than new
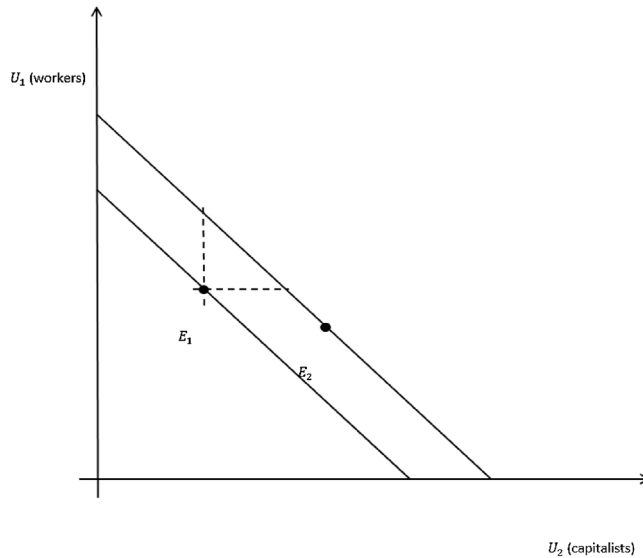
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Fig. 1. Even with an outward movement of the utility possibilities curve, the competitive allocation (without redistribution) may leave one group worse off. All that an outward movement of the utilities possibilities schedule means is that all groups could be made better off, not that the will be made better off.

jobs are created (Stiglitz, 2002)—indeed, there is evidence that a surge of imports from China led to higher unemployment and lower wages.[6] If there are costs of moving from a sector with declining employment because of productivity increases (as was the case with agriculture a century ago) to elsewhere in the economy, the economy can easily get trapped in a low-level equilibrium. In such a situation, what would have been a Pareto improvement if there were zero mobility costs can, in reality, make everyone worse off (Delli Gatti, Gallegati, Greenwald, Russo, & Stiglitz, 2012, Delli Gatti, Gallegati, Greenwald, Russo, & Stiglitz, 2016).

But even if the utility possibilities schedule moves out, the competitive equilibrium may be such that one group is worse off: more than 100% of the gains go to others. (In Fig. 1, if $E_1$ represents the initial competitive equilibrium, and $E_2$ that after the technological change, one group is actually worse off.) Globalization represents precisely such a kind of change. Trade liberalization will lead to a lowering of wages of unskilled labor in the advanced countries, even though trade liberalization makes the country as a whole better off. (See Samuelson, 1949; Stolper & Samuelson, 1941.) Economic theory explained that in this situation, both groups *could* have been better off, but only if there are (potentially large) redistributions.[7]

Unfortunately, in the US and some other advanced countries, the redistributions (adjustment assistance) required to ensure that all will benefit were not made. There were real losers.[8] Not

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[6] See Autor, Dorn, and Hanson (2013).

[7] Formally, if the aggregate production function is $Q = F(K, R, L_u, L_s)$, and there is full employment of skilled and unskilled workers, a replacement of one unit of convention capital with one unit of robots will reduce the competitive wage of unskilled workers if $F_{32} - F_{31} < 0$, which may well be the case, e.g. if ordinary capital is complementary to unskilled labor and robots are substitutes.

[8] In certain periods, such as after the 2008 crisis, there are large disequilibria in labor markets: even those with training cannot get jobs. A necessary condition for preventing large costs associated with globalization—and for ensuring that trade adjustment assistance works—is that the labor market is tight.

surprisingly, those who lost have not been happy. In the case of technology, they may feel there is nothing they can do. In the case of globalization, they feel there is: support politicians who promise to change the rules of the game in ways that protect their interests.

## 4. Welfare economics: the critical norm

The implication of this discussion is that in evaluating changes in policy, there is a critical norm that we should employ: change is desirable only if it improves social welfare, taking into account the impacts on distribution. The objective of policy is not to maximize GDP.

Thus, a change in policy that results in losses to the bottom part of the income distribution would only be desirable if there were very large gains to those at the top—how large would depend on how *inequality-averse* society is.[9] Under the Rawlsian criteria, we only need to look at those at the bottom (that is, society is better off if and only if the worst-off citizens within the society are better off). Obviously, under the Rawlsian standard, changes and reforms of the last quarter century may have been welfare-decreasing. But there is a growing consensus that the distributive consequences of globalization have been large relative to impacts on the size of the economy, so that in the advanced countries globalization would be welfare-decreasing under plausible inequality-averse social welfare functions.

Some of those concerned with the potential of robots and other future changes in technology to lead to high levels of unemployment, in response to these concerns, have come out in favor of some version of a "universal income benefit," which would provide all individuals a certain minimum grant. But recent discussions of well-being have recognized that individuals value work (see, e.g. Stiglitz, Sen, & Fitoussi, 2010), implying that a system without work, relying *only* on redistribution, should not be viewed as acceptable. (Others have responded that our skills at consuming leisure would improve over time, making such a universal income benefit system acceptable, so long as the benefit is large enough.)

## 5. We can't go back in time

It is, of course, impossible to precisely ascertain the pace and direction of technological change and its future impacts of globalization. As the song goes, "que sera sera, the future's not ours to see." This much is clear: Manufacturing jobs are not coming back. Global employment in manufacturing is declining, simply because the pace of productivity growth exceeds the rate of increase in demand. Because of comparative advantage, the share of the United States (and of other advanced countries) in these declining manufacturing jobs will also decline. Even if *production* returns, jobs will not: it will be capital-intensive manufacturing. Moreover, protectionism is unlikely even to help those that it claims to benefit. Standards of living will decrease as a result of the increased price of imported goods upon which especially those with lower incomes rely. Many of the imported goods are intermediate goods; for the United States to impose tariffs on these goods would decrease the country's competitiveness. Most importantly, the trade deficit is a result of macroeconomic forces, the disparity between national savings and investment. Protectionism

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[9] If social welfare takes on a generalized Benthamite form, $W = \Sigma G(U(C))$, where G is any monotonic transform of U, then society is inequality-averse if and only if $G''U + U''G' < 0$, a sufficient condition for which is that $G'' < 0$ and $U'' < 0$. Of course, social welfare functions do not have to take this additive form. For a more general discussion of inequality-averse social welfare functions, see, e.g. Atkinson (1970), or Rothschild and Stiglitz (1973).

6                         *J.E. Stiglitz / Journal of Policy Modeling xxx (2017) xxx–xxx*

is unlikely to have much effect on these macro-balances, but by distorting overall efficiency, it lowers national productivity and thereby standards of living.

There is an important implication of this analysis which I briefly note: The East Asia export-driven manufacturing development model, which has proven so successful, *is not likely to be the basis of development going forward*. Africa might be able to garner for itself significant numbers of jobs in manufacturing as China's wages increase, but this will provide employment for only a fraction of Africa's burgeoning population. The question for Africa is, what will replace the East Asian manufacturing export-led growth model? The risk is that the divergence between countries—between leaders and followers—could increase.[10]

## 6. Critical distinctions

We noted earlier that economic research in recent years has provided a framework for assessing the consequences of alternative possibilities. In particular, it has identified some critical distinctions, which I outline below.

(a) "Equilibrium" impacts—assuming costless adjustment—should be distinguished from disequilibrium impacts, taking account of systemic imperfections and rigidities. In particular, the economic system may be able to "absorb" small changes; but not large changes. A new set of problems arises when the pace of innovation is too fast. Often, the advocates of globalization look past the adjustment period and are describing the future equilibrium state of the world. The assertion that "globalization is good" then simply means that once we make the transition we are better off. The desirability of globalization in this case depends on balancing the present discounted value of the long-run benefits against the present discounted value of the adjustment costs.

(b) Labor-saving innovations should be distinguished from capital or resource-saving innovations. The former reduce the demand for labor, lowering wages.[11] This discussion notes that different kinds of innovation can have markedly different effects on the competitive equilibrium, and in particular, on the distribution of income. For instance, both labor- and capital-augmenting technological change (given a particular labor supply and capital stock) move out the utilities possibilities curve, giving the maximum level of utility (well-being) of one group, given that of others. But if technological change is labor-saving, the competitive equilibrium will be as depicted in Fig. 1, with workers actually worse off. Capital saving innovation could have the opposite effect.

(c) Factor bias of technological change *should* be endogenous (as should be the capital and labor supplies) with all these variables being determined simultaneously. With pervasive market failures, the market-determined bias (and level) of innovation may not be efficient. Indeed, there is a presumption that it will not be (see chapter 6 of Stiglitz & Greenwald, 2014).

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[10] Standard theory predicts convergence between laggards and advanced countries, with the speed depending on the extent to which ideas and capital goods move across borders. But in more sophisticated models, incorporating costs of learning (and thereby of catching up) there may be an equilibrium in which followers remain a given distance behind the leaders. Even if they could catch up, this requires resources, and they are better off remaining a follower. See Stiglitz (2015a).

[11] Labor-*augmenting* technological change (where, as a result of innovation, each worker after the innovation is equivalent to, say, two workers before) leads to an increase in wages, so long as elasticity of demand for labor is not too low. See Hicks (1932).

For instance, the real scarcity in the world today is related to our planetary boundaries: if we "ruin" this planet through an excessive emission of greenhouse gases, we cannot move to another. This means that from a social point of view we should be especially focusing on innovations that reduce emissions; but so far, without a carbon price, firms have little incentive to do so. At the same time, we see firms devising innovations leading to more unskilled labor unemployment. Innovators do not confront the cost of unemployment, only the savings to firms from reducing the usage of unskilled labor. This is important for the broader question at hand: innovators may have incentives to continue to robotize, even when the social costs of robots—the high unemployment especially of unskilled workers—is high. There are large disparities between private and social costs. Of course, this is not inevitable: public policy can alter incentives. Imposing a cost of carbon emissions will induce firms to look for carbon saving technologies; and recognizing the social costs of unemployment of unskilled workers by perhaps imposing a tax on unskilled labor-displacing robots may dampen the pace of robotization.

Some have criticized such a tax, calling it a Luddite measure. The reality is that whenever social and private costs and benefits differ, corrective taxes may lead to more efficient outcomes. The issue is particularly germane today: the unnaturally low rate of interest in response to the financial crisis—with governments unnaturally constrained in the use of fiscal policies—has distorted firms to look for highly capital-intensive innovations, creating conditions for a distorted jobless recovery, requiring very large increases in aggregate demand to restore the economy toward employment levels normally associated with full employment.

(d) One way that the adverse distributive effects that may arise can be contravened is to tax the winners to help the losers. Here, the key question is the elasticity of entrepreneurial effort—will higher tax rates reduce the pace of innovation? There are other ways besides taxation by which the fruits of innovation can become more widely shared, e.g. through weakening intellectual property rights, and restricting the abuses of the monopoly power associated with the granting of a patent. In the latter case, not only will the distribution of income improve, so will the static efficiency of the economy. Again, the key question is, what will be the effect on entrepreneurial effort and the overall pace of innovation. (Indeed, in some cases, weakening intellectual property rights may increase the pace of innovation, because it results in a larger pool of knowledge upon which others can draw. Though with a *given* level of knowledge, stronger intellectual property rights might induce more innovation, if the impact on the pool of knowledge is considered, the pace of innovation is actually reduced. See Stiglitz, 2014b; Stiglitz & Greenwald, 2014).

Again evaluations are most easily done from a Rawlsian perspective, but similar results are obtained with more general inequality-averse social welfare functions. If the benefits of innovation cannot be translated to the well-being of the worst-off individual, then the innovation is not welfare-increasing. If the trickle-down effects are small (or negative, as we have seen in many cases), we should be willing to accept even a slowdown in innovation.

More generally, in all economies, the rules of the game are critical[12]—similar economies exhibit markedly different patterns of distribution of market and after-tax and transfer income, with some of the more innovative economies having more equality. Equality and growth may

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[12] See Stiglitz, Abernathy, Hersh, Holmberg, and Konczal (2015).

be complements rather than substitutes.[13] This is especially so in an innovation economy: innovation gives rise to rents—both from IPR and monopoly power. Who receives those rents, and the extent to which the government "recaptures" these rents through taxation, is a matter of policy.

(e) Political economy is crucial—one needs to pay attention not only to what is *feasible* but also to what is likely to happen, given how the political system works. Moreover, political systems are evolving. Policies, e.g. relating both to innovation and the political process itself, may affect how they evolve. For instance, in the United States, money matters a great deal in politics. Economic rules that allow, say, corporations to appropriate some part of the knowledge which might otherwise be in the public domain result in their having more money with which to influence the economic and political rules in ways that favor their lot.

## 7. Conditions under which evolution of technology is likely to be welfare-increasing

This broad framework allows us to ascertain conditions under which the evolution of the economy—even robotization—is likely to be welfare-enhancing. We begin with the hypothesis already enunciated—the economy will be moving away from manufacturing (at least as measured by employment) and evolving toward a service-sector economy. Indeed, it has already moved a considerable distance in that direction.

### 7.1. Recognizing the value of key public services

Among the key service sectors are education, health, and other public services. The essential assumption in our analysis is that the value of those services is largely socially determined—not "just" a market process. If we value those services highly—pay good wages, provide good working conditions, and create sufficient number of jobs—that will limit the growth in market income inequality. The value of these services depends on how we, as a society, care about our children, our sick, and our elderly. If we believe our children should be well looked-after and well educated, we will want those who do that to be "high quality," not those who cannot get jobs elsewhere. We might understand that many who work in this sector do so because they are dedicated and love children. Still, if there is an enormous disparity between the wages of teachers and bankers, banking will become more attractive. Thus, if we pay our teachers more, we will get more bright, hardworking individuals to take care of our children, and they will exert greater effort in their jobs. So too, if we want those who care for our elderly to be more compassionate, more engaged, then we will need to pay higher salaries.

Of course, in a very divided society, where the rich pay for these services themselves, living in effect in their own rich ghettos, they can value their children and their parents highly—and hire the people to provide the high-quality care they want. They may actually prefer lower wages in the public sector, because that makes it easier for them to hire the more talented. It is not just that in a society in which the 1% is running the economy for themselves they *ignore* the public provision, which the rich have little interaction with anyway. It is also that lower wages in the public sector benefit the wealthy twice: low wages entail lower taxes, and the lower wages in the public sector

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[13]  There is by now a long line of research arguing this. See Stiglitz (2012, 2015b, 2015c), Makowski and Ostroy (1995).

depress private-sector wages for those services, allowing the wealthy to procure them for their children and parents at lower cost.

This is a shortsighted view: poorly educated children of the general population result in a poorly functioning economy and may make the political system prey to demagogues. But the financial sector and corporate sectors are notorious for their shortsightedness, and we should expect that shortsightedness to extend to views about the provision of public services. Those sectors focus on the costs—the increased taxes that they might have to pay—and not on the benefit to the entire society, of which they are a part.

Higher pay will result in such jobs having higher "respect," and this will be true even for jobs with limited skill requirements. Moreover, the benefits of paying higher wages will extend beyond the public sector: private-sector wages will follow public-sector wages.

### 7.2. Broader measures may be required

These measures may not suffice, i.e. it may still be the case that market wages for low-skilled workers may be so low that even a full-time worker will not achieve a livable income. Thus, it may be necessary to enact a higher minimum wage and provide a wage subsidy for low-wage jobs (e.g. an earned income refundable tax credit), to encourage demand for such jobs and increase wages. (Later in this paper we will describe other measures that might be undertaken.)

If the elasticity of entrepreneurial services is low, we can impose high taxes to finance these valuable service-sector jobs and the earned income tax credit. There are many other ways of raising the requisite tax revenues—pollution taxes (carbon taxes) improve the environment as they raise revenue; land and natural resource taxes and other taxes on rents (on inelastically supplied factors) raise revenues without giving rise to distortions. Taxes on rents may actually reduce the incentives to engage in rent-seeking activities, thereby improving the efficiency of the economy.

### 7.3. Endogenous responses in patterns of technological change

If the endogenously determined bias of technological change works as it should (Stiglitz, 2014a), as wages get low, innovation should focus on capital- and resource-augmenting technical change. This will limit the decline in the share of labor (in stable equilibrium) and in inequality.[14]

Under the conditions described in this section, the benefits of growth—even robot-induced growth—can be shared equitably, and in ways that ensure full employment. There is a larger pie—so everyone can be better off.

## 8. Alternative approaches to shared prosperity

There are a couple of other ways to ensure a modicum of shared prosperity in the face of, say, increasing robotization.

Almost surely, there will be some "real" labor required. A first requisite for shared prosperity is that the demand for those real labor services is equitably shared.

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[14] If the elasticity of substitution is greater than unity, the steady state equilibrium may be unstable. A slight perturbation leading to a larger share of capital induces more capital-augmenting technological change, leading to a larger share of capital, leading to further increases in capital-augmenting technological progress. See Stiglitz (2014a), including a formalization of these dynamics, as well as a discussion of the limitations in the underlying assumptions.

### 8.1. The limiting case of laborless production

Consider, in the alternative, the limiting case where no labor is required. The only two factors of production are "knowledge" and "capital." Currently, patented knowledge that has been produced more than 20 years earlier belongs within the public domain. Assume that the patent were to be extended, but that all the proceeds of the patent were used to finance the services described in the previous section, an earned income tax credit (or similar wage subsidy), and a universal income benefit. The only *differential* return to knowledge that would go to the "innovative class" is that associated with *new* knowledge. Typically, on average, across all the sectors of the economy, productivity increases slowly, implying that the knowledge rents associated with this "new knowledge" would be limited.

The seemingly higher rents we see associated with innovation arise from the ability to extend in time knowledge rents and/or to use the short-term knowledge monopoly to create a more self-sustaining monopoly, e.g. associated with network externalities. The proposal of the previous paragraph represents an attempt to limit the extent of "evergreening," of extending in time the rents associated with a patent. But that likely will not suffice. There will need to be a high tax on monopoly rents, complemented with more effective anti-trust actions.

In short, earlier we argued that we must evaluate the desirability of any change (policy or technology) with an equalitarian social welfare function. This means that any innovation which results in significant decreases in living standards of those at the bottom should be rejected. And that means that we should be willing to accept heavy taxes on those benefiting from innovation (including on the innovators) or other actions, such as that described here, moving knowledge more forcefully into the public domain.

The argument that such actions will slow down the pace of innovation is unpersuasive for two reasons. First, it may not do so: having more shared prosperity—more people, for instance, with access to high quality education—may increase the pace of innovation. Secondly, and more importantly, innovation is not an end in itself, it is a means to an end. Innovations may be welfare-decreasing, unless accompanied by policies that ensure that the fruits are equitably shared.[15]

## 9. Inequitable growth

While the previous two sections argued that even with extreme robotization, shared prosperity is economically feasible, the economy may not go in that direction. Politics matters. There is a possibility of the economy sinking into a low-level equilibrium trap, into endemic high levels of inequality. The rich take a strong stance against the redistributions that are necessary to achieve shared prosperity. In a politics in which money matters, if there is enough money at the top, and enough political conviction against progressive taxation, then innovations and policy reforms like globalization will lead those at the bottom, including unskilled workers, to be worse off. This in turn means that episodically, politicians may arise to exploit this unrest, and the reforms will be undone, public support for basic research (the wellspring from which most innovation arises) will be reduced, and other populist measures will be undertaken. Even before such extreme events, there may be a direct cost to society for this political uncertainty—investment is discouraged, and especially the long-run investment associated with innovation. Other supply-side effects weaken

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[15] In making these welfare assessments, we may want to include an explicit valuation associated with "dynamism." The process of learning associated with being in an innovative economy may have value in its own right.

innovation: inequitable access to education means that the society is drawing on a smaller talent pool.

One might ask, surely, seeing this risk, why those at the top would not see it as being in their own interests (their own *enlightened self-interest*) to support policies ensuring shared prosperity? The answer is that that may happen: it has occurred in the Nordic countries. (See Stiglitz, 2015a and the references cited there.) But while it may be in the interests of society as a whole, it may not be in the interests of any particular well-off individual. Moreover, for reasons already briefly noted, behavior in the realm of politics may be even more shortsighted than in the realm of finance.

## 10. Transition

So far, we have focused our attention mostly on the long-run equilibrium. But even were it possible to manage the long-run equilibrium in ways that ensure shared prosperity, the transition may not be easy, and especially, it may not be easy for the same groups that will lose out in the long run. Large changes (globalization and robotization are both potentially large changes) require a structural transformation of the economy, and markets on their own are not good at structural transformation. The reasons for this are easy to understand. Individuals have to move from one sector to another, requiring "new" human capital. They often have to move from one place to another. All of this requires money—just at a moment when the assets of those in the "old" sectors have declined dramatically. For instance, the value of both their home and their human capital may well have decreased.

The Great Depression can be viewed as being caused by the rapid pace of innovation in agriculture. Fewer workers were needed, resulting in marked decline in agriculture income, leading to decline in demand for urban products. The latter effect was so large that long-standing migration patterns were reversed, and there was a net migration to rural areas in 1931–4, even as the agricultural sector continued to decline (see Delli Gatti et al., 2012). What *might* have been a Pareto improvement turned out to be technological change that caused misery, as both those in the urban and rural sector suffered.

There is a general result: with mobility frictions and rigidities technological change can be welfare-decreasing (Delli Gatti et al., 2012, 2016).

Government intervention in the transition enabled the successful structural transformation—an unintended byproduct of World War II. War spending was not only a Keynesian stimulus, but also facilitated the move from rural to urban, from agricultural to manufacturing, including the retraining of the labor force, especially with the G.I. Bill. It was, in effect, a very successful industrial policy.

There are clear parallels to the situation today, where the economy may be caught in a low-level equilibrium trap. Again, the decline in incomes of those in the "old" sectors has led to a decrease in aggregate demand, greater than the increase in aggregate demand from the growth sectors. The result is that, in the transition, there may be persistent deficiencies in global aggregate demand. But this sets off a vicious circle: weak aggregate demand weakens wages, increasing inequality, and weakening aggregate demand further.[16]

Government needs to pursue not just a Keynesian stimulus, but Keynesian *structural* policies—spending that helps restructure the economy.

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[16] This is sometimes referred to as secular stagnation. But it is important to realize that this state of affairs is not an incurable disease; it is simply the consequence of the failure of government to respond as it should to the underlying forces requiring a structural transformation.

But the Great Transformation that we may be confronting requires more than just an economic transformation, in which resources are moved from one use to another. A *social* transformation as well as an economic transformation may be necessary, affecting, for instance, what kinds of jobs are viewed as "acceptable" by various groups in society. Such a social transformation would be more easily navigated if more service-sector jobs paid decent wages.

Globally, the money required to finance the economic transformation could come from the creation of a global reserve system,[17] or even new issuances of special drawing rights under current arrangements, carbon taxes, and rent taxes.

There is a long list of policies to facilitate a welfare-increasing transition and ensure a welfare enhancing long-run equilibrium. These include:

(a) Policies to increase wages of even low-skilled jobs. Among the policies, perhaps the most important is maintaining a high level of aggregate demand—to ensure a low unemployment rate and to increase workers' bargaining power.

(b) Wage subsidies for low-wage jobs (as described earlier), and a vastly expanded Earned income tax credit—to ensure that no one who works full time is in poverty.

(c) Minimum wage, which also would (together with other measures) help encourage innovations that increase productivity of labor at the bottom (in the standard theory of endogenous factor-biased technological change).

(d) High wages in the public sector—to help drive up wages in economy more generally. There may be other policies to encourage attractiveness of such jobs and increase respect for them.

(e) A high carbon tax—to encourage resource saving innovation, at the expense of labor saving innovation. Such a tax would simultaneously address two of the most serious global problems—it would discourage carbon emissions and it would increase aggregate demand, as firms retrofitted themselves in response to the high carbon price. Moreover, the revenues from the tax would be useful in carrying out the other measures described above.

(f) Elimination of tax deductions for interest, and the imposition of a tax on capital—to induce more capital-augmenting innovation.

(g) A "wage share" tax to encourage firms to increase the share of their revenues they pay out to workers (for instance, increasing the profit tax rate if the wage share, appropriately defined, is decreased).

(h) Narrowing the breadth and duration of patents, and circumscribing use of patents to create monopolies.

(i) More reliance on public research, with government appropriating returns, and directing research toward resource-saving innovation and away from labor–using innovation.

(j) More effective antitrust laws, more effectively enforced.

(k) An increase in labor-demand-increasing public investments (i.e. public investments that are complementary with labor, and especially unskilled labor).

(l) Changes in labor laws to increase workers' bargaining power—labor markets are typically imperfectly competitive, with wage outcomes affected by the relative bargaining power of the two sides. Changes in labor legislation in the last third of a century have weakened workers' bargaining powers.

(m) Tax and education policies to weaken the intergenerational transmission of advantage and disadvantage.

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[17] See, for instance, United Nations (2010) and Greenwald and Stiglitz (2010a, 2010b).

(n) Education and training policies helping individuals cope with the changes.
(o) Place-based policies—it is not always feasible, efficient, or equitable to ask individuals to move to where the jobs are, rather than to move jobs to where the people are. Market-based processes of location are, on their own, not necessarily efficient.

Most of these policies have been tried and have worked. All of this is economically feasible. The question is whether it is feasible within our political systems.

## 11. Concluding comments

A central message of this paper is that both in the transition and in the long run, there is no reason to be confident that markets will automatically adjust in ways that maintain full employment, and even when employment is high, large fractions may be in very low-wage jobs without much intrinsic or extrinsic job satisfaction. Robotization and other large *potentially* welfare-increasing changes may actually lead to lower societal well-being in the absence of appropriate government policies. The great divide in our society will become even larger.

The fact that in earlier transitions *eventually* the economy reached full employment and those at the bottom did well is no assurance that it will happen this time. *This time could be different.*

But even in these earlier episodes, government intervention was required to prevent excessive immiseration. Some form of "universal basic income" may be necessary as a fallback. But I have suggested that it would be better to create meaningful work with decent pay for as many people as possible, and I have explained how this can be done.

The failure to achieve this shared prosperity may, in the end, be shortsighted: policy reforms that hold out the promise of increased growth from globalization, or even those that focus on innovation itself, may not be sustainable in the absence of a modicum of shared prosperity.

We may be at the edge of another Great Transformation. There are alternative paths forward. I have described one—which puts the economy on a path toward shared prosperity. But there are others—with ever increasing concentration of economic wealth and economic and political power. The great debate today concerns which path to follow.

## References

Atkinson, A. B. (1970). On the measurement of inequality. *Journal of Economic Theory*, 2(3), 244–263.
Autor, D., Dorn, D., & Hanson, G. (2013). The China syndrome: Local labor market effects of import competition in the United States. *American Economic Review*, 103(6), 2121–2168.
Delli Gatti, D., Gallegati, M., Greenwald, B., Russo, A., & Stiglitz, J. E. (2012). Mobility constraints, productivity trends, and extended crises. *Journal of Economic Behavior & Organization*, 83(3), 375–393.
Delli Gatti, D., Gallegati, M., Greenwald, B., Russo, A., & Stiglitz, J. E. (2016). Sectoral imbalances and long run crises. In F. Allen, M. Aoki, J.-P. Fitoussi, N. Kiyotaki, R. Gordon, & J. E. Stiglitz (Eds.), *The global macro economy and finance, IEA conference volume no. 150-III* (pp. 61–97). Houndmills, UK and New York: Palgrave (originally presented to World Congress of IEA, Jordan, June, 2014).
Gordon, R. (2016). *The rise and fall of American growth: The U.S. standard of living since the civil war*. Princeton: Princeton University Press.
Greenwald, B., & Stiglitz, J. E. (2010a). Towards a new global reserves system. *Journal of Globalization and Development*, 1(2). Article 10.
Greenwald, B., & Stiglitz, J. E. (2010b). A modest proposal for international monetary reform, with Bruce Greenwald. In S. Griffith-Jones, J. A. Ocampo, & J. E. Stiglitz (Eds.), *Time for a visible hand: Lessons from the 2008 world financial crisis* (pp. 314–344). Oxford: Oxford University Press.
Hicks, J. (1932). *The theory of wages*. New York: Springer.

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Makowski, L., & Ostroy, J. M. (1995). Appropriation and efficiency: A revision of the first theorem of welfare economics. *American Economic Review*, *85*(4), 808–827.

Milanovic, B. (2016). *Global inequality*. Cambridge: Harvard University Press.

Mokyr, J. (2014). The next age of invention: Technology's future is brighter than pessimists allow. In Brian C. Anderson (Ed.), *City journal* (pp. 14–20). Manhattan Institute.

Newbery, D., & Stiglitz, J. E. (1984). Pareto inferior trade. *Review of Economic Studies*, *51*(1), 1–12.

Polanyi, K. (1944). *The great transformation*. New York: Farrar & Rinehart. Reissue: *The Great Transformation: The Political and Economic Origins of Our Time*, Boston: Beacon Press, 2001.

Rothschild, M., & Stiglitz, J. E. (1973). Some further results on the measurement of inequality. *Journal of Economic Theory*, *6*(2), 188–204.

Stolper, W. F., & Samuelson, P. A. (1941). Protection and real wages. *Review of Economic Studies*, *9*(1), 58–73.

Samuelson, P. A. (1949). International factor-price equalisation once again. *Economic Journal*, *59*(234), 181–197.

Stiglitz, J. E. (2001). Introduction. In K. Polanyi (Ed.), *The great transformation: the political and economic origins of our time*. Boston: Beacon Press (reissue).

Stiglitz, J. E. (2002). *Globalization and Its Discontents*. New York: W.W. Norton.

Stiglitz, J. E. (2008). Capital Market Liberalization, Globalization, and the IMF. In J. E. Stiglitz, & J. A. Ocampo (Eds.), *Capital Market Liberalization and Development* (pp. 76–100). New York: Oxford University Press (revised and extended version of an earlier paper with same title, 2004, *Oxford Review of Economic Policy*, 20(1): 57–71.

Stiglitz, J. E. (2012). *The price of inequality: How today's divided society endangers our future*. New York: W.W. Norton.

Stiglitz, J. E. (2014a). *Unemployment and Innovation, NBER Working Paper 20670*.

Stiglitz, J. E. (2014b). *Intellectual Property Rights, the Pool of Knowledge, and Innovation, NBER working paper 20014*.

Stiglitz, J. E. (2015a). Leaders and followers: Perspectives on the Nordic model and the economics of innovation. *Journal of Public Economics*, *127*, 3–16.

Stiglitz, J. E. (2015b). *The great divide: Unequal societies and what we can do about them*. New York: W.W. Norton.

Stiglitz, J. E. (2015c). The origins of inequality, and policies to contain it. *National Tax Journal*, *68*(2), 425–448.

Stiglitz, J. E., Abernathy, N., Hersh, A., Holmberg, S., & Konczal, M. (2015). *Rewriting the rules of the American economy*. A Roosevelt Institute Book, New York: W.W. Norton.

Stiglitz, J. E., & Greenwald, B. (2014). *Creating a learning society: A new approach to growth, development, and social progress*. New York: Columbia University Press. Reader's Edition published in 2015.

Stiglitz, J. E., Sen, A., & Fitoussi, J. P. (2010). *Mismeasuring our lives: Why GDP doesn't add up*. New York: The New Press.

United Nations. (2010). *The Stiglitz report: Reforming the International Monetary and Financial Systems in the Wake of the Global Crisis*. New York: The New Press.

United States International Trade Commission. (2016). *Trans-Pacific Partnership Agreement: Likely Impact on the U.S. Economy and on Specific Industry Sectors*. , available at https://www.usitc.gov/publications/332/pub4607.pdf