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Cloth for Wine?

The Relevance of Ricardo's Comparative Advantage in the 21st Century

Edited by Simon J. Evenett

In association with:

Department for International Trade

CEPR Press

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Foreword

This year is the 200th anniversary since David Ricardo put forward his theory of comparative advantage.

Ricardo's theory of comparative advantage generated three powerful insights. It provided a new basis for trade. Whilst not all countries have an absolute advantage, all can have a comparative advantage. It also helped revolutionise the reason for trade. We don't export for the sake of exporting, but in order to be able to afford to import what we want to consume. And it identified a new source of efficiency gains from international trade.

The world has changed a lot over the last 200 years. And in particular in the last 70 years after World War II and the creation of the Bretton Woods institutions. At that time, the victorious powers recognised the need to ensure that world war did not return. But in creating the General Agreement on Tariffs and Trade in 1947, the forerunner to the World Trade Organization, they put in place the foundations for securing prosperity and stability that sit alongside securing peace. Trade is a key mechanism to both generating that stability and prosperity, and to sharing it. Over the last 25 years, trade has supported lifting a billion people out of poverty.

But as we consider the world today, in which the orientation of advanced economies towards services and the pace of technological development and innovation changes the nature of trade and brings new opportunities, it is right to ask ourselves whether the approach to which we hold, and the support for free trade and the liberalisation of markets, continues to be right. I believe that it is. But as policymakers, we need to also recognise that alongside the opportunities there are also fears, such as the fear that robots will replace workers. In making the case for free trade, we must also address people's concerns and ensure everyone can take advantage of the opportunities it provides.

These changing times also require that we look at things in a different way. As a result of the well-documented growth in global value chains, the world and the nature of trade has become much more complicated. With many companies in different countries

involved in the production of goods, we no longer trade in goods made in one place but in products made in many places involving many firms. It is important that we also look at where the value of trade accrues, in other words who gets the benefit. The Trade in Value Added data, developed by the OECD and the WTO, show us how we might be misled if we base our judgements on gross data alone. Indeed, they demonstrate the importance of free trade and how actions to protect domestic firms facing competition from overseas suppliers ultimately hurts those domestic firms and exporters that we might initially seek to protect.

For the UK, we need to make sure we understand the implications and activities we need to take to shape our future as a dynamic, productive, innovative and value-adding economy, to underpin our prosperity, in all parts of our country, and for our trading partners.

The essays in this eBook explore these issues, and the continuing relevance of Ricardo's thinking for today's policymakers. As the UK prepares to embark on its own independent trade policy, once we have left the EU, these questions are as relevant as they ever have been.

Secretary of State for International Trade
The Rt Hon Dr Liam Fox MP

1 Introduction

Simon J. Evenett
University of St. Gallen and CEPR

Fundamentally, international commerce allows the consumption of goods and services in locations that differ from where they were designed, produced, and distributed. How much poorer, less entertained, and unhappy would we be if the only things we could consume were those that were produced close by? Greater variety, lower prices, and the many benefits of competition flow once production location can be divorced from the place of consumption. International commerce follows from that mismatch between production and consumption.

Understanding where goods and services are produced, given the lure of alternative locations at home and abroad and the frustrations and impediments associated with operating at a distance from buyers, is a central societal question with implications not just for employment and the standard of living but also for the level and growth of national income. Who gains and who loses from the technological and policy factors that alter how close producers need to be to consumers are also of interest, not least as the fortunes of nations wax and wane as they inevitably do over time.

These are matters of longstanding interest to statesmen and women as well as to analysts, business people, civil society, and trade unions. They have also been acute sources of controversy, whether it be during the last US presidential election, the so-called globalisation backlash witnessed in some countries at this time, or the great debate over the repeal of the Corn Laws in the 1840s. Not surprisingly, then, some of the great minds of each generation have thought about the causes and consequences of international commerce.

David Ricardo made one of the enduring contributions to the analysis of international trade with the publication in 1817 of his *On the Principles of Political Economy and Taxation*. In addition to putting forward what was to become known as the Principle or

Law of Comparative Advantage, in this treatise Ricardo analysed the effects of import tariffs and subsidies ("bounties", as he called them) on resource allocation, trade, and the level of profit; the impact of shocks to international trade; and the terms upon which the UK traded with its colonies.

Economists and social scientists have not uncritically retained all of Ricardo's method or conclusions. His theory of the distribution of income would, for example, be unrecognisable in the 21st century to a student of economics that consulted leading textbooks and doctoral course reading lists. Yet, his explanation for why specialisation pays in economies open to trade has been retained, confirmed, and extended in modern economic analysis (see Jonathan Eaton's chapter in this eBook).

Ricardo put forward a simple and deeply compelling example that showed why two nations would trade cloth for wine and why both benefited from that trade, even if one nation maintained a productivity edge over the other in the production of both goods. Some object to the simplicity as being unrealistic but, as Richard Baldwin argues in his chapter of this eBook, Ricardo simplified to clarify. And with it the implication that it is comparative cost advantages – rather than absolute cost advantages – that matter.

Still, there is the question of whether the Principle of Comparative Advantage remains relevant in the 21st century. In an age when services are traded not just goods, when data, ideas, and technology flow across borders, and when firms have organised production into tasks that can be located in different nations (Grossman and Rossi-Hansberg 2006, 2008), one is entitled to ask if an example designed to highlight the determinants of physical goods trade remains the best organising framework for analysis.

Several of the chapters of this eBook specifically address the question of contemporary relevance. While many authors cogently argue that the Principle remains relevant, there are interesting cases where this may not be so (see, in particular, the chapter by Alan Deardorff.) Interestingly, where there are doubts concerning the predictions of the Principle of Comparative Advantage they relate to the direction of trade as opposed to the gains from trade.

Indeed, Ricardo's trenchant defence of free trade and his corresponding opposition to protectionism stands out at the present time when more and more question the benefits of cross-border movement of goods, services, people, investments, and ideas. Well

before the populist backlash against globalisation and against the negotiation of more free trade agreements – such as the Transatlantic Trade and Investment Partnership and the Trans-Pacific Partnerships – took hold in certain Western nations, governments were already discriminating more frequently against foreign commercial interests. Just because world trade has not collapsed as it did in the 1930s does not mean that beggar-thy-neighbour policies are not flourishing in what has become a heavily distorted world trading system. Ricardo's message may be heard but it is certainly not being acted upon often enough. Ernesto Zedillo's chapter here is a shot in the arm for those seeking to counter populists and advance the cause of free trade.

Making reference to cutting-edge research findings, several contributors to this eBook revisit the costs and benefits of trade reform. As Swati Dhingra points out, we now have a much better understanding of the many different ways in which trade benefits societies and the size of those benefits. In light of a growing body of analysis of the impact of China's integration into the world economy since it joined the WTO in 2001, we also have a much better sense of the human cost that follows from international trade.

These costs, mainly felt in local labour markets that have been found to respond much more slowly than many analysts originally thought, are referred to drily in the trade policy literature as adjustment costs. Such technocratic garb does nothing to blunt the political impact of the costs associated with the profound shifts in economic heft in the world economy. It is an interesting question as to the extent to which support for further trade reform in high-income nations will depend on governments' ability to fix their local labour markets. The Achilles' heel of free trade may well be flawed policies at home rather than the foul deeds of our trading partners.

However, a rejection of trade agreements and the WTO need not be a rejection of Ricardo's principal policy recommendation on commercial policy. Arguably, in his *Principles*, Ricardo made the case for unilateral trade reform. So is Ricardo off the hook? Maybe not. As Alan Winters argues in his contribution to this eBook, in an age of cross-border supply chains, the case for unilateral trade reform may weaken as compared to that of reciprocity-based approaches to opening markets. And so, once again, the relevance of Ricardo's insights is re-evaluated in the light of contemporary circumstances.

But expecting enduring relevance over centuries is asking too much of any author. After all, who can accurately predict that far into the future? Isaac Newton once wrote to a rival that "If I have seen a little further it is by standing on the shoulders of giants." Ricardo was such a giant, and it is testament to the enduring value of his insights that they remain the starting point for contemporary analysis of the world trading system.

Given the overall goal of this volume is to assess the contemporary relevance of Ricardo's writings on international trade on the 200th anniversary of the publication of his *Principles*, the contributions in this volume have been organised around three themes: our contemporary understanding of Ricardo's insights and the manner in which they have been developed by researchers in recent years; the relevance of Ricardo's analysis in a world trading system far different from one where cloth was exchanged for wine; and the contemporary relevance of Ricardo's policy recommendations as they relate to rejecting protectionism in favour of unilateral free trade.

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Part One

Ricardo's insights then and now

2 Ricardo and comparative advantage at 200

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Dartmouth College

"No extension of foreign trade will immediately increase the amount of value in a country, although it will very powerfully contribute to increase the mass of commodities, and therefore the sum of enjoyments." With these words David Ricardo, opened his famous chapter "On Foreign Trade" in his book, *On the Principles of Political Economy and Taxation*, published a little more than 200 years ago on 19 April 1817.

The publication of Ricardo's book deserves special commemoration because in it he set out, for the first time, the theory of comparative advantage. The idea of comparative advantage has been an essential part of every economists' intellectual toolkit ever since.

The key idea behind comparative advantage is that every country, no matter how advanced or behind it might be in the productivity of its labour compared to other countries, would be able to engage in beneficial trade with others. A country with a productivity advantage over other countries would not export everything, but only those goods in which it had a comparative advantage. Thus, paradoxically, an advanced country would find it advantageous to import goods even if it could produce those goods more efficiently than other countries. Conversely, countries behind the technological frontier, without an 'absolute' productivity advantage in anything (in comparison with others), could still export goods in which its comparative disadvantage was the least and import goods in which its comparative disadvantage was the greatest – and benefit from doing so.

Ricardo was deeply insightful in making this point, but his way of explaining the idea was not exactly lucid and easy to understand. Using a somewhat convoluted numerical example, Ricardo described how England and Portugal, producing cloth and wine, could

both gain from exchange because it takes 100 workers to produce cloth in England and 120 workers to produce wine, and… well, you get the picture. In trying to keep track of all the labour requirements and exchange ratios, any layperson reading Ricardo would more likely come away more confused than convinced about the merits of trade. As George Stigler (1982: 58) once quipped: "The import this layman is likely to embrace is not the English theory of free trade but a bottle of Portuguese wine."

Even professional economists have found Ricardo's discussion lacking. Looking back, John Chipman (1965: 480) even remarked that "Ricardo's own statement of the law [of comparative advantage] is quite wanting, so much so as to cast some doubt as to whether he truly understood it; at best, his version is carelessly worded".

Perhaps for this reason, Ricardo's novel idea was not instantly recognised as a scientific breakthrough. In fact, it was easy for economists of the day to overlook Ricardo's great insight, despite his reputation as the greatest economic thinker of his generation. Many political economists, including James Mill and Robert Torrens, had written about the benefits of international trade and the international division of labour. Ricardo's numerical example seems to be a specific demonstration of the benefits of specialisation and trade, but no more. For example, in his 1825 book, *The Principles of Political Economy,* John Ramsay McCulloch did not even discuss Ricardo's work on trade.

The person most responsible for drawing everyone's attention to Ricardo's path-breaking contribution was John Stuart Mill. In an essay written in 1829-30, but not published until 1844, Mill wrote of Ricardo that "none has contributed more to give to that branch of knowledge the comparatively precise and scientific character which it at present bears, than the more accurate analysis which he performed of the nature of the advantage which nations derive from a mutual interchange of their productions" (Mill 1844: 1) Indeed, Mill highlighted the key point of Ricardo's contribution: "It is not a difference in the absolute cost of production, which determines the interchange [between nations], but a difference in the *comparative* cost" (1844: 2). In doing so, Mill contended, Ricardo "substituted for the former vague and unscientific, if not positively false, conceptions with regard to the advantage of trade, a philosophical exposition which explains, with strict precision, the nature of that advantage, and affords an accurate measure of its amount". Mill knew all this because he was acquainted with

Ricardo, and his father, James Mill, more than anyone else, encouraged Ricardo to write his *Principles* and followed its progress closely.

In his own *Principles of Political Economy*, first published in 1848, John Stuart Mill praised Ricardo as having been "the thinker who has done most towards clearing up this subject" of international trade. Since Mill's text was the leading book on political economy in the mid- and late-19th century, subsequent economists took their understanding of the matter from Mill himself.

No sooner had Mill put Ricardo on a pedestal, however, than an 'authorship' controversy arose. At issue was who had been the first writer to state the idea of comparative advantage. Mill himself contributed to this debate when he later gave Robert Torrens some of the credit for the idea.[1] Ever since, there has been an occasional debate among historians of economics about whether Torrens, or even James Mill, should get the credit for first having expressed the idea of comparative advantage.[2] While the authorship debate never rose to the fevered pitch of the Shakespearean authorship controversy, a fair number of papers have been generated that sift through the textual evidence.

This question still bubbles up every now and then, but perhaps should be put to rest. Both Torrens and James Mill gave credit (explicitly or implicitly) to Ricardo at the time, which should settle the matter. More recently, Ruffin (2002) offered a strong defence of Ricardo as the first expounder of the idea. Ruffin seems to have clinched the case for Ricardo, but even his evidence has not gone unchallenged, as Gehrke (2015) has done. While the idea of comparative advantage may have been 'in the air' among the cluster

1 In the 1862 edition of his *Principles*, J. S. Mill added the following footnote: "I at one time believed Mr. Ricardo to have been the sole author of the doctrine now universally received by political economists, on the nature and measure of the benefit which a country derives from foreign trade. But Colonel Torrens, by the republication of one of his early writings, *The Economists Refuted*, has established at least a joint claim with Mr. Ricardo to the origination of the doctrine, and an exclusive one to its earliest publication."

2 Jacob Hollander and Edwin R. Seligman considered the matter at the start of the 20th century. In his famous survey of international trade theory, Chipman (1965: 482) maintained "that credit for the principal discovery should go to Torrens". William Thweatt (1976) made the case for James Mill. Ruffin (2002) argues that Torrens "earns a gold star, perhaps," but "does not merit scientific sainthood" because Torrens's statement is close but an incomplete statement of the idea of comparative advantage, and lacks any numerical basis. See also Ruffin (2005).

of political economists in London who cared about the matter, Ricardo went far beyond intuition and provided the numerical example to drive the point home.

Like Ricardo himself, economists have taught generations of students a simple two-country, two-good version of comparative advantage.[3] They have admired the craftsmanship of the Ricardian model and its sometimes counterintuitive implications. They have delighted in using it to address popular statements such as "what if a country does not have a comparative advantage in anything?" And they take pride in telling the legendary story of Paul Samuelson, who, when challenged by the eminent mathematician Stanislaw Ulam to name one proposition in the social sciences that was both true and non-trivial, thought of the theory of comparative advantage (Samuelson 1972: 683).

And yet, perhaps more modesty is called for. The theory of comparative advantage is more difficult than it seems, making it understandable why the uninitiated do not immediately understand its logic. In his essay "Ricardo's Difficult Idea",[4] Paul Krugman explored why non-economists have such a hard time grasping the implications of trade based on comparative advantage, aside from the inherent difficulty of the concept. The reason, he concluded, is not just that many people fail to understand the positive-sum nature of trade, instead viewing it in the context of an international rivalry based on zero-sum competition. Equally important is that many ancillary assumptions that economists take for granted – such as labour mobility, full employment, flexible wages and prices, balanced trade, and so forth – are needed for it to fully make sense. As Krugman put it: "At a deeper level, comparative advantage is a harder concept than it seems, because like any scientific concept it is actually part of a dense web of linked ideas."

Even economists have sometimes missed Ricardo's point. In fact, they have been teaching something different from Ricardo himself. Ruffin (2002) argues that the four labour input numbers presented by Ricardo were not input–output coefficients, as commonly taught, but actually the quantities of labour needed to produce the amounts of wine and cloth actually traded by Britain and Portugal. This being the case, Maneschi

3 Maneschi (1998) provides a nice history of the idea of comparative advantage.

4 Available at http://web.mit.edu/krugman/www/ricardo.htm

(2004) shows that Ricardo's four numbers are shown to yield each country's gains from trade by simply subtracting two of the numbers from the other two. Since the numbers also indicate each country's comparative advantage, Ricardo established a close connection between comparative advantage and the gains from trade. This is a much more sophisticated analysis than even Ricardo's most ardent admirers previously thought.

Of course, because comparative advantage is so closely related to the gains from trade, it is closely related to the idea of free trade. It is, therefore, bound to come under attack as being erroneous or incomplete on some dimension. Sure enough, the journalist Michael Lind has spoken of the "fairy tale of comparative advantage" because it ignores dynamics and history.[5] Peter Navarro, the director of President Trump's National Trade Council, recently told the National Association for Business Economics that "most of our profession, as well as much of the mainstream media, continues to embrace and espouse an antiquated Ricardian view of the world that has little to do with the events or risks of our time".[6] And so the criticisms go.

And yet Ricardo's framework has endured as a workhorse model of international trade because of the malleability of its underlying structure and the timeless insights that it yields. As Krugman put it, "Ricardo's idea is truly, madly, deeply difficult. But it is also utterly true, immensely sophisticated – and extremely relevant to the modern world".

Thus, on every 19 April, the anniversary of the publication of *The Principles of Political Economy*, we should all raise a glass of Portuguese wine to salute Ricardo for his magnificent achievement!

5 "In discussing trade theory with students and politicians, academic economists use fairy tales rather than history. There is the fairy tale about comparative advantage: England was good at producing wool, Portugal wine, so they trade and both are better off. There is the fairy tale about how because market transactions are always voluntary and always beneficial that trade, being simply a market transaction across borders, is always win-win. But Econ 101 never explains how nations like America, Britain, Germany and Japan have used national industrial policies over the past century to become industrial powerhouses." (Atkinson and Lind 2013).

6 https://www.c-span.org/video/?424924-3/peter-navarro-outlines-trump-administrations-trade-policy-economic-policy-conference

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3 The neglected subtleties of comparative advantage

Terry Peach
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It is ironic that David Ricardo has become best remembered for a theory of comparative advantage for which he never laid claim to originality and which was dwarfed in importance (for him, at least) by his development of what was arguably the first coherent theory of the general rate of profit in the entire history of economic thought.[1] But that irony assumes tragic proportions when the theory for which he is remembered is not even his, when crucial elements in his exposition are neglected (such as the means by which comparative advantage is realised), and when he is accused – without foundation – of ignoring circumstances that might complicate the argument (such as non-constant returns). To paraphrase George Stigler, one may perhaps make the case that the modern economist has no need to be acquainted with Ricardo, but there is no case for being acquainted with an imposter.

The case for free trade

Ricardo was, without doubt, a passionate advocate of free trade: "every research into this subject convinces me that trade should be left perfectly free" (Sraffa 2004c: 100). There are two potential benefits from free trade: first, if trade results in cheaper wage-goods (the goods on which workers spend their money wages), then for a given real wage the general rate of profit would rise; and second, trade "will very powerfully contribute to increase the mass of commodities [non-wage-goods], and therefore the sum of enjoyments" (Sraffa 2004a: 128), where "the sum of enjoyments" is conceived

1 The theory, in short, that profitability is determined by the physical conditions of producing a given real wage.

in Benthamite, subjective utility terms, with utility as an increasing function of material consumption.[2]

Comparative advantage: Wine and cloth

Specialisation according to comparative advantage could result in *both* types of benefit, as indeed Ricardo made clear in a commonly neglected footnote to his exposition (Sraffa 2004a: 136n).[3] But it is his numerical explication of the argument in terms of non-wage-goods ("luxuries") – or rather, the first phase of that argument – that has left its indelible impression on the minds of countless generations of students and their teachers.

Using Ricardo's own example from the chapter "On Foreign Trade" in *The Principles of Political Economy and Taxation* (Ricardo 1821), it is supposed that 120 English labourers (a_1) are required to produce a particular quantity of wine (x_1) and 100 labourers (a_2) to produce a certain quantity of cloth (x_2), whereas in Portugal it takes 80 labourers (a^*_1) to produce the same quantity of wine (x^*_1) and 90 labourers (a^*_2) to produce the same quantity of cloth (x^*_2). Portugal has an *absolute* advantage in the production of both commodities ($x^*_1/a^*_1 > x_1/a_1$, $x^*_2/a^*_2 > x_2/a_2$), yet it would be in its interest (and England's) to export wine and import cloth; by doing so, Portugal would be exchanging the produce (wine) of 80 of its labourers for a quantity of cloth that would have required the input of 90 domestic labourers, thus saving the potential output of 10 labourers. Likewise, England would be exchanging the produce (cloth) of 100 labourers for a quantity of wine that would have required 120 English labourers to produce, saving the potential output of 20 labourers. It follows that by specialising in the production of commodities in which they have either the maximum comparative advantage

2 Ricardo also mentions that cheaper luxuries would enable capitalists to maintain their standard of living at a lower cost, thus providing an opportunity for increased saving and investment.

3 "It will appear, then, that a country possessing very considerable advantages in machinery and skill, and which therefore be enabled to manufacture commodities with much less labour than her neighbours, may, in return for such commodities, import a portion of the corn required for its consumption, even if its land were more fertile, and corn could be grown with less labour then in the country from which it was imported" (on the assumption that its comparative advantage is greater in manufactures than in agriculture).

in terms of output per unit of labour (wine for Portugal) or minimum comparative disadvantage (cloth for England), both countries have the possibility of expanding material consumption through the employment of their "saved" labour.[4]

Realisation of comparative advantage through absolute advantage

Truncating the argument at the point at which the prospective gains from trade have been demonstrated – the commonplace textbook practice – gives the impression that comparative (dis-)advantage is somehow calculated *ex ante*, perhaps by an omniscient state, and that specialisation and trade take place only after the information has been gathered. But that was *not* Ricardo's position. On the contrary, his argument suggests that the only people who calculate comparative advantage, or may even be aware of it, are those (like him) who are writing books on economic principles (or economic theory, as we would call it nowadays). In reality, economic actors are pursuing their own "*individual* advantage", and it is "this principle" – not the calculation of comparative advantage – "which determines that wine shall be made in France and Portugal, that corn shall be grown in America and Poland, and that hardware and other goods shall be manufactured in England" (Sraffa 2004a: 134, emphasis added). Paradoxically, trade and specialisation in accordance with *comparative* advantage is the result of people pursuing their individual *absolute* advantage, i.e. seeking to make as much profit as they possibly can.

To give the flavour of Ricardo's argument, assume that gold is the (international) money commodity, and take the gold money prices of cloth and wine in England and Portugal as p_1, p_2, p^*_1, p^*_2, respectively. For production to take place according to comparative advantage, it must be the case that $p_1 < p^*_1$ and $p_2 > p^*_2$, otherwise English merchants would not find it profitable to import Portuguese wine and export English cloth (*mutatis mutandis* for Portuguese merchants). But suppose, for the sake of argument, that $p_1 = p^*_1$ and $p_2 > p^*_2$. English merchants would certainly find it profitable to import Portuguese wine, with the result that gold flows from England to Portugal, but there would be no

4 Formally, $a_1/a_2 < a^*_1/a^*_2$ is the condition required for England to specialise in x_1 and Portugal to specialise in x_2.

incentive either to import or export cloth. According to Ricardo's reasoning with the quantity theory of money, however, the expansion of the money supply in Portugal would tend to raise prices there, while its contraction in England would tend to lower prices, so that $p_1 = p^*_1$ and $p_2 > p^*_2$ is unsustainable (the same reasoning applies if we assume $p_2 = p^*_2$ and $p_1 < p^*_1$). The only sustainable outcome *is* $p_1 < p^*_1$ and $p_2 > p^*_2$, an outcome that would be achieved by private individuals calculating their own *absolute* pecuniary advantage in response to market prices.

Neglected caveats

Ricardo may have believed that there were pedagogical advantages in presenting a highly simplified illustration involving only two countries, two goods, unchanging conditions of production and, as an outcome, complete specialisation, but he had not reckoned on the inattention of later commentators to his own clarifications and qualifications. Thus, he was perfectly aware that conditions of production are *not* static: attempts to expand agricultural output by countries having a comparative advantage at one point in time are likely to encounter diminishing returns, and conditions of production in manufacturing may undergo secular improvements (from division of labour) and shocks (from changes in technology). He was also clear that transport costs and (differential) taxes had to be taken into account. Furthermore, he considered, if only briefly, the implications of multi-commodity trade in qualifying the results of the two-good model (Sraffa 2004a: 137 and 140-141, Sraffa 2004b: 265). Overall, his vision of trade was of a complex, dynamic and ever-changing set of transactions, with comparative advantages in a constant state of flux. Yet, quite regardless of the myriad complications, it was Ricardo's belief that in a world of "perfectly free commerce", with decisions taken solely on the basis of "individual advantage", each country "naturally devotes its capital and labour to such employments as are most beneficial to each" (Sraffa 2004a: 134). The benefits of trade according to comparative advantage are always *tending* to be realised, whatever momentary appearances there may be to the contrary.

Who benefits from trade?

Where a problem really does arise for Ricardo's argument – obscured in its modern translations by the imposition of a marginal productivity treatment of wages – is with his claim that an abundance of commodities is "advantageous to all classes, for all classes are consumers" (Sraffa 2004a: 133). If, as Ricardo (mostly) maintained, the real wage tends to be given at a level determined by habit and custom, there is one, not insignificant, social class – that is, labourers – who may *not* partake in the delights of increased material consumption, leaving the only sure beneficiaries of (extended) foreign trade as the rich. As a corollary, the only sure losers from a *reduction* in foreign trade – perhaps, hypothetically, as a result of leaving a customs union – are also the rich. Through the neglect of *this* qualification, for whatever reason, Ricardo had given later generations a rosier picture of the benefits of foreign trade than was strictly warranted, even on his own terms.

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4 The long shadow that Ricardo has cast over the modern analysis of trade

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Two hundred years after the publication of David Ricardo's *On the Principles of Political Economy and Taxation*, the messages of its Chapter 7, "On Foreign Trade", have become bizarrely central. The reasons for the revival of its relevance to discourse about international trade are several. Some reflect the evolution of academic research in international trade over the last 40 years. Others reflect political convulsions during the last year.

Before turning to the developments which have brought Ricardo back to the centre of academic discourse and political controversy, I'll first state why Ricardo very much deserves to be considered the founder of the theory of international trade, establishing the basic framework in which it has operated ever since. I'll then turn to how, over the century and a half following the publication of *The Principles*, the field seemed to have been leaving Ricardo in the background. At that point, I'll return to the academic developments that put Ricardo very much back into the centre of research in the area today, and his relevance for current state of the world.

What Ricardo did and didn't do

While Chapter 7 (in the Library of Economics and Liberty edition; Ricardo 1821) is ten pages long, what Ricardo contributed to the academic modelling of international can be paraphrased in seven sentences:

In England, it takes 120 workers to make a unit of wine and 100 workers to make a unit of cloth. In Portugal, it takes 80 workers to make a unit of wine and 90 workers to make a unit of cloth.[1] While an English or Portuguese worker can readily move between making wine and cloth in her own country, she can't change countries. As labour is the only input into production, if each country were to produce only for itself England would need to sacrifice 1.2 units of cloth to get a unit of wine by diverting 120 workers from cloth production to wine production. Portugal would need to sacrifice 9/8 units of wine to get one unit of cloth by diverting 90 workers from wine production to cloth production. If, instead, England and Portugal exchange on unit of cloth for one unit of wine, then England need only sacrifice 1 unit of cloth to get 1 unit of wine, and Portugal need sacrifice only 1 unit of wine to get 1 unit of cloth. Everyone is better off.

The example is breathtaking in its brevity and simplicity. Like many profound insights, it seems obvious once stated. That's why this example remains the tool that economists use to instruct beginners on the gains from trade.

While straightforward, the example packs in three strong assumptions and a modelling strategy that have guided research in the field ever since:

1. Workers can readily change activities within a country

As a proto-academic Ricardo had already prepared us for this assumption, writing of how, as a consequence of a higher rate of return to capital in Yorkshire than in London, "capital would speedily move from London to Yorkshire". It's not a problem for workers in England to quit wine production to make cloth, or for workers in Portugal to quit cloth production to make wine.

1 I could not find in the chapter what units Ricardo has in mind. He earlier writes of "pipes" of wine. For the purposes of the example, the units in question don't matter, as long as each unit can be produced with that number of workers regardless of how many units are produced (that is, that returns to scale are constant).

2. Workers can't change countries

Even better in Ricardo's example would be for everybody to move to Portugal to enjoy the higher productivity in both wine and cloth there. But if the rate of return is higher in some foreign country than in England, "it would not follow that capital and population would move…".[2] Ricardo defends his assumption of international immobility, citing "the natural disinclination which every man has to quit the country of his birth and connexions, ..., feelings which I should be sorry to see weakened".

3. Production technologies differ across countries and relative differences in these technologies deliver gains from trade

Ricardo's example treats labour as the only input into production. Returns to scale are constant, so that differences in relative labour productivities drive the gains from trade. Highlighting the connection between technology and trade, Ricardo writes after his example about how "improvements in arts and machinery" in England will have an effect not only in England, but in Portugal as well.

4. To understand the gains from trade requires taking a global general equilibrium perspective

Trade is people in a country exchanging some goods for other goods with people in other countries. Understanding the potential gains from trade requires looking at the complete picture. Ricardo provided the simplest picture possible.

Ricardo's first two assumptions have remained foundational to the field ever since. More recent work has recognised imperfect internal mobility and international migration and studied its implications, but the empirical relevance of these assumptions remains

2 As a modern trade economist not steeped in Ricardo's writings or the history of economic thought, I find Ricardo's conflation of labour and capital in this chapter confusing. Capital plays no role in his numerical example nor in the standard Ricardian model as it's currently understood. I can make most sense of his concept of capital here as a resource that works with labour in fixed proportions. Note that Ricardo mentions only capital as moving to equate its rate of return between London and Yorkshire, but speaks of "capital and population" in equating returns between England and abroad. Did Ricardo realise that the seamless movement of labour from London to Yorkshire was a less obvious proposition?

striking. As documented in Eaton and Fieler (2017), even in current data, cross-country differences in incomes swamp internal differences, reflecting the extent to which internal mobility equates income differences between individuals in the same country while lack of cross-country mobility leaves yawning income gaps between countries.

Also foundational was Ricardo's realisation that trade could be properly understood only in general equilibrium. Trade involves simultaneous activity in the markets for different goods. The academic field of international trade has remained one of applied general equilibrium analysis.

It is Ricardo's third assumption that has had a more circuitous evolution. Note what Ricardo is leaving out. Even though Chapter 2 of *The Principles* advances the theory of land rents – and land played a central role in the work of Ricardo's contemporary Robert Malthus, to whom Ricardo devotes Chapter 32 of *The Principles* – land, or any other factor of production, doesn't come up in Ricardo's example.

Technology takes a back seat

In fact, as trade theory progressed into the 20th century, beginning with the writings of Eli Heckscher and Bertil Ohlin (Heckscher 1919, Ohlin 1933), Ricardo's assumptions of a single factor and technological heterogeneity were fully reversed. The factor-endowments theory Heckscher and Ohlin developed provided an elegant explanation of trade simply on the basis of differences across countries in factor endowments and differences across products in their factor intensity in a context in which all countries have access to the same production technologies. While this theory ran with Ricardo's assumption that factors are mobile inside a country and immobile across countries, and maintained the general equilibrium tradition he established, multiple factors with homogeneous technologies replaced a single factor with heterogeneous technologies.

Basic patterns of international trade at the beginning of the 20th century seem consistent with the factor endowments perspective. Land-abundant Argentina, Australia, Canada and the US were exporting land-intensive agricultural products in exchange for labour-intensive manufactures from labour-abundant England and Germany. Factor

endowments theory became the canon of international trade by the middle of the last century and remained so until at least the 1980s.[3]

Ricardo's long shadow on research: Economic data and the Ricardian revival

For millennia, governments have relied on taxes on international transactions as a source of revenue and as a means of protecting local producers. Since tax payments often generate a record, data on international trade are abundant. Until the advent of computers, these data were hard to access and the compilation of data was haphazard. But with the harmonisation of product codes and the United Nations COMTRADE reporting system, by the beginning of this century the field had easy access to a vast array of data.

Early exercises that exploited data struggled to squeeze them into the factor-endowments paradigm. Early on, Wassily Leontief famously established his (1953) "paradox": US exports embodied more labour relative to capital than US imports. Leontief's resolution was to deem US labour so productive that the US was actually a labour-abundant country. Heckscher-Ohlin theory was used to measure factor endowments from the trade data. Subsequent exercises proved troubling for factor endowments theory as well. Staffan Burenstam Linder found trade greatest among the most similar countries (Linder 1961). Henry Grubel and Peter Lloyd (1971) found interindustry trade much more common than interindustry trade (Grubel and Lloyd 1971).

At first glance, these last two findings might seem as troubling for Ricardo as for Heckscher and Ohlin. After all, shouldn't trade be greatest between countries with the most different technologies and in different products?

The theory of monopolistic competition applied to international trade, which took the field by storm starting in the 1980s, provided a clean break from the factor-endowments

3 In 1965 and 1966, *Econometrica* published John Chipman's magnificent three-part "Survey of the Theory of International Trade". The titles of the three parts reflect the perspectives that trade theorists had on the different approaches at that time. Part 1, devoted to Ricardo and what followed from it, was "the classical theory" while the factor-endowments approach was "the modern theory".

approach and provided an explanation for both the Linder and Grubel-Lloyd findings. It went so far as to explain why trade might be most intense between identical countries and why they might trade seemingly identical products. While inconsistent with Ricardo's assumption of prefect competition, monopolistic competition returned to a focus on technology, and didn't rely on factor-intensity differences. The core papers assumed labour was the sole factor of production. But in contrast to Ricardo's assumption of exogenous national technologies, each firm in each country endogenously comes up with its own technology.

While it elegantly resolved a number of puzzles, the monopolistic competition framework did not provide guidance into interpreting the product level trade data. Monopolistic competition makes the counterfactual prediction that each country will export every product, and that all producers of a product are identical in size. The data report bilateral trade in thousands of individual products sorted into product groups. Many products have only a few countries that export them, while others have many exporters.

In the last 15 years, trade economists have developed models that have provided insight into understanding these patterns. My work with Samuel Kortum extended Ricardo directly by introducing an arbitrarily large set of products (Eaton and Kortum 2003). By introducing specific assumptions about the distribution of labour requirements, this Ricardian model becomes highly amenable to analysing both aggregate bilateral trade patterns and patterns exhibited by firms or within highly disaggregated product categories.[4] By allowing the Ricardian framework to apply to an arbitrary number of goods and countries, it rendered the Ricardian model a powerful tool for analysing trade patterns and measuring the gains from trade.

If Ricardo's omission of land (or other factors of production) was perceived as a deficiency corrected by Heckscher and Ohlin, what are we to make of its absence in

4 Much earlier, Rudiger Dornbusch, Stanely Fischer and Paul Samuelson provided an elegant framework extending the Ricardian model to incorporate a continuum of goods and transport costs (Dornbusch et al. 1977). Their framework was limited to two countries, however, so provided little guidance toward understanding the data. In the same year as Eaton and Kortum (2003), Melitz (2003) provided a framework that is a hybrid between monopolistic competition and Ricardo. Firms with distinct products emerge endogenously, but with heterogeneous technologies.

much of the contemporary Ricardian analysis of international trade? From today's perspective, Ricardo's focus on technology seems prescient. While the Heckscher-Ohlin framework provides excellent insight into why land-abundant countries produce land-intensive agricultural goods and raw materials, it has nothing to say about why Singapore exports computer chips, Japan cars, or Germany bathroom fixtures. The land-intensive components of the economy are shrinking relative to the labour- and technology-intensive manufacturing and services sectors. The potential for renewable energy sources to displace fossil fuels suggests a further decline in the role of natural resources in economic activity. In fact, Ricardo anticipated this development in Chapter 7 of *The Principles*:

> *In the early states of society, when manufactures have made little progress, and the produce of all countries is nearly similar, consisting of the bulky and most useful commodities, the value of money in different countries will be chiefly regulated by their distance from the mines which supply the precious metals; but as the arts and improvements of society advance, and different nations excel in particular manufactures, although distance will still enter into the calculation, the value of the precious metals will be chiefly regulated by the superiority of those manufactures.*

As Ricardo anticipated in the quotation above, analysis of economic growth has placed advances in technology as the driver of improvements in living standards. The Ricardian framework, with its focus on technology, has thus provided a useful tool for tracking the connections among innovation, technology diffusion, and specialisation in production.[5]

Ricardo's long shadow on policy: Globalisation and the subsequent nationalist revival

In the more than half century following the end of World War II up until the Brexit vote of last year, it seemed that Ricardo's message about the benefits of trade had

5 While land does not play a central role in most Ricardian analysis of international trade, Ricardo's reasoning has recently proved invaluable in analysing specialisation in agriculture. Donaldson (2016), Sotelo (2016) and Pellegrina (2017) have applied the Ricardian framework to understanding crop specialisation in India, Peru, and Brazil, respectively, on the basis of the comparative advantage of land.

been understood by those in power. World leaders created international institutions and negotiated bilateral and multilateral arrangements lowering artificial trade barriers. According to the World Bank website, world trade as a share of world GDP grew from below 25% in 1960 to 60% by 2007.

But the recession of 2008-2009 saw a collapse in trade from which the world has not fully recovered. In addition, industrial workers in many developed countries have experienced a stagnation or decline in living standards over the last three decades. A perception is that this decline is associated with economic integration.

The answer to how lower trade barriers could cause harm in the economy is hiding in plain sight in Ricardo's example. Consider an English vintner too old to learn the trade of making cloth. His efforts get him no more wine but 20% less cloth. A Portuguese weaver unable to find a job in a winery can afford no more cloth, but her price of wine has risen by over 12%.

Ricardo's example also speaks to how opposition to immigration could arise. Say that once England and Portugal embrace free trade, they forge a single labour market. English workers migrate to Portugal to take advantage of the higher productivity there, eliminating Portugal's cheap source of cloth.

While serious economic analysis of the decline of manufacturing wages in advanced countries suggests that trade has played at most a small role, politicians in a number of countries have exploited the perception that it has.[6] That such sentiments can reverse gains in globalisation of course has its precedents. World War I halted the increase in economic integration that began in the latter half of the 19th century. The subsequent decades brought the Great Depression and the rise of nationalism in a number of

6 To quote British Prime Minister Theresa May: "If you believe you're a citizen of the world, you're a citizen of nowhere". (quoted in The Guardian 2016). According to US White House economic adviser Gary Cohn and US National Security Advisor H.R. McMaster,

> *The president embarked on his first foreign trip with a clear-eyed outlook that the world is not a 'global community' but an arena where nations, nongovernmental actors and businesses engage and compete for advantage. We bring to this forum unmatched military, political, economic, cultural and moral strength. Rather than deny this elemental nature of international affairs, we embrace it*. (As quoted in Drezner 2017).

countries. It wasn't until World War II defeated these forces that progress in world market integration continued. Ricardo's message was an element in the development of a view of the world that took a universal rather than solely national perspective on welfare. England's gains were Portugal's as well. Keeping this message alive poses a major challenge to trade economists.

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Understanding the global economy has been Jonathan Eaton's passion since his early days. He received a Ph.D. in Economics from Yale University in 1976. Early work with Mark Gersovitz developed the Eaton-Gersovitz model of sovereign default which has become a standard tool for analyzing government borrowing in international capital markets. More recently he and Sam Kortum developed the Eaton-Kortum model of international trade. The framework extends Ricardo's basic idea of comparative advantage to analyze quantitatively the role of technology in shaping patterns of trade, growth, and multinational activity in the world economy. In 2004 the Econometric

Society awarded them the Frisch Medal for their paper on this topic. The framework extended the basic Ricardian example to accommodate many goods and countries. Eaton is now Distinguished Professor of Economics at Pennsylvania State University. This year he was elected a member of the American Academy of Arts and Sciences.

Part Two

Ricardo's relevance to understanding 21st century commerce

5 Comparative advantage in digital trade

Alan V Deardorff
University of Michigan

Introduction

When Ricardo formulated what we now call his Law of Comparative Advantage, international trade took the form of goods being produced in one country and being transported by land or sea to another. His law was based on the need to locate production most efficiently in terms of the cost of production itself and the cost of moving goods to where they would be consumed. The latter might cause a good to be produced in a country without a relative cost advantage in its production, but it would never cause it to export the good. The Law of Comparative Advantage has served two important purposes during the two centuries since its publication: to explain the pattern of trade, and to explain the gains from trade. For the pattern of trade, the law predicts that if trade is not distorted by policy, countries will export goods for which they have relative cost of production lower than in their trading partners. For the gains from trade, the law explains that trading in this fashion can reduce the overall costs of what people everywhere are able to consume.

For most of the past 200 years, trade continued in much the same way as when Ricardo wrote, although transport became faster and cheaper, including eventually by air. Only in the late 20th century did a form of international trade appear that might have challenged Ricardo's conception – international trade in services. At first, trade economists tended to deny that trade in services was possible, since services typically require the presence in one location of both the producer and the consumer. Either might themselves travel to the location of the other (what today we would call modes 2 and 3 of services trade), but since that was movement of people (as is mode 4), we

didn't initially call it international trade. Only when a producer could provide a service from across a border without either party themselves crossing it (what we now call mode 1) did it seem to warrant being called trade. But when such trade began to be possible, through means of communication such as the telegraph, telephone, telex, and so on, and the services that could be provided by these means were very limited.

This state of affairs might have continued longer were it not for the efforts of some major international service providers to get their customer offering reclassified as trade in order to come under the auspices of the General Agreement on Tariffs and Trade (GATT). The late Harry Freeman, a graduate and friend of the economics department at the University of Michigan and an officer of American Express, led a push to include trade in services within the Uruguay Round of international trade negotiations, which ultimately resulted in the General Agreement on Trade in Services (GATS) becoming one of the three pillars of the WTO.[1]

As trade in services was becoming 'a thing', my colleague Bob Stern organised one of his many conferences to deal with the topic, and he asked me to contribute something about comparative advantage as it applies to, or does not apply to, trade in services. I contributed the paper, Deardorff (1985). In it, I examined the three different kinds of trade in services that I could think of at the time: 'trade services', such as transportation, that are demanded as a part of international trade in goods; services provided by entities that travel to the location of their consumer; and services that are provided across the border by some remote means. Focusing only on the extent to which the concept of comparative advantage could be used to explain the pattern of trade, not the gains, I argued that the first two of these could fit well into the Ricardian framework. However, for the third – cross-border service trade, or mode 1 – I found a case in which the normal application of comparative advantage would incorrectly predict trade.

The example could be easily understood within the context of an otherwise Heckscher-Ohlin 2x2 model of trade, but in which one of the two factors is able to contribute to the

1 In an addendum to his obituary of Freeman, Shapiro (2011) says "Mr. Freeman was a crucial figure in the movement to persuade members of Congress and the executive branch to include services – 'travel, education, business services, financial and banking services,' as he once defined them – in trade negotiations."

production of the service from across the border. Suppose, for example, that the factors are labour and management, with labour needed at the location of the consumer but management operating from a distance to produce the service (but not the good). If the service is relatively labour-intensive, then the management-abundant country will have a relatively high relative price for the service in autarky, yet will export the service if there is free trade. Thus, the relative autarky price suggests a comparative disadvantage in services, even though the country's abundance of management makes it the most efficient provider of services abroad, where it can employ from a distance the cheaper labour that is available there.

My conclusion, then, was that comparative advantage as we have understood it since Ricardo will not always work for explaining trade in services. I have been asked, now, to look at a form of trade that is even newer than trade in services – digital trade – and to examine whether comparative advantage works for explaining that. As should be clear already, the answer must surely be that it does not always work, since some digital trade is just an example of the mode 1 services trade that I examined before.

I will not therefore conduct any formal analysis here. Instead, I will just talk through the several types of digital trade that I have been able to think of and discuss how they may or may not fit into our conceptions of comparative advantage. Note that, as in my earlier paper, I am concerned only with whether comparative advantage is a useful tool for understanding the pattern of trade (who exports what to whom), not whether there are gains from trade. I presume that the usual benefits of free-market transactions apply as well to digital trade as to other forms of trade, as long as those markets are not distorted. Whether digital markets are more or less likely to include such distortions is a topic for another day.

Digital trade

There is no standard definition of digital trade. USITC (2013) defines it in a Glossary as "the delivery of products and services over either fixed-line or wireless digital networks" (p. xii), but also says "[t]here is no standard or generally accepted definition for 'digital trade'" (p. xv). The sequel to that report defines digital trade as "U.S. domestic commerce and international trade in which the Internet and Internet-based

technologies play a particularly significant role in ordering, producing, or delivering products and services" (USITC 2014: 29).

Since I am interested here in the comparative advantage of countries, I will ignore domestic commerce and define international digital trade as follows:

- Commerce involving more than one country for which the product itself is digital and/or any of the following are accomplished at least in part by using the internet or a similar digital technology: advertising, ordering, delivering, payment, or servicing.

The least-interesting form of digital trade, by this definition, would be a physical (digital) music CD or movie DVD that is marketed internationally entirely by conventional mail. It is least interesting here because, aside from one aspect of its production, it is a physical product that is traded by means that were conventional before digital trade in other forms existed.

Potentially more interesting are the following types of digital trade:

- Physical products that are advertised, ordered, and/or paid for digitally, but transported by normal trade means.
- Digital products (music, movies, books, software) that are transmitted to purchasers via the internet and are most likely to be marketed and paid for via that as well.
- Services that are provided remotely by digital means.
- Data storage and computer applications accessible in the 'cloud'.
- Online platforms that serve an international audience and are supported by advertising, such as Facebook, YouTube, IMDB, Twitter, etc.

In what follows, I will discuss each of these in terms of the extent to which comparative advantage seems applicable to explaining them. There are also several other items that I suspect might be included as aspects of digital trade, but which I know even less about and will therefore not consider:

- The 'dark web', which apparently may do much of the above, but invisibly and illegally.
- Cryptocurrencies, such as Bitcoin.

- The physical infrastructure of the internet, such as the trans-oceanic fibre-optic cables that transmit the signals and are owned by companies that charge internet service providers for their use.

Physical products

Physical products become part of digital trade when they are advertised, ordered, and/or paid for digitally, even though they must be shipped from producers to buyers by non-digital means. The location of their production is subject to the same economic considerations as any physical good, including the costs and availability of factors of production, technology, and intermediate inputs. Therefore, the role of comparative advantage in determining that location should be the same as it is for other trade. The role of the digital economy in this form of commerce is that is provides some or all of the services that the commerce requires to complete the trade, aside from transportation.

As such, it is like the 'trade services' that I considered in Deardorff (1985). I argued there that trade in services, even though they may be provided from a different country than either the ultimate buyer or the seller, will reflect comparative advantage. For example, the retailer Amazon may be the intermediary between a producer in China and a buyer in Canada, providing its services from the US where the available internet technology and skilled labour are most abundant.

Digital products delivered electronically

Increasing amounts of trade consist of products that never take a physical form, but are instead the steams of zeroes and ones that encode music, text, video, and computer programs. While these can be recorded on physical disks, today they more often reside in computer memories and are transmitted from seller to buyer over the internet. It is perhaps tempting to think of them, therefore, as intrinsically different from physical goods, and in one sense that is true – they can be duplicated at essentially zero cost. That, however, does not make them immune from the forces of comparative advantage, as even though the marginal cost of an additional copy is zero, the cost of the original is not. And this cost depends on the usual determinants: prices of factors of production

and technology. Thus, economic forces should cause such digital products to be produced where their costs are relatively low, exactly like physical products.

The zero marginal cost of duplicating them, however, means they do not fit well into the simple Ricardian model, where marginal costs are positive and constant, while fixed costs are zero. The presence of increasing returns to scale also interferes with the Ricardian assumption of perfect competition. However, the absence of perfect competition need not invalidate the Law of Comparative Advantage. For example, although he did not comment on this aspect of his model, Krugman (1981) provided a simple model of two countries trading with monopolistic competition, and the pattern of net trade in that model conformed nicely to comparative advantage. That is, each country had a lower relative autarky price for the industry that used its relatively abundant factor, and with free trade, although it both exported and imported in that industry, its net exports were positive.[2]

Services provided remotely

As increasing numbers of services are provided digitally using computers, it has become common for these to be provided in remote locations by workers whose advantage might be their low wage or their greater expertise. With the rise of the internet, it is no longer necessary for these workers to communicate by mail, but instead they can be given their assignments and return the results of their work by email or other purely digital means. The fact that internet communication is also nearly instantaneous means that some remotely provided services can happen in real time, as when a computer technician takes control of a customer's computer remotely and is then able to diagnose and repair it from a distance. Both forms of remote services may be traded at arm's length (a perhaps inappropriate metaphor, given the distances involved) between a service company and a separate customer, or they may be provided in-house. A hybrid of these two would include the manufacturers of capital equipment that have built in

2 That model is not, however, able to accommodate the assumption of zero marginal cost, since its CES utility specification implies (with large numbers of firms) that prices are a multiple of marginal cost, and hence would be zero. I feel confident that an alternative model of monopolistic competition could also yield comparative-advantage trade based only on fixed costs, but I have not yet found or been able to construct that model.

digital capabilities so that the manufacturer is able to monitor performance, diagnose malfunctions, and perhaps repair them all via signals transmitted digitally.

The fact that such services can be provided across great distances at close to zero cost means that their costs consist almost solely of the costs of labour and capital in the location where the service originates. Thus, a country will be an exporter of such a service only if it possesses the skilled labour and appropriate capital, just as if the service were to be provided at home. Comparative advantage should therefore be expected to explain such trade just as well as for trade in physical goods in Ricardo's day.

The cloud

When my colleagues and I built our computer model of world trade, we used software and stored our data on a remote computer – a 'mainframe' that I never saw. We were connected to it by phone lines and dial-up modems from computer terminals. Since then, computing power and storage have both expanded and shrunk to the point that my phone today may have more of both than that huge machine. And yet the trend today is again for computer users to access software, data, and storage on remote computers, said to exist in 'the cloud'. That merely means that they are once again in large complexes of computers and digital storage, but they are accessed now by the internet, not by phone. Businesses and individuals all over the world can purchase space in the cloud and use the software that is stored there for their needs, and large companies such as Amazon sell this service both domestically and internationally. It is therefore yet another form of digital trade.

The business of selling such cloud services requires hefty doses of both human and physical capital, which need not be located in the same place or same country. Indeed, the fact that the physical capital, in the form of giant 'server farms', also requires massive amounts of energy both to run and to keep them cool may argue in favour of locating them in places with an abundance of energy, such as Iceland, while the human capital operating the system and interacting with customers locates elsewhere, such as in the US. If this is the case, then digital cloud services may conform exactly to the case of cross-border service trade that I mentioned above, where comparative advantage may fail to explain the pattern of trade. That is, if one country has an abundance of the

human capital needed to manage the cloud but a scarcity of energy, while another has cheap energy but little human capital, then neither may have a low relative price for cloud services in autarky, even though in combination they do.

International online platforms supported by advertising

The last case I will consider is online platforms that provide free content and are supported by advertising. To the extent that they serve an international audience – and the large ones surely do – then they seem to require the label of digital trade. But what are they trading? With respect to the users of their sites, they are exchanging some sort of content not for money but for the attention of their users, which in turn allows them to sell advertisements to those who want to reach those users. Had broadcast television worked across borders, then we might have included it as a form of international trade in the pre-digital era. But we would have been hard pressed to measure it.

What these platforms are really trading is the attention of their users, which they 'produce' with their content, in exchange for the payment they require for advertising to those users. Since the platforms are typically based in one country but serving many, their transactions with advertisers in other countries are international trade.

To what extent can comparative advantage explain this trade? The companies that run these platforms certainly make extensive use of human and physical capital, and they may therefore tend to locate in countries with an abundance of both. That would conform with comparative advantage. However, a distinctive feature of most of these platforms is the network effects that make them successful. And these depend less on such factors of production, or even on technology, than on the timing of a firm's entry and on the size of the market that they are able initially to serve. I suspect that it is no coincidence that the largest platforms on the internet today are based in the two largest countries, the US and China, where network effects could provide the greatest benefit. And that might well have been true even if some other country – Finland, say, or South Korea – had superior factors and technology.

Conclusion

I am an ardent defender of the importance of comparative advantage, which I would seek to apply in areas well beyond international trade.[3] But as I have now looked at the topic of digital trade, I am forced to admit that not all such trade seems to be well explained by comparative advantage. Just as when I looked at trade in services back in the 1980s and found that one form of service trade – cross-border services – did not fit well into the Ricardian framework, I find something similar here for one form of digital trade, namely, cloud services. In both cases, I can imagine a country having a high relative autarky price for such trade and nonetheless being able to export it successfully. In these two cases, the key is that the trade draws upon factors from two different countries, harnessing the abundance in both to a form of trade that neither might be able to do efficiently alone.

I also find myself questioning the relevance of comparative advantage for explaining the form of digital trade that builds on platforms whose success depends on network effects. Here, too, I see countries successfully exporting for reasons that have more to do with country size than inherent comparative advantage.

I conclude, therefore, that comparative advantage remains a very useful tool, but its application is not universally valid.

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6 Examining trade in services through Ricardo's lens

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Services account for more than 70% of world GDP, but most discussions about trade still focus on manufacturing goods. Ricardo himself is no different from the majority of economists who discuss the economy but ignore services. In his defence, the share of services in the economy was much lower 200 years ago.[2] But as the 'servicification' of economies is the main trend today, it seems important to address this lacunae. Moreover, since barriers to trade in services are higher than barriers to trade in goods, one might also think that it is time for policymakers to look at services sectors through Ricardo's lens.

Ricardo did not talk about services…

There is no reference to services or trade in services in Ricardo's *Principles of Political Economy and Taxation* (Ricardo 1817). When introducing his theory of value, Ricardo refers only to 'commodities'. The few times the word 'services' appears in the *Principles* is when Ricardo quotes the work of Jean-Baptiste Say. For this French economist, all trade is an exchange of services: "In the exchange of two products, we only in fact exchange the productive services which have served to create them".[3] While Ricardo finds some inconsistencies in Say's theory of value, he does not disagree with the idea

1 The views expressed are those of the author and do not necessarily reflect the official views of the OECD or its member countries.

2 According to Maddison (2001), 30% of employment in the UK in 1820 was in services industries, compared to 33% in the manufacturing sector and 37% in agriculture.

3 Ricardo (1871: Chapter XX).

that 'productive services' can define the exchange value of goods. But this was just because it supports his labour theory of value. We cannot see here any anticipation of 'trade in tasks' (Grossman and Rossi-Hansberg 2008) or a theory of comparative advantage that would assume a specialisation in services rather than commodities.

For classical economists, most services were regarded as 'unproductive' (which is why Jean-Baptiste Say used the expression 'productive services'). But while it is true that Ricardo did not focus on services, his theory of value and what he explains about comparative advantage both apply very well to services activities, even if it was not at all clear to classical economists.[4]

… but the theory of comparative advantage works for services

If we read Chapter VII of the *Principles* and replace the production of wine in Portugal by transport services, and the manufacture of cloth in Britain by financial services, nothing in the rest of the text needs to be changed. There is a cost to producing transport and financial services in both countries that can be expressed in the number of hours needed to provide the service. And it might be less costly for the UK to export financial services and import transport services rather than producing both services at home, because of the relative difference in productivity. The argument is no different when instead of a commodity (such as wine or cloth), the product is a service. As is observed for goods, productivity does differ across services activities within each country. This can be related to scale economies, skill endowments, technology (which includes management and organisational capital), governance, or regulations.

Services even have characteristics that make them more likely to be traded according to the Ricardian theory of trade. Some services are capital-intensive (e.g. telecommunication services), but differences in productivity in the case of services are more related to labour productivity and technology, which is the basis for Ricardian specialisation. Moreover, as a consequence of differences in wages, relatively similar services may have different costs across countries, corresponding to situations of absolute advantage

4 See Hill (1999) for a discussion of services in the work of classical economists.

(for example, in countries with low wages and an educated workforce). The mechanism for gains from trade, then, is *comparative* advantage.

There are of course specificities in services, such as the face-to-face contact or 'co-creation of value' with customers, which would require adjustments to the Ricardian argument. But these specificities are not in contradiction with the theory and are more a matter of extending the model by relaxing some assumptions, such as the immobility of labour.[5]

There is 'Ricardian' specialisation in services

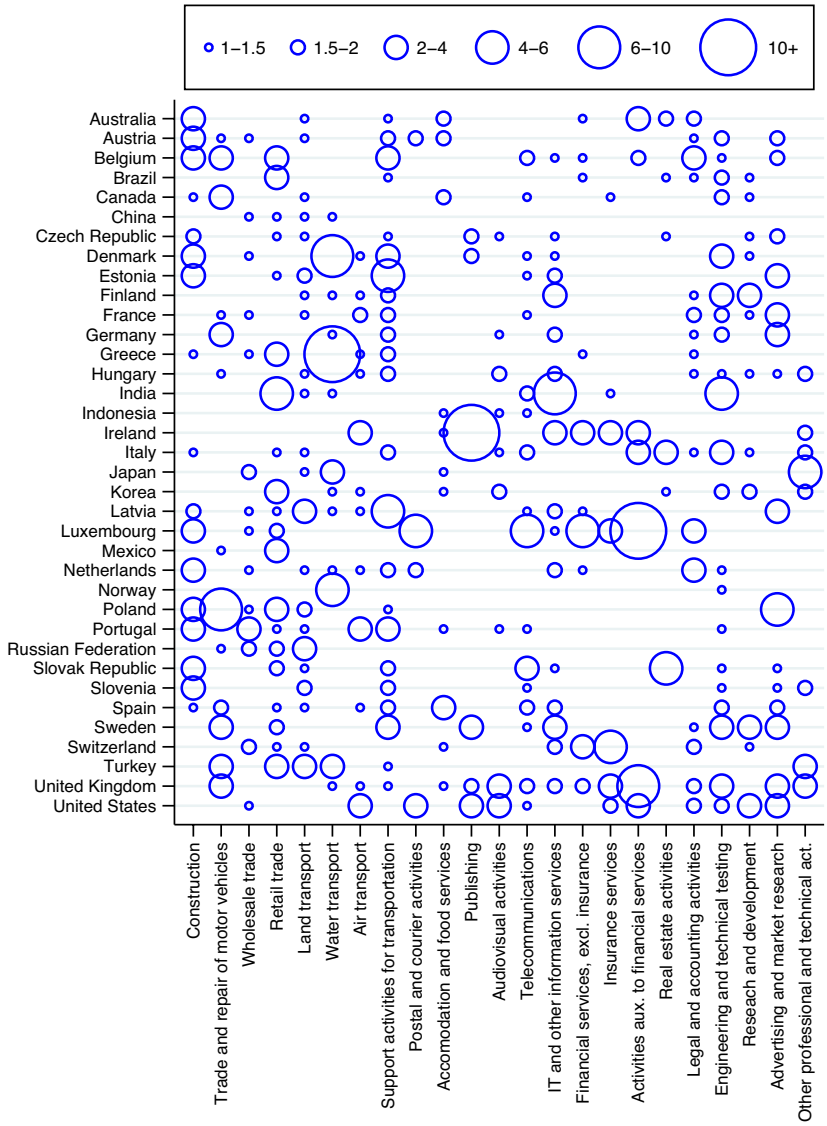
To empirically assess the specialisation of countries in services, one can appeal to the concept of 'revealed comparative advantage' (RCA). Introduced by Balassa (1965), RCA is an index that is calculated as the share of a country's exports of a specific product in total exports divided by the share of world exports of this product in total world exports. A value above one indicates that a country has a comparative advantage in the activity. The RCA is not a perfect proxy for actual comparative advantage, in particular because existing trade distortions have already altered the observed patterns of specialisation (Deardorff 2011). But it can still illustrate the specialisation of countries in services industries.

As many services are embodied in goods that are traded, RCA indices for services are more revealing when calculated in value-added terms, so that services used as inputs in manufacturing exports are also taken into account in the specialisation of countries (Miroudot and Cadestin 2017). Figure 1 shows such the value-added RCA for services for 40 countries. Only values above one in 2014 are reported, with bubbles proportional to the size of the comparative advantage. A strong comparative advantage is found, for example, for Greece in water transport and for Luxembourg in activities auxiliary to financial services. Emerging countries also have a comparative advantage in some services, such as India in information technology (IT) and other information services. If the RCA were just calculated in gross terms, a country such as Turkey, which is

5 For a more detailed discussion, see Hindley and Smith (1984).

specialised in manufacturing exports, would not have a comparative advantage in 'other professional and technical activities'. But it has an advantage when these business services embodied in goods are taken into account.

Figure 1 Value-added revealed comparative advantage in services industries, 2014

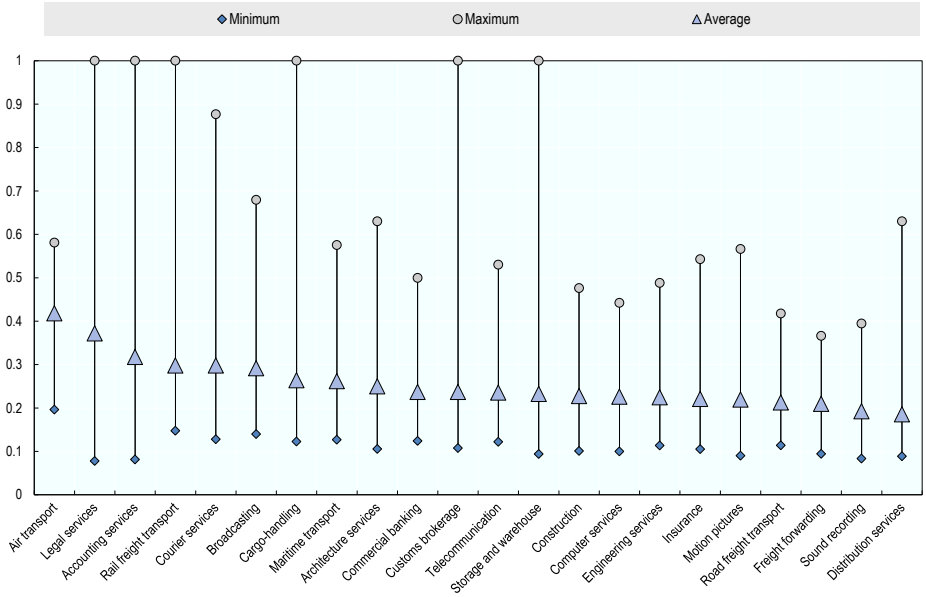


Source: Miroudot and Cadestin (2017).

Why are countries reluctant to gain from trade in services?

There are potentially huge gains from liberalising trade in services (Gervais and Jensen 2015, OECD 2017). Most of these gains come from specialisation and the fact that trade reallocates resources towards the most-productive firms. The theories and empirical methods to assess these gains have become more sophisticated, but the engine remains more or less the same as that described by Ricardo. The issue with services is that despite some progress in the liberalisation of trade (mostly triggered by unilateral domestic reforms), countries have so far not achieved a significant reduction in the level of trade restrictiveness. This can be illustrated with the OECD's Services Trade Restrictiveness Index (STRI), which aggregates a broad range of barriers to trade in services in an index with values between zero (open regime) and one (fully closed regime). There are important differences across sectors and among countries within each sector, but relatively high values are observed for this index in most services industries (Figure 2).

Figure 2 Services Trade Restrictiveness Index (STRI) average, minimum and maximum scores by sector, 2016



Source: OECD (2017).

The question, therefore, is why, despite the potential gains, countries prefer to not open their services markets? One answer is that services sectors often have market externalities (e.g. network effects) that require specific regulations that are difficult (but not impossible) to reconcile with trade openness. In some sectors, regulators regard cross-border commerce more as a source of potential disorder rather than economic gains (e.g. financial services). However, it is often difficult to disentangle protectionist considerations from genuine regulatory concerns. A sector like air transport (with the most restrictive policies in Figure 2) is still organised as some form of cartel and remains excluded from multilateral and regional trade liberalisation efforts. As it is often the case with trade policy, rents and vested interests play their part in accounting for policy choices, and maybe even more so in the case of services. Similar to the argument put forward by Joseph Schumpeter in *Capitalism, Socialism and Democracy* (Schumpeter 1942), it seems that the reallocation of resources resulting from trade liberalisation is easier to encourage when the people affected are workers in the manufacturing sector as opposed to 'white-collar' employees in services industries.

Another important constraint for services is that they often require the movement of people. Compared to the 'first wave' of globalisation in the 19th century, the freedom of movement of people is really the missing piece in today's globalisation. In the context of terrorism and surges in migration, one cannot expect this to change in the near future.

The future of services trade liberalisation: Will Ricardo's message be heard?

Today, Australian wine or Chinese cloth entering the EU still face significant tariffs that reduce the gains from trade. There is no longer a tariff discouraging the exchange of wine and cloth between Portugal and the UK, but it is not clear that this will remain the case after Brexit. So, 200 years after the publication of Ricardo's *Principles*, will Ricardo's argument be heard even for trade in goods? There is at least some tangible progress to report in terms of the reduction of trade costs for goods. Unfortunately, this is not the same for services (Miroudot and Shepherd 2016). For services, we may have to wait until further domestic reforms actually reduce trade costs (unless, of course, technology blurs even more the line between goods and services and redefines the

tradability of services at a pace that regulators with protectionist instincts will not be able to match).

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7 Ricardo's comparative advantage has been denationalised

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Two centuries ago this year, David Ricardo showed us how to conceptualise 19th century globalisation – globalisation that was dominated by 'made here, sold there' goods crossing borders (Ricardo 1817). Like all highly successful 'mental models', its strength did not lie in the fact that it so accurately characterised reality. It failed to consider a wide range of factors, but of course that is the whole point of mental models. They simplify to clarify. Mental models are useful since they focus minds on the essentials; they allow us to work collectively on problems by providing a shared perspective on what the key issues are. And Ricardo's mental model was so powerful that it outlived his century.

The crystalline purity of Ricardo's logic – plus two centuries of empirical success – makes it the best foundation for puzzling through globalisation's maze of interrelationships. Or at least it did up until the early 1990s. Twenty-first century globalisation is different. But that is getting ahead of the story. Consider the three key simplifications Ricardo made to clarify.

Ricardo's three premises

The first premise is that trade is driven by 'comparative advantage'. In plain English, Ricardo's horribly confusing term 'comparative advantage' means that some nations are intrinsically better at making some things than others. If no trade were allowed,

1 This is not intended as an original piece of research but rather as a contribution to policy discussion that draws on existing research, especially Baldwin and Evenett (2012) and Baldwin (2016).

smugglers would buy products in the nations that were particularly good at making them and sell them in nations that were particularly bad at making them. The smugglers would then return with their packs filled with goods where the ranking of national competencies was reversed. Free trade is just legalised smuggling, so the 'principle of comparative advantage' – which could equally be called the smuggler's principle – determines the direction of trade.

Put differently, Ricardo's view tells us that globalisation should be thought of as allowing nations to focus their productive resources on sectors where they have an inherent advantage. This is Ricardo's way of explaining the first question that any trade theory must deal with – the 'who makes what' question. Ricardo's answer is that it depends on intrinsic differences in competencies.

Since this 'trade as two-way smuggling' perspective is a double buy low, sell high arbitrage (that is, the smuggler makes money in both directions), comparative advantage also answers the 'who gains' question. Ricardo's famous answer is that both nations gain for the same reason: the smuggler can buy home goods 'low' and sell them 'high' abroad, and buy other goods 'low' abroad to sell them 'high' at home. That is what happens when relative prices differ across nations.

The second premise is that nations are the correct unit of analysis. The differences in competencies that determine comparative advantage, and thus drive trade, are either intrinsic (e.g. climate) or slow moving (e.g. technology) – but they are national, so nations are the proper level of analysis in Ricardo's thought paradigm.

The third precept is that globalisation is driven forwards by lower trade costs. In the simplified 'mental model' that Ricardo used to make sense of reality, goods are the only things that cross borders. By default, deeper globalisation can only come from easier trade in goods.

Combining the three precepts yields the traditional mental model of globalisation. As trade costs fall, nations increasingly specialise in producing goods where their relative efficiency is inherently highest while importing goods where it is inherently lowest. Do what you do best, import the rest. This is win-win for each nation.

The other 19th century globalisation: Kuznets cycles

In Ricardo's simple framework, the sources of comparative advantage stay put. That's why nations are the right unit of analysis. But one massive 19th century trend contradicted this. Europe had lots of farmers and very little farmland. In the New World, by contrast, great expanses of land were uncultivated – much of it quite similar in climate to European farmland. Until the mid-1800s, most of this was inaccessible, but railroads offered a chance to change that. The result was a series of 'Kuznets cycles'.

Railroads and canals turned frontier land into farmland. This triggered a massive demand for labour, which, in turn, lead to massive migration from the Old World to the New World. What put the 'cycle' in all this was that the booming expansions would get overexcited, overbuilt and would inevitably lead produce retrenchment. But the cycle part is not the key point here. It is the fact that the *sources* of comparative advantage are crossing borders, and not just the *fruit* of comparative advantage as in the Ricardian story. This was no small thing. In the 1890s, for example, 5% of Britons, 6% of Spanish, and 7% of Swedes moved to the US and Canada. The inflows in the 1890s alone boost the US population by 9% and Canada's by half that figure.

We can think of this migration as driven by a one-way arbitrage in labour. It was attractive to migrants as long as the labour-to-land ratios remained extremely unbalanced. And indeed, the migration continued until the 'pipeline' that allowed the flows – lax US immigration policy – was shut by US politicians.

Ricardo's framework is speechless in the face of these facts – or at requires some tweaking before it can be useful in understanding the outcome. The main point of this example is that it was a form of globalisation whereby cross-border flows changed comparative advantages rather than simply allowing nations to better exploit pre-existing comparative advantage.

Something similar started happening in the world economy when the global value chain revolution started in the decades bracketing 1990. In the 1800s, Europe had many farmers and little farmland; the US had lots of farmland and few farmers. In the 1980s, China had very little manufacturing knowhow per worker, while Germany, Japan, and the US had lots of manufacturing knowhow and few workers. Dramatic advances

in telecommunications opened a 'pipeline' that allowed one source of comparative advantage – manufacturing knowhow – to flow from the high-tech, high-wage nations to low-tech, low-wage nations. The pipeline is still open.

Global value chains undermine the Ricardian mental model

It started with the information and communication technology (ICT) revolution – technological change that had as big an impact on globalisation in recent decades as steam power did in the 19th century.

Until the 1980s, high communication costs had forced the microclustering of manufacturing in factories. ICT allowed firms to coordinate complex manufacturing process over long distances, and once this was feasible, big international wage differences made this unbundling profitable. As a consequence, factories started crossing borders.

To keep the whole process working together, the offshoring firms sent their firm-specific marketing, managerial, and technical knowhow along with the offshored jobs. This, in turn, denationalised comparative advantage. It meant that technology boundaries were increasingly defined by the shape of firm-specific international value chains rather than by national boundaries. We found out that, for example, German technology actually belonged to German firms and they were perfectly free to spread it to low-wage workers in, say, Poland.

As I argued in my 2016 book, *The Great Convergence*, this denationalisation of comparative advantage had historic effects on the world's economic geography (Baldwin 2016). First, there was a massive delocation of manufacturing from what used to be called the industrialised nations to a handful of developing nations. The G7 nations, for example, saw their global manufacturing shares fall from about two-thirds to under half. This transformed global competition in manufacturing. In the Ricardian world, high technology is offset by high wages so that each nation is the low-cost producer of something. With global value chains, however, a new high-tech, low-wage competition arose.

The most obvious case of denationalised comparative advantage is China. China's share of global manufacturing soared from 3% to 19% in two decades. This was not Ricardo

at work; it was not a triumph of Chinese labour, capital, technology, and institutions. It was the result of combining firm-specific knowhow from advanced nations with low wages inside China. China went way beyond this, but that is how it started.

Second, this new type of industrialisation sparked growth take-offs in the affected developing nations. Third, this rapid income growth sparked a long-lived commodity boom that lifted the fortunes of many other developing nations. Baldwin and Robert-Nicoud (2014) show how to integrate such offshoring-linked technology flows into an otherwise standard Heckscher-Ohlin model.

Concluding remarks

The fact that globalisation has changed is not the problem. The problem is that governments and analysts continue to use the old mental model to think about the implications of the new globalisation.

Armed with the traditional mental model – and decades of experience in applying it successfully – national leaders felt confident that they understood which sectors and skill groups would be the winners and losers. Governments arranged all manner of policy to help shift workers and firms from 'sunset' sectors to 'sunrise' sectors. The range included policies on education, retraining, relocation subsidies, housing, unemployment insurance, regional assistance, and others. But the nature of globalisation changed. It is now operating at a finer degree of resolution – at the level of stages of production, not sectors or skill groups.

For goods sectors affected by the second unbundling, it is much harder to predict which stages in which sectors will lose competitiveness and thus be offshored. The changes are also often more sudden and uncontrollable, and the impacts are more individual. An individual worker in a given firm could suffer from offshoring, while others in the same firm and with the same educational attainment could prosper. Moreover, because the changes are driven by better communication technology instead of tariffs, they are less controllable.

We have some great models of how all this works, starting for example with Grossman and Rossi-Hansberg (2007), but these have yet to percolate through to policymaking. For

example, the solutions proposed by isolationists in the UK and the Trump administration are still very much based on the Ricardian view of the world as dominated by 'made here, sold there' goods crossing borders. The policies they propose will slow the flow of goods across borders, but since the pipelines that allow manufacturing knowhow to flow across borders are still open, their efforts will affect the UK and the US in ways that Ricardo's simple framework cannot explain. When factories are crossing borders as well and goods, we need to go beyond Ricardo's comparative advantage framework.

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He has been an adviser and consultant to many international organisations and governments. He did his PhD in economics at MIT with Paul Krugman and has published a half dozen articles with him. Before that he earned an MSc at LSE (1980-81), and a BA at UW-Madison (1976-1980). The author of numerous books and articles, his research interests include international trade, WTO, globalisation, regionalism, global value chains, and European integration.

8 International commerce and technology transfer measures two centuries after Ricardo

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This chapter discusses contemporary motivations for, and concerns about, the use of commercial policies to influence international technology transfer (ITT). It argues that David Ricardo's early analysis of technological progress and, particularly, of the gains from trade remains largely relevant for thinking through the effects of ITT policies in today's interconnected world. Key findings from a recent OECD-sponsored paper (Kowalski, Rabaioli and Vallejo 2017) that collected data on ITT-related measures are summarised for 24 developing and industrialised countries which are important actors in global FDI, technology, and product markets. Together with insights from the extant literature, these findings suggest that the current use of ITT measures might be disproportionate given how little is actually known about the potential of these measures to promote ITT and to distort trade or investment. There is also considerable heterogeneity in emphasis on the different elements of ITT policies across countries and across countries at different levels of development. All of this implies that future attempts at international coordination of these measures will require a more careful identification of those policy instruments that successfully encourage ITT and at the same time do not create distortions or undermine international competition .

1 The views expressed in this chapter are solely those of the author and do not implicate the Organisation for Economic Co-operation and Development or its member states. Contact: Przemyslaw.Kowalski@oecd.org.

International technology transfer and policy intervention

Technology and innovation have long been recognised as key determinants of long-term per capita productivity and income growth. In the era of increasingly mobile global value chains (GVCs), they are also seen as important sources of more sustained competitive advantage based on intangible assets rather than labour costs (Nolan and Pilat 2016). Creating an innovation-friendly environment where economic actors have the ability, incentives and necessary protection to develop and assimilate new technology has thus become a key policy objective in most countries.

International trade and investment policies have long been important elements of these national innovation strategies for two principal reasons. First, accompanied by appropriate institutions, international commerce provides incentives which help direct domestic resources and innovation efforts into most profitable uses. Second, it is an important channel of international technology transfer (ITT) whereby national economic agents access foreign knowledge and successfully learn and absorb it into their production processes (Maskus 2004) through trade in products, movement of people, foreign direct investment (FDI) and trade in technology markets (Hoekman et al. 2005).

Some technology transfer can take the form of market transactions (e.g. technology licensing, joint ventures), although these have costs related to the actual ability to transfer certain kinds of knowledge (e.g. tacit knowledge and intangible assets) and market failures to which information and technology are seen as particularly prone (Maskus 2004). Some forms of technology transfer are also beyond the control of technology holders and not subject to market transactions (e.g. reverse engineering, personal movement of key individuals) (Maskus 2013).

The market imperfections and externalities related to technology transfer and diffusion are argued to be important enough to justify public intervention, but views on how such intervention should be designed differ. Technology developers are interested in reducing the costs of uncertainty around technology transfers and in protecting their rights to profit from such transfers, for example through intellectual property rights (IPR). Technology acquirers may, however, be interested in minimising the cost and maximising spillovers to the local economy, including beyond those which would occur

automatically (Maskus 2004). The latter can involve efforts to encourage or 'mandate' transfer of technology at prices lower, or quantities higher, than those that would be normally set by markets, including through the use of requirements conditional on market access or other incentives.

There are thus both arguments for government intervention as well as potential pitfalls related to the possibility of distorting – or even blocking – processes which might be better left to markets. In addition, there is also the danger of undermining or reversing the primary gains from trade and investment associated with comparative advantage and efficient resource allocation.

Ricardo's insights

Although developed in a different historical, economic and technological context, David Ricardo's ideas remain astonishingly relevant for the today's analysis of ITT measures. One example is his sober appreciation of the implications of technological progress, international mobility of capital and technology, and potential dangers of misguided policy interventions in Chapter 31 of his *Principles*, "On Machinery". Considering the economic impacts of invention of new machinery, amongst other claims, Ricardo argues that "the employment of machinery could never be safely discouraged in a State, for if capital is not allowed to get the greatest net revenue that the use of machinery will afford here, it will be carried abroad, and this must be a much more serious discouragement to the demand of labour, than the most extensive employment of machinery (…)" (Ricardo 1821).

Ricardo's theory of comparative advantage in Chapter 7 of his *Principles*, "On Foreign Trade", stresses that it is the relative, not absolute, differences between countries that are the source of the gains from trade. One implication is that a country which is more technologically advanced in producing a good than any another country (absolute advantage) may still find it profitable to import that good and export other goods in which it is even more productive than trading partners (Ricardo's comparative advantage; e.g. Deardorff 2011). In Ricardo's original analysis, the relative differences stem from (permanent) productivity or technological differences, but his idea has been shown to apply also to situations where countries use the same technology but differ in terms of

relative factor endowments or institutions (i.e. the Heckscher-Ohlin-Samuelson model of international trade and its many extensions; e.g. Kowalski 2011). This implies that, while technology can be an important source of gains from trade, it is not the only source. Another key implication is that for gains from trade to materialise, policies must not play too large a role in subsidising or otherwise influencing a trade pattern that contradicts comparative advantage (e.g. Deardorff 2011). Thus, despite possible particular gains in terms of technology transfer, an ITT policy which distorts trade may well have an overall negative impact on the national economy.

While Ricardo's original analysis does not address several other specific issues relevant for ITT such as the dynamic dimensions of comparative advantage, the role of externalities or the economic rationale for state intervention in technology markets, it correctly identifies some of the basic dangers inherent in using commercial policies to influence ITT.

International technology transfer measures in an interconnected world

Together with adequate protection of IPR, trade and investment distortions are thus some of the key recurring issues in the long-standing debate on ITT policies. The rapid changes to the nature of technology and the means of its storage and transfer, the amplified stakes associated with new opportunities to apply and transfer technology in GVCs in countries at lower levels of economic development, and, possibly, a more insistent ITT policy stance from some countries, have all contributed to a renewed interest in these measures in recent years. Some commentators have called for their greater international coordination. The potential for such action, however, remains uncertain as measures which can have more or less impact on international competition and can, at the same time, effectively enable technology transfer have not been clearly identified.

In a recent paper sponsored by the OECD, my colleagues and I make an attempt at informing the ongoing debate by, first, cataloguing ITT measures and collecting the associated related regulatory data, and second, reviewing the literature on their potential to distort trade or investment and promote ITT (Kowalski et al. 2017). ITT policies are

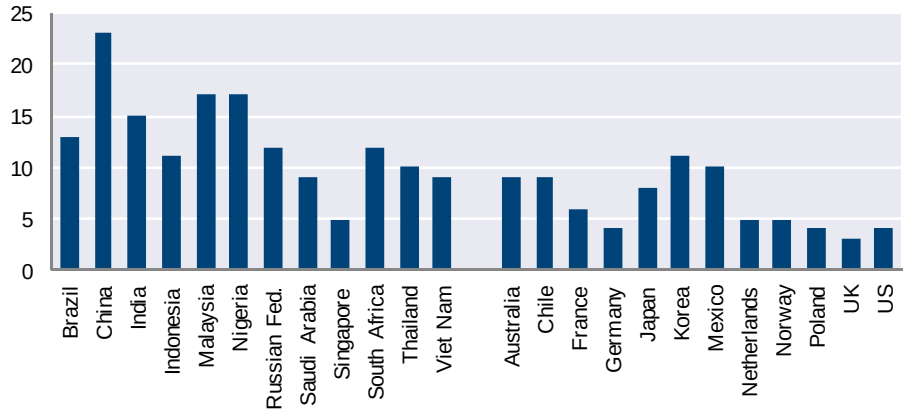
grouped into a number of categories covering a wide range of issues extending from absorptive capacity policies, through IPR protection, to various measures related to FDI and technology licensing. A list of "yes/no" questions about measures in place is devised for four categories of measures on which information is currently particularly scarce. These include: (1) FDI promotion measures; (2) FDI restrictions and FDI screening; (3) performance requirements; and (4) investment incentives. One feature of the adopted approach is that it aims to capture the most competition-distorting ITT measures through a focus on those measures which are technology-, sector- or product-specific. We present results for 24 developing and developed countries which are important actors in global FDI, technology and product markets.

The results show that all countries studied maintain measures to encourage technology transfer, although these are more frequently found in developing countries (Figure 1).[2] There is, however, considerable heterogeneity in emphasis on the different elements of technology transfer policies across countries and across countries at different levels of development.

2 The questions are formulated so that the "yes" responses denote a country's attempt at encouraging ITT. Thus, in principle, a higher number of positive responses for a country would indicate that it has more regulations or policies aiming at encouraging ITT. However, as we discuss at length in the original paper, policies that can be used to influence ITT differ along several dimensions and can be interpreted in a variety of ways. They also have different impacts in terms of both technology transfer and international competition. The binary data presented in charts and figures should thus always be considered in the context of the details of specific underlying measures and the situations in which they are applied.

Figure 1 All ITT-related measures

Number of positive responses to all regulatory questions



Note: This figure graphically summarises the regulatory information collected and presented in Kowalski et al. (2017). When interpreting it, it should be remembered that the different measures can have very different impacts on technology transfer, the quality of such transfer and competition. Some measures may be more important than others. Therefore, the number of measures that a country has adopted is only a rough measure of that country's commitment to attracting foreign technology and facilitating its spillover.

FDI promotion measures

Most studied countries have investment promotion policies which target technology-related investment in specific sectors, but few have sector- or technology-specific administrative simplifications. Aftercare services and promotion of business linkages are usually available to all investors, but more than one half of the countries analysed have put in place policies that target facilitation of investor access to human capital in technology-intensive areas.[3] These approaches are broadly consistent with the findings of the literature which suggest that targeting investment promotion at technology-intensive sectors can be effective in terms of attracting additional FDI in these sectors. Research and empirical evidence on the potential distortions such targeting might cause, however, is scarce.

3 See Table 1 in Kowalski et al. (2017).

FDI restrictions and FDI screening

Policies directly setting limits to FDI are rare today and are often determined by other considerations such as, for example, those related to competition law and national security. A small number of countries do, however, have joint-venture requirements in technology-intensive sectors, and these sometimes mandate transfer of technology to local partners.[4] The literature suggests that joint-venture requirements are often ineffective, because of reluctance to transfer the latest technology, a high risk of failure of such ventures, and possibility of exits. There are some case studies that find positive technology transfer effects, but these usually do not address the associated economy-wide or competition impacts.

Performance requirements

The infrequent use of performance requirements in industrialised countries (Table 1) suggests that policymakers in these countries have largely taken into account the deterrent effect of restrictions and performance requirements on FDI inflows and ITT documented in the literature. Local content requirements in government procurement, local employee quotas, and provisions setting training requirements and requiring substitution of foreign with national employees are, however, still rather common in developing countries. There the prevailing view seems to be that the size of local markets or natural resource endowments are often sufficient to compensate for the deterrent effect these measures can have on investment and on trade. However, there is considerable evidence that such requirements may also have significant effects on competition because they influence conditions under which firms from different sectors, or equipped with different technologies, compete in markets. They may also be particularly detrimental to effective participation in GVCs.

4 See Table 2 in Kowalski et al. (2017).

Table 1 Performance requirements

	Question	Brazil	China	India	Indonesia	Malaysia	Nigeria	Russian Fed.	Saudi Arabia	Singapore	South Africa	Thailand	Viet Nam	Australia	Chile	France	Germany	Japan	Korea	Mexico	Netherlands	Norway	Poland	UK	US
C1	The country does not have a PTA or BIT where performance requirements related to technology transfer are explicitly prohibited	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	no	no	no	no	no	no	no	no	no	yes	no	no	no
C2	Firms are required to disclose software source code to government agencies	no	yes	no	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
C3	Local data storage requirements are present	no	yes	no	yes	no	yes	yes	no	no	no	no	yes	yes	no	no	yes	no	yes	no	no	yes	no	no	no
C4	Jurisdictions require a quota or other target of national employees	yes	no	yes	yes	yes	yes	yes	yes	no	yes	yes	no	no	yes	no	no	no	no	yes	no	no	no	no	no
C4i	If C4=yes, does this apply to specific technical or management positions?	no	n/a	yes	no	yes	yes	yes	no	n/a	yes	no	n/a	n/a	no	n/a	n/a	n/a	n/a	no	n/a	n/a	n/a	n/a	n/a
C5	Jurisdictions either require or encourage training of national employees or substitutions of foreign with national employees	yes	no	no	yes	yes	yes	no	yes	no	yes	yes	no	no	no	no	no	no	no	yes	no	no	no	no	no
C6	Investment in country-based R&D is required	yes	no	no	no	no	yes	no	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no
C7	A country applies local sourcing requirements	no	yes	yes	yes	no	yes	yes	yes	no	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no
C7i	If C7=yes, do these apply in specific sectors?	no	yes	yes	yes	no	yes	yes	no	n/a	no	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
C8	In its procurement, the government accords preferences to local suppliers or local content in specific sectors	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no

Source: Kowalski et al. (2017).

Some performance requirements have been disciplined in international agreements such as the WTO TRIMS and a myriad of related provisions in bilateral investment treaties (BITs) and preferential trade agreements (PTAs), and the trend appears to be in the direction of expanding the list of prohibited measures. However, inclusion of such disciplines remains uneven, particularly as far as agreements involving developing countries are concerned. Future agreements might therefore attempt to set additional limits to the misuses of such measures. There is, however, also room for further international cooperation at the multilateral level in order to establish more widely accepted standards regarding such performance requirements.

Investment incentives

The FDI-deterring effect of performance requirements and restrictive regulation explain also the relative popularity of investment incentives which face less strict disciplines at the international level and are used more equally across the studied developing and industrialised countries (Table 2). For example, the majority of the countries have investment incentives which depend on R&D spending or technological characteristics of investments.

While the actual impact of these incentives depends on the context and the few specific studies that exist show that in many cases their effectiveness is limited, in a few cases they may generate positive externalities and thus support ITT. However, there are also indications that investment incentives provided only to industries or firms with certain technological characteristics may distort resource allocation, favour uneven development of some industries at the expense of others, and create unfair competitive advantages over non-subsidised companies. Such incentives also require leveraging public resources and their use by some governments may incite similar or more generous measures by others.

Table 2 Investment incentives

	Question	Brazil	China	India	Indonesia	Malaysia	Nigeria	Russian Fed.	Saudi Arabia	Singapore	South Africa	Thailand	Viet Nam	Australia	Chile	France	Germany	Japan	Korea	Mexico	Netherlands	Norway	Poland	UK	US
D1	Tax credit for personal income of highly skilled workers	no	yes	no	no	yes	yes	no	no	no	no	no	no	no	no	no	no	no	yes	no	yes	no	no	no	no
D2	The country has patent box schemes	no	yes	yes	no	no	no	no	no	no	no	no	no	no	no	yes	no	no	yes	no	yes	no	no	yes	no
D3	A fiscal incentive or a grant scheme depends on R&D spending by investing firm	yes	yes	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D4	A fiscal incentive or a grant scheme depends on the technological characteristics of investments	yes	yes	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	yes	no	yes
D5	A fiscal incentive or a grant scheme depends on either building suppliers capacity or using local facilities	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	no	no	yes	no	no	no	yes	no	no	no	no	no	no
D6	A fiscal incentive or a grant scheme depends on employment of highly skilled local workforce	no	yes	no	no	yes	no	no	yes	yes	no	no	no	no	no	no	no	yes	yes	no	no	no	yes	no	no
D7	An incentive scheme depends on keeping either headquarter or management in the country or in specific locations	yes	yes	no	yes	yes	no	no	no	yes	yes	no	no	no	no	no	no	yes	yes	no	no	no	no	no	no
D8	The country has either SEZ or incentive programmes based on geographical location for where advantages depend on sector of operation	yes	yes	yes	no	yes	yes	yes	yes	n/a	yes	yes	yes	no	no	no	yes	yes	yes	no	no	no	no	yes	yes

Source: Kowalski et al. (2017).

Summing up

Assuming there is interest in doing so, developing more effective ITT-related disciplines in future international agreements would require a more careful identification of measures that encourage FDI and ITT but do not (or only minimally) create distortions or undermine international competition. These considerations would have to be underpinned by clearer definitions of effectiveness of ITT policies and the associated trade distortions. David Ricardo's ideas, and particularly his theory of comparative advantage, remain an important organising framework in this respect. Better data on ITT policies and more rigorous empirical assessments of their effects are also needed. It is hoped that the data and analysis presented in this chapter and the underlying research paper are a useful step in this direction.

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9 Ricardo's relevance in today's open but heavily distorted world trading system

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Ricardo's intellectual legacy extends well beyond the much-admired principle of comparative advantage. His arguments reinforced the case for free trade, a highly contentious matter in his lifetime (and ours, for that matter). Moreover, his *magnum opus*, *The Principles of Political Economy and Taxation*, contained chapters on tariffs, subsidies ("bounties", as he called them) and trade with the United Kingdom's colonies. In addition to analysing the impact of trade policy, Ricardo also argued that protectionism begat protectionism, implying that his policy recommendation went against the tide.

Having reviewed some of Ricardo's statements concerning the effects of protectionism and its spread, the purpose of this chapter is to demonstrate their contemporary relevance by referring to data on policy choices made by governments since the onset of the Global Crisis. While the international architecture that is supposed to support open trade is certainly more developed today than in Ricardo's time, it would be wrong to conclude that a level playing field exists in global commerce. Well before the recent surge in populism, the cumulative effect of literally thousands of government policy interventions that harm foreign commercial interests has resulted in a nominally open, but heavily distorted world trading system.

Ricardo's critique of trade distortions

In Chapter XXII of his *Principles,* Ricardo analyses the effects of import duties and export subsidies. His principal criticism of these policies was that they distort the allocation of scarce national resources, thereby lowering the total amount of commodities produced and ultimately reducing living standards. Specifically, he argued:

> *The sole effect of the high duties on the importation, either of manufactures or of corn, or of a bounty on their exportation, is to divert a portion of capital to an employment which it would not naturally seek. It causes a pernicious distribution of the general funds of the society – it bribes a manufacturer to commence or continue in a comparatively less profitable employment. It is the worst species of taxation, for it does not give to the foreign country all that it takes away from the home country, the balance of loss being made up by the less advantageous distribution of general capital.* (page 210)[1]

It turns out, however, the resource misallocation is not the only adverse side effect. For Ricardo went on to argue later in that chapter that protectionism begat protectionism:

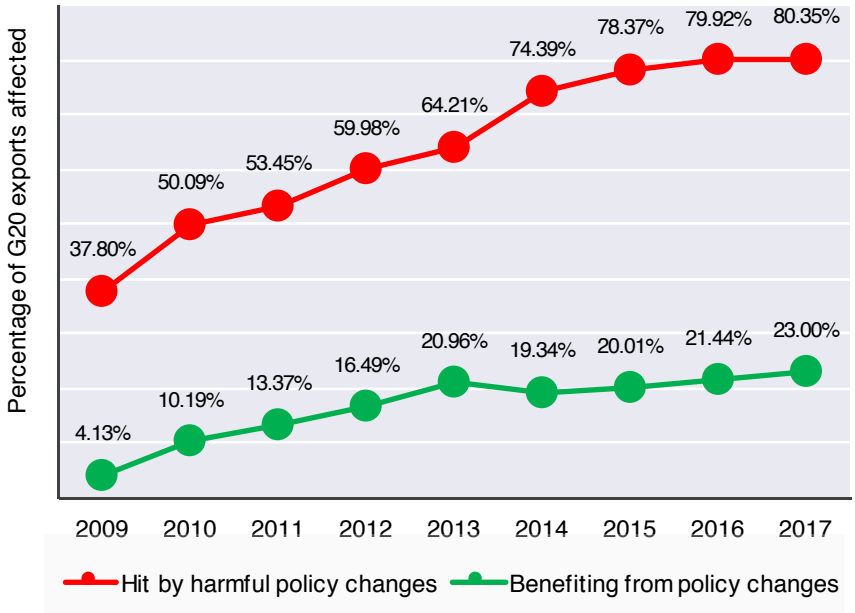
> *Because the cost of production, and, therefore, the prices of various manufactured commodities, are raised to the consumer by one error in legislation, the country has been called upon, on the plea of justice, quietly to submit to fresh exactions. Because we all pay an additional price for our linen, muslin, and cottons, it is thought just that we pay an additional price for our corn. Because, in the general distribution of the labour of the world, we have prevented the greatest amount of productions from being obtained by our portion of that labour in manufactured commodities, we should further punish ourselves by diminishing the productive powers of the general labour in the supply of raw produce. It would be much wiser to acknowledge the errors by which a mistaken policy has induced us to adopt, and immediately to commence a gradual recurrence to the sound principles of a universally free trade.* (pages 212-3)

1 The quotes on this page are taken from the 1911 reprint of Ricardo's *The Principles of Political Economy & Taxation* published by J.M. Dent & Sons Ltd (London).

While the mechanism was not spelled out, producers which have not received protection may find themselves at a disadvantage to those that have, by dint of their relatively lower revenues that constrain them in the commercial battle for domestic resources, such as talent. Once one sector is granted protectionism, other sectors seek to artificially inflate their revenues by seeking favours from government. As Ricardo notes, this process can be quiet and only the most alert customer is the wise to it.

When it comes to reversing course – from spreading protectionism to freer trade – Ricardo calls for acknowledging the error of the former. But who will come forward to do so and with what information? This question is as relevant today as it was 200 years ago.

Figure 1 Why we need advocates for a level commercial playing field



Source: Global Trade Alert.

Twentieth century experience, however, does provide some grounds for optimism. Following sharp economic downturns, policymakers recognised the need to adopt binding international trade rules, which form much of the legal arrangements underpinning the current world trading system. The desire to avoid the beggar-thy-

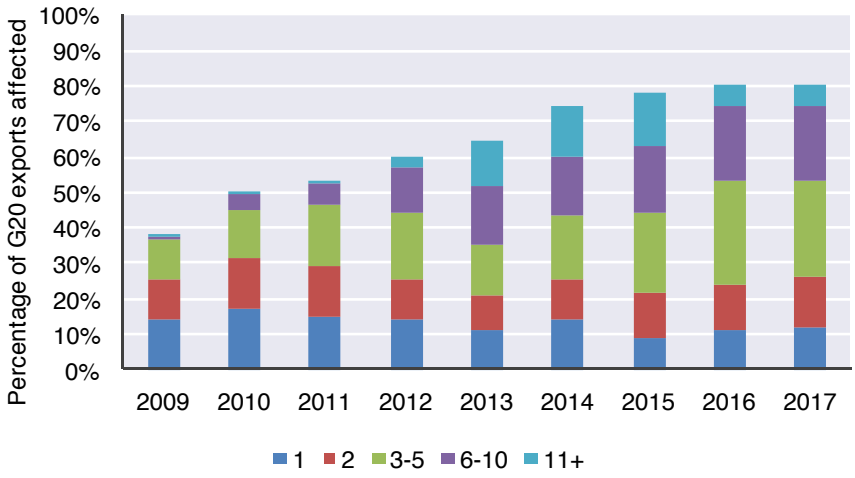
neighbour policies of the 1930s that extended the Great Depression was a significant contributing factor in the post-war creation of the General Agreement on Tariffs and Trade (GATT), the precursor to the modern World Trade Organization. The widespread resort to voluntary export restraints following the sharp global economic downturn of the early 1980s resulted in those particular trade distortions being banned in the subsequent multilateral trade round. So, progress is possible. But, after the Global Crisis that began in 2008, will this time be different?

The fallout from recent global economic crisis is an excellent opportunity to make the case for freer trade

The post-war era saw impressive reductions in import tariffs, first by industrialised countries and then by developing countries. Multilateral trade disciplines expanded over time to include rules on subsidies, trade in services, agricultural products, intellectual property, to name a few policy areas. Indeed, before the Global Crisis hit in 2008 many observers, business people, and policymakers would have described the world trading system as being on a general trajectory towards freer trade. Ricardo would have been pleased.

Ricardo would have frowned, however, at developments since the freezing of world financial markets caused a sharp global economic downturn in 2009. For sure, the Group of 20 nations (G20) came together and promised not to repeat the trade policy disaster of the 1930s and, to date, no major trading nation has resorted to across-the-board tariff increases on the scale seen in earlier eras (the Smoot Hawley tariffs passed by the US Congress being a case in point). Instead, governments around the world undertook thousands of surgical measures that sought to benefit domestic producer interests over foreign rivals. According to the Global Trade Alert, an independent trade policy monitoring service that I coordinate, a total of 8,560 policy interventions harmful to foreign commercial interests have been implemented since November 2008 (the starting point of our monitoring). That total is more than twice the total number of liberalising policy interventions (3,388).

Figure 2 More and more G20 exports have been hit by a larger number of harmful policy interventions



Note: Each year's total for G20 exports affected is decomposed into the number of harmful policy interventions faced. Hence the light blue segments of the figure show the share of G20 exports facing 11 or more harmful policy interventions.

Source: Global Trade Alert.

Creeping protectionism of this frequency soon mounts up and implicates large shares of global trade. Figure 1 reports estimates by the Global Trade Alert team, using very fine-grained international trade data, of the share of G20 exports that compete in a foreign market against one or more trade distortions that are still in effect. The estimated shares take account of the lapsing of trade policy interventions. Only policy interventions implemented from November 2008 count towards the totals in Figure 1, so pre-crisis protectionism may well add to these totals.

At this time of writing, just over 80% of G20 exports now compete in foreign markets where one or more trade distortions is in effect, which arguably results in lost sales, lower prices, or shrunken profit margins. This statistic makes clear the reversal of fortune experienced by the world trading system since the crisis struck. In contrast, less than a quarter of G20 exports are shipped to overseas markets where there has been some improvement in trading conditions.

A cynic might look at Figure 1 and argue that the share of G20 exports facing harmful policy intervention has stabilised since 2015. On the face of it, this is true. However, it

masks the fact that exports can be hit by more and more harmful policy interventions taken abroad. Consistent with the argument that the number of trade distortions keeps piling up, Figure 2 breaks down the totals for the export share harmed that were reported in Figure 1 into the share of G20 exports harmed by one, two, three to five, six to 10, and 11 or more harmful policy interventions.

As the years have passed, the proportion of G20 exports that face three or more harmful policy interventions when competing in foreign markets has risen sharply. Half of G20 exports face three or more crisis-era trade distortions that are still in effect. In sum, over time more and more of the 80% of G20 exports that compete at a disadvantage in foreign markets are finding the commercial playing field tilted against them more and more often. Protectionism, it would seem, still begets protectionism.

Given his emphasis on import duties and export bounties, Ricardo would almost certainly recognise much contemporary trade distortion: since its November 2008 start date, the Global Trade Alert team has documented 2,226 bailouts and subsidies (principally to local farmers and manufacturers), 1,560 contingent protection measures, 1,548 traditional tariff increases, and 1,289 state support measures for exports, as well as other trade distortions. The battle for freer trade and a less distorted world trading system is as relevant now as it was during Ricardo's time. *Plus ça change, plus c'est la même chose*.

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Part Three

The contemporary relevance of comparative advantage for decision-makers

10 Don't blame Ricardo – take responsibility for domestic political choices

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Commemorating the 200-year anniversary of Ricardo's *Principles of Political Economy and Taxation* must be above all a celebration of a concept both simple and sophisticated that as applied, consciously or unconsciously, has helped to build a world of unprecedented economic interdependence. Building on Adam Smith's brilliant understanding and explanation of specialisation (division of labour) induced by economic self-interest as well as competition, Ricardo formulated the corollary of comparative advantage as the fundamental determinant of the pattern of and *raison d'être* for international trade.

As explained in any popular trade textbook, comparative advantage simply means that with free trade, countries will tend to export goods that their labour produces relatively efficiently (with a low opportunity cost) and import goods that their labour produces relatively inefficiently (with a high opportunity cost). If comparative advantage is what drives international trade, Ricardo rightly observed that there should be gains from trade by all participant countries.

Despite its vintage and repeated empirical confirmation, a proper understanding of comparative advantage and its implications continues to elude many commentators and, more dangerously, policymakers. Ignoring the Ricardian principle of comparative advantage along with the essential GDP identity that also happens to provide the most essential equation of international economics, which is that the trade balance is simply the difference between GDP and gross national expenditure, is leading anew to a view

– not least on the part of the current US administration – in which international trade resembles a zero-sum game.

Unfortunately, the rejection of free trade is not an isolated event. The long-feared backlash against globalisation, if not yet unleashed to its full force, has begun to show clear signs of life and could grow rapidly with dire consequences. If this is to be avoided, the question is what to do? An obvious response would be to provide better and more widespread education on international economics.

At this point, one is tempted to remember what Paul Samuelson warned students in a later edition of his famous textbook:

> *Good sense economics is not all obvious. The common sense you bring with you from home to college will not let you understand why a rich country and a poor country can both gain great benefit from free international trade at the same time. (And your senator won't understand the point either without taking a good course in comparative advantage).*
> Samuelson and Nordhaus (1998).

For good reason, one of Samuelson's brightest students, Krugman himself, submitted that "the essential things to teach students are still the insights of Hume and Ricardo" (Krugman 1993).

If teaching Ricardo's comparative advantage and the other essential concepts of international economics to students and policymakers alike were the sole task needed, it would still appear to be feasible, though not easy. Recurrent ignorance, real or pretended, of such concepts is just the tip of the iceberg of a much more complex problem that has to do more with politics than economics.

Of course, the economics profession has long warned against a simplistic application of the Ricardian model to justify unreserved free trade. Since the Stolper-Samuelson formulation of the Heckscher-Ohlin theory, the alteration of factor prices and therefore income distribution as a consequence of international trade has been an indispensable qualification acknowledged even by the most recalcitrant proponents of free trade. Recommendations of trade liberalisation must always be accompanied by other policy prescriptions if the distributional effects of open markets deemed undesirable are to

be mitigated or even fully compensated. This is the usual posture in the economics profession. Curiously, however, those members of the profession who happen to be sceptics or even outright opponents of free trade persistently 'rediscover' Stolper-Samuelson and its variants as if this body of knowledge had never been part of the toolkit provided by economics.

In the case of politicians opposed to international trade, the arguments put forward vary a lot, from the subtle to the grotesque, but all have in common the deflection of responsibility for domestic policy failures to external forces as the cause of those failures. The most extreme case of such deflection is to be found in the rhetoric of populist politicians, from both the left and the right. More than any other kind, the populist politicians have a marked tendency to blame others for their countries' problems and failings. Foreigners who invest in, export or migrate to their country are the populist's favourite targets to explain almost every domestic problem. That is why restrictions – including draconian ones – on trade, investment and migration are an essential part of the populist's policy arsenal. Populists praise isolationism and avoid international engagement, except with their foreign populist cronies. The 'full package' of populism frequently includes anti-market economics, xenophobic and autarkic nationalism, and authoritarian politics. Populists display their protectionism and xenophobia as proof of their 'authentic patriotism' and excel at manipulating the public's nationalistic sentiments to execute their retrograde economic and political agenda, which invariably includes a strong rejection of open markets.

Unfortunately, asserting a causal relationship between globalisation and domestic ills is the rule rather than the exception even in countries governed by moderate democratic leaders, left or right. It is a rare event that a government confronting serious domestic problems would look first into its own policy failings rather than external causes in dealing with their citizens' demands for effective solutions. Blaming imports, foreign capital volatility and migrants would seem always preferable to explain phenomena such as slow GDP growth, external disequilibria, stagnant wages, and high unemployment. Taking responsibility for domestic policies – or the lack of thereof – that may be at the root of such problems, even if the latter is flagrantly the case, would seldom happen without first trying to point to external factors as the culprits for the unwanted conditions.

This deflection of responsibility is costly on two accounts. First, it undermines the political conditions that would make the process of global interdependence advance more smoothly, thus making it more difficult to realise the growth and development opportunities potentially offered by such a process. More importantly, perhaps by distraction, it frequently obstructs the discussion about fundamental shortcomings in the performance of governments and consequently their respective accountability for those failings.

A remarkable example of the latter distraction is found in the discussion of essential topics such as inequality, stagnant wages, and the so-called squeezed middle class in some high-income countries. Politicians of practically all persuasions use this topic to advance their electoral agendas – and populists more aggressively so, a circumstance that should not be terribly surprising if it is considered that speaking openly about the remedies for those maladies would imply losing votes, particularly among certain powerful constituencies. Politicians are in the business of winning votes not losing them, which they will do if they apply measures that, although necessary, will impact negatively some groups in the electorate. They get around this eventuality by blaming those who cannot vote but can be purported, even if falsely, as causing the ills that concern the electorate. This explains the reflex found in many politicians for blaming trade or migrants for those maladies.

What is a bit harder to understand is the tendency of some researchers and intellectuals to rely on the easy expedient of pointing to globalisation as the real culprit of what has gone wrong with some advanced market economies. Many examples come to mind but for economy of space, it seems fitting to choose just one to make the point. It involves an enormously valuable work on the evolution of global income distribution by Branco Milanovic, a researcher of great distinction. He and his co-authors have produced the most refined and reliable calculations of global income distribution from micro-data (individual household data) skillfully tapped from various sources. These have been summarised in the now famous elephant graph which shows that over a period of 20 years (1998-2008), people in some percentiles have had substantial income gains while people in other percentiles have had no gain whatsoever. This work has been summarised, updated and interpreted in a book that deservedly for several reasons has received widespread attention and praise (Milanovic 2016).

The problem is that the book too quickly connects the main shifts in inequality with globalisation, and in doing so pays insufficient attention to other more consequential factors to explain this phenomenon. The entire volume is permeated with the strong presumption of causality from globalisation to inequality. And yet, to confirm the validity of the presumption, the reader is referred to a number of contributions in the trade and income distribution literature, where it is hard to find enough evidence in support of the book's preferred explanatory narrative. It is not that other factors that may be at the root of the inequality trends are ignored altogether. In principle, three 'culprits' for increased inequality are acknowledged: technology, openness, and policy (the 'TOP'). But by suggesting that both skill-biased technological change and policies – such as taxation of capital and of highest incomes—happen to be endogenous to globalisation, the latter ends up being the ultimate culprit. Where this conclusion is accepted, it becomes very tempting to proclaim, as many do (but to be fair, Milanovic doesn't), that manipulation of the speed of globalisation, including its reversion, could be an effective equalising force.

Technological change has been a key driver of the intensification of globalisation and not the other way around. The information technology revolution, along with better means of transportation and certainly with the opening of previously closed economies, is what has allowed the contemporary pattern of complex global supply chains and of international trade and production.

If technology is by itself a chief cause of phenomena such as labour force displacement, increasing skill premiums, and deepening wage inequality, then putting sand in the wheels of globalisation could prove not only futile but also counterproductive.

The idea that policies – tax and otherwise – live inexorably in the straitjacket of globalisation is also objectionable. Regressive tax policies, shrinking social safety nets, poor adjustment support, bad education and training policies, and crumbling infrastructure, among many others, are not inescapable consequences of globalisation. They are explicit political choices.

Technology and trade do have the potential to benefit everyone, provided the right policies are put in place. This has not happened however; instead, policies are frequently

conformed, intentionally or not, to protect the interests of those at the top of the income distribution.

Yes, Ricardo's genial, truthful, and non-trivial proposition of comparative advantage must be explained better to wider audiences, not just to economics students. A better job must also be done to understand why a disproportionate share of the benefits, not only of trade but of growth in general, end up being captured by a small proportion of the population, probably because of policies over which the rich minority has an overwhelming influence. More curiosity and talent should be employed to determine how this injustice can be fixed.

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11 Why managers still need to take account of comparative advantage

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Managers generally don't seem to take much account of comparative advantage. Some of this may reflect the non-obviousness of the concept itself, as hinted at by Paul Samuelson's citation of it in response to Stanislaw Ulam's challenge to name one proposition in all of the social sciences that is both true and non-trivial (Head and Mayer 2013). But this state of affairs also reflects distinctively managerial concerns: the grounding of managerial efforts in partial equilibrium views of the world, the confusion between comparative advantage and competitive advantage (as revealed, for instance by online searches for "managers and comparative advantage") and, perhaps most novel to readers of this book, the tendency, even among sophisticated managers, to overestimate how integrated the world actually is.

To elaborate on the last point, in a survey that I ran in 2007 of *Harvard Business Review* readers, 62% of respondents agreed with a quote from Thomas L. Friedman's *The World Is Flat* that companies now operate on "a global, web-enabled playing field that allows for…collaboration on research and work in real time, without regard to geography, distance, or in the near future, even language" (Friedman 2005). A multi-country survey that I ran in spring 2017 indicates some softening in support for a flat or completely globalised world, especially in the US and the UK, but a plurality – 46% – still agreed with this view of the world as opposed to it being localised, or 'semi-globalised' (i.e. falling somewhere in the broad range between these two extremes).[1]

1 I discuss this survey and business responses to the present pressures against globalisation in my forthcoming book, *The New Global Road Map: Enduring Strategies for Turbulent Times* (Ghemawat 2018).

Such conceptions of the world as being completely integrated obviously eliminate the scope for factor price differences and, therefore, for arbitrage strategies that seek to take advantage of them. All that are left from a managerial perspective, then, are 'aggregation strategies' – strategies that seek to take advantage of similarities across countries, with perhaps some allowance for adaptation in response to differences between countries. I even titled a managerially oriented article about arbitrage "The forgotten strategy" (Ghemawat 2003), because of the tendency of managers to think about cross-country differences (when they do acknowledge them) only as constraints, leading many of them to get locked into an endless tug-of-war between aggregation and adaptation.[2]

This state of affairs is costly at both the company and the society levels. From a company perspective, it leads to a foregoing of potentially valuable arbitrage opportunities. Think, for instance, of Indian information technology (IT) services, which was the industry that originally motivated Friedman's faux insight that the world was – or would soon become – entirely flat. If Indian IT services companies had actually pursued this thought to its logical implications, they might have given up on their arbitrage-based business models, which have directly generated almost 3 million jobs and increases in market capitalisation of over $150 billion, while also accounting for one-third of the growth in India's exports (in dollar terms) since 2005, the year when Friedman's best-selling book was published.[3] Arbitrage of labour – skilled and unskilled – also accounts for many of India's other export successes, from cut and polished diamonds, to pharmaceuticals, to textiles. Obviously, the idea of focusing on labour-intensive sectors flows directly from the concept of comparative advantage. But arbitrage strategies also underpin more 'modern' notions in international business, such as exploiting knowledge differences around the world. If managers were more sensitised to comparative advantage, they would be less likely to miss valuable arbitrage-driven trade opportunities – at least in the real world as opposed to the hypothetical world of micro textbooks, in which no avoidable mistakes are made.

2 I cover the 'AAA strategies' of adaptation, aggregation and arbitrage individually, and then in combination, in Chapters 4-7 of Ghemawat (2007).

3 These data are drawn primarily from Nasscom reports and incorporate IT services as well as related activity such as business process outsourcing (BPO).

The Indian IT example also highlights three lessons about arbitrage strategies and, by extension, firm-level implications of comparative advantage. The first has to do with the societal backlash that arbitrage can provoke. In an October 2016 survey, 80% of Americans said that "increased outsourcing of jobs to other countries" hurts American workers (Pew Research Center 2016). Firms that focus on arbitrage need non-market strategies that address such sensitivities – a theme to which I will return later. Second, as long as they don't get shut down by protectionist measures, arbitrage strategies can be surprisingly sustainable. In financial markets, one tends to think of arbitrage windows as opening and closing almost instantaneously. But real-world arbitrage is more sustainable because the capabilities firms develop to execute it can be hard to imitate – and strategies can be adjusted over time. Faced, for example, with escalating wage costs in India, IT firms hired workers in smaller Indian cities with lower costs, broadened hiring beyond traditional labour pools, and shifted more work from onsite to offshore, among other changes. Third, while arbitrage is motivated by cross-country differences along certain dimensions, it is normally also constrained by them, in the sense that cross-country similarities still boost interactions along other dimensions. In IT services, a common language turns out to be particularly important. Thus, nearly 80% of Indian IT exports go to the US and UK alone, close to double those countries' combined 44% share of the world market. Of course, other points of contact, both cultural and administrative, are also at work: large Indian diaspora (including, in the US, in the tech space); colony–coloniser links (direct and indirect) and associated similarities in, for example, legal systems; historically relaxed attitudes towards offshoring in the US and the UK (compared to, say, France, Germany or Japan), and so on.

In addition to pointing the way towards potentially untapped trade opportunities, greater managerial sensitivity to comparative advantage could also help sharpen the location strategies of multinational firms. Focusing on comparative rather than absolute advantage could help counter the tendency to focus on 'one best place' in the world for producing or sourcing a given product or component. Doing so can help firms to boost both the efficiency and the resilience of their supply chains. And broadening firms' locational consideration sets – diminishing the 'herding' behaviour that tends to characterise foreign direct investment patterns – can also boost development opportunities in countries that tend to get overlooked.

As indicated by the preceding point, and also suggested by the Indian examples, foregone business opportunities also impose social costs. In other words, the harm extends beyond just the companies concerned. And in addition to the obvious social harms associated with the managerial mistakes discussed above, lack of understanding of comparative advantage also probably contributes to managers not participating effectively in the public dialogue about protectionism. Belief in a flat world leads to exaggerated conceptions of globalisation that, compounded by home bias, help stoke the fears of people who worry about globalisation. Managers who understand the distinction between competitive (or absolute) advantage and comparative advantage are less likely to think that all economic activity is migrating to emerging (low labour-cost) economies, and more likely to be effective exponents for the importance of continued economic openness and globalisation. The upsurge of protectionism, particularly in advanced economies, has only amplified the importance of this consideration.

Given the potential gains from improving managerial understanding of comparative advantage and its implications, what is to be done? First and most obviously, increased attention in business school curriculums to the concept cannot but help. While comparative advantage is covered in courses and modules on international economics, more attempts need to be made to communicate its continued relevance. The reason is that in a modern economy, the "visible hand" of management, as Alfred Chandler famously described it, has to a significant extent supplanted Adam Smith's "invisible hand" of market forces in coordinating how and where many goods are produced (Chandler 1977). Ricardo, of course, developed the idea of *comparative advantage* long before Chandler's "managerial revolution", in an economic context far more similar to Smith's perfect competition scenario than to the one in which today's managers operate. The focus on perfect competition, in which firms are ignored, is particularly unfortunate because it is the larger, more efficient firms that tend to export (and import). Discussing how firms exploit comparative advantage seems more likely to bolster the concept's 'stickiness' than stylised models of exchange in which there are no firms. India's export successes provide examples, as already discussed, but there are many others. Thus, Embraer, the Brazilian manufacturer of regional jets, undertakes labour-intensive assembly in Brazil but offshores the capital-intensive design and manufacture of parts such as wings to supplier partners in advanced economies.

Second, and perhaps less obviously, explicit attempts should be made to counteract biases towards the overestimation of globalisation levels.[4] Even managers who do not agree with the world being completely flat tend to be subject to 'globaloney' in the sense of overestimating globalisation levels.[5] Thus, in my recent multi-country survey described above, on average, they guessed that the world is five times more globalised than it really is, based on a set of metrics covering the intensity of trade, capital, information, and people flows. Clearly, globaloney about how integrated we already are undercuts urgency around understanding the implications of and opportunities afforded by comparative advantage. Note, in this context, the unhelpfulness of the recent emphasis on 'hyperglobalisation' as a characterisation of the period starting in the early 1990s (Subramanian and Kessler 2013). While economists drilled in the mystery of the missing trade and home bias (Trefler 1995) are likely to be able to retain a sense of perspective about such characterisations, managers (and policymakers) who are already prone to globaloney may not be.

In sum, managers – and society – could benefit greatly if managers had a better handle on the concept of comparative advantage. More emphasis on the concept in business curriculums, and more company-focused examples, could not but help. And the same goes for more accurate – as opposed to inflated – perceptions of how globalised we are.

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4 One resource that can be employed to combat globaloney with a heavy dose of hard data is the DHL Global Connectedness Index (www.dhl.com/gci), which tracks the depth and breadth of 140 countries' trade, capital, information, and people flows based on roughly 2 million data points (Ghemawat and Altman 2016).

5 The term 'globaloney' was coined by the late American politician Clare Booth Luce; see Krebs (1987).

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12 Welfare gains in a globalised world: Insights from Ricardo for the 21st century

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Two hundred years ago, David Ricardo revolutionised our thinking of international trade with the concept of comparative advantage. Until then, the dominant view was that a country should make the goods that it can produce more efficiently than other countries. If Portugal could make wine and cloth with fewer resources than England, then it should be making both wine and cloth. Ricardo exposed the logical fallacy in this view – when resources are scarce, it is not the absolute costs that matter but the relative costs. If Portugal is better at making wine versus cloth compared to England, then it should specialise in wine production and import its cloth supply from England. This would be the best way of utilising the scarce resources of both countries, and it would result in higher aggregate welfare in the world economy.

The idea that countries specialise in the industry of their comparative advantage is a bedrock of mutual welfare gains from international trade (Jones and Neary 1982). It goes against the earlier wisdom that Portugal, being a low-cost country, would produce both wine and cloth. When countries specialise based on comparative advantage, trade does not benefit just one nation at the expense of de-industrialising another. England and Portugal both gain by exchanging goods that are produced at lower opportunity costs. Therefore, Ricardo's comparative advantage theory is the simplest explanation for why globalisation need not be a zero-sum game. This has motivated a recent line of research quantifying the gains from international trade (Costinot and Rodriguez-Clare 2014).

Quantitative trade models typically use a workhorse model, such as Ricardian trade based on productivity differences, to put numbers to the gains from trade. The basic feature of a quantitative trade model is that the percentage change in per capita income can be inferred as the percentage change in the share of domestically produced consumption divided by the trade elasticity (defined as the sensitivity of trade volumes to trade costs). The advantage of this approach is that the change in income per capita due to trade cost changes can be estimated from data on bilateral trade and trade costs (such as tariffs).

The appeal of Ricardo's theory is that it fits this formula and provides a simple way of summarising trade patterns and the resulting welfare effects of international trade, which makes it a compelling workhorse model for important positive and normative questions. For example, Costinot and Donaldson (2016) use a quantitative trade model to answer the positive question of the extent to which trade, driven by Ricardian productivity differences, has increased economic welfare. The main difficulty in answering this question has been that under the Ricardian model, countries would specialise in industries in which they have relatively higher productivity and we would not observe the productivity of these countries in industries in which they did not specialise. England would not be producing wine, and we would not have an estimate of the productivity in the wine industry in England.

To determine the contribution of Ricardian productivity differences in trade and welfare, we would therefore need to get credible estimates of what England's productivity in the wine industry might have been if it had specialised in wine production. Costinot and Donaldson provide a compelling test of Ricardian trade by focusing on agriculture, where agrononomic data on soil, weather and other factors can be used to generate credible predictions of how productive England might have been had it diverted land away from cloth production to wine production. Looking at US agricultural production from 1880 to 1997, they show that market integration among US counties reduced price dispersion and provided substantial efficiency gains – 0.5% to 1.5% per year (compounding) – which are similar in size to the gains from technological progress in agriculture during the period

Building on a modern Ricardian trade model, in a recent paper (Dhingra et al. 2017) my co-authors and I examine a normative question: how much would real incomes

change in the UK and elsewhere under different Brexit trade policies? Our model uses the most recent trade data, which divides the world into 35 sectors and 31 regions. To account for the rise in global value chains and services trade, the model allows for trade in both intermediate inputs and final output in both goods and services. We use the model to quantify the impact of a different Brexit scenarios on the UK economy. In a Norway-style "soft Brexit", tariffs on UK–EU trade would continue to be zero but non-tariff barriers (NTBs) would increase slightly (by 2% for current NTBs, and with a 5.7% less reduction in future NTBs over ten years after Brexit). These NTBs arise from higher cross-border costs due to customs checks, border checks, or possible regulatory divergence in the future. We find that in our Ricardian trade model, a Norway-style exit from the EU would result in a 25% reduction in exports to the EU and a 1.3% fall in average UK incomes (or £850 per household) per year, compared to the status quo of continued membership in the EU. Under a "hard Brexit" with no new deal with the EU, tariffs on UK–EU trade would rise to the level of tariffs charged to other members of the WTO and non-tariff barriers would be higher (modelled as a 6% rise for current NTBs and a 12.8% smaller reduction in future NTBs). This would translate into a 43% reduction in exports to the EU and a 3% fall in average UK incomes, compared to a no Brexit scenario. We also find that all EU countries would lose income after Brexit, but the combined income loss would be about half that of the UK. This application highlights the relevance of the Ricardian model in informing the debate over trade policy.

The ease with which the Ricardian model can be deployed to answer welfare-relevant questions and the fundamental appeal of the idea of comparative advantage have placed the model firmly in the canon of international trade. But there are two questions related to the model that remain more contentious. First, are mutual gains just a theoretical possibility in an integrated world economy? Second, how does economic policy determine the underlying comparative advantage of nations?

We have discussed the gains from increased trade under comparative advantage, but not how these gains shift around when the world is integrated and faces various economic shocks. In a prescient article written over a decade ago, Paul Samuelson argued that economic changes, such as the rise of China and India, can dilute the original comparative advantage of the West, and lead to permanent declines in income in the

West (Samuelson 2004). Recent studies of the China shock confirm the view that the rise of China contributed to the decline in manufacturing in the US and Europe (Autor et al. 2016). Displaced workers in regions specialising in manufacturing have not been compensated for the losses in income they suffered. Interpreted through the lens of a specific factors model (of comparative advantage with limited worker mobility), this has put the focus on the policies enabling re-employment of displaced workers away from declining industries or regions. It has also revealed the limits to redistribution mechanisms aimed at compensating displaced workers.

Interpreted through the lens of Ricardo's comparative advantage theory, Samuelson argues that redistribution policies are not going to be enough when the gains from economic changes are concentrated on one side of a border. Economic changes which dilute or reverse the comparative advantage of a country need not create enough gains within the country to compensate those who suffer from the rise of trade partners. In an integrated world economy, redistribution policies therefore need not be enough to make up for real wage declines from forces, such as technological change, that change the comparative advantage of countries. Compensating for the losses to individuals is difficult when the gains from economic changes accrue largely in the foreign country. Thus, Samuelson cautions against the complacency that the "drastic change in mean US incomes and in inequalities among different US classes" could be fixed through the usual redistribution mechanisms that ensure mutual gains from trade.

The problem that Samuelson points to is exacerbated in a Ricardian world where resources, and not just goods, can flow across borders. When capital can move from the low-productivity country to the high-productivity country, economic changes can reinforce the absolute and relative cost advantages of low-cost trade partners in industries which need little of the fixed immobile resources. Then a greater proportion of economic activity would locate to the low-cost country, leading to a shift in profits away from the higher-cost country. As the share of labour declines and profits of superstar firms rise (Autor et al. 2017a), this insight of permanent income losses and the inadequacy of redistribution policies is likely to become even more important.

How could countries cope with the constant churning from economic changes? One approach is the economic nationalism witnessed today (Autor et al. 2017b, Colantone and Stanig 2017). This, however, does not enable the economy to deal with future

shocks, and it comes at the expense of higher trade costs which reduce the gains from the positive-sum game of economic integration. Another approach is to put in place cross-border mechanisms for compensating losses, but this seems unrealistic as the WTO and other international agreements have shown limited capacity to develop mechanisms beyond a narrow remit of trade-related measures (Baldwin 2016, Bown 2016).

An alternative approach, that goes right to the centre of Ricardo's theory, is to focus on policies that raise a country's productivity. In a Ricardian world, productivity differences across nations are driven by country-industry productivity differences. Looking at existing patterns of trade, productivity differences – as measured by differences in country-industry producer price indices – play a small role in determining the comparative advantage of nations (Costinot et al. 2012). But comparative advantage is not a fixed concept, and industrial policies could enable countries to develop comparative advantage in high-growth industries (Hausmann et al. 2007). By increasing productivity in all or some high-growth industries, countries could reduce the hardship from the losses of economic changes within the country.

A more contentious issue is the extent to which governments are capable of implementing industrial policies (Harrison and Rodriguez-Clare 2010). Since the Global Crisis, there has been heightened interest in targeted industrial policy to ensure full employment, productivity growth, and the reduction of spatial disparities (Aghion 2009). Looking at European programmes to provide regional assistance, Criscuolo et al. (2012) show that investment subsidies can be cost effective in generating economic activity in lagging regions of the economy. Boehm et al. (2017) examine the link between industrial policy and product specialisation, showing that pro-competitive industrial policy changes the comparative advantage of firms and results in productivity growth. This is an active area of research, but we currently understand little about how the process of setting and implementing efficient industrial policies works. Evidence from this research in the future could provide inputs into policies for reducing the hardship that economic changes bring in a globalised world.

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13 Ricardo and unilateral liberalisation

L Alan Winters
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To re-read Ricardo after decades as a practising international trade economist has been an immense pleasure. Ricardo's powers of abstract reasoning, pursued without any of the tools (props, perhaps) that we have become used to, are breath-taking. Here is truly one of the great exponents of our profession. And the fact that it was all in aid of practical policymaking only doubles the pleasure I take in it.

Ricardo brought us the theory of comparative advantage, which is among the most subtle and powerful ideas in economics and is arguably more central to our world view today than it was in 1817. That voluntary and undistorted trade benefits both parties is a lesson which we should never forget.

Ricardo also writes about trade policy and argues strongly against the Corn Laws and subsidies ('bounties') to exports, although interestingly he explicitly accepts the case for temporary protection to ease adjustment to trade shocks (p. 272).[1] He does not, so far as I can see, say a great deal about other countries' trade policy, the essential difference between unilateral and bi- or multilateral liberalisation. All his argumentation is about British policy and hence, by omission, was implicitly unilateral, but it is not clear that we can jump from this to a view that unilateral liberalisation was his preferred approach under all circumstances. I see three reasons to be cautious about such a leap.

First, Ricardo was trying to influence British policy and that policy was, in the 1810s, pretty restrictive, so his focus on a single set of policies (British ones) was perfectly

1 All my references are to the 1971 edition of David Ricardo's *Principles of Political Economy and Taxation*, edited by R M Hartwell (Penguin Edition).

understandable. Second, he does, at least once, recognise the harm caused by one country's polices to another's welfare: "Bounties on exportation or importation, new taxes on commodities, … disturb the natural trade of barter … in a greater or lesser degree, in every country …" (p.160). It is true that this is in a section where he is writing about macroeconomic consequences, which he thinks are mostly neutralised by the inter-sectoral movement of factors, but it is, nonetheless, indicative that he thinks policy elsewhere may matter.

The third and main reason to be cautious about drawing an ineluctable link from comparative advantage to unilateral liberalisation is that in Ricardo's model, it barely matters what other countries do because each country's relative costs of production of the two goods are constant. Thus in the long run trade policy affects only consumers' welfare; producers can avoid its effects by shifting between sectors. All three caveats suggest that Ricardo did not seriously address the question of unilateral versus bilateral liberalisation, and hence that unless we are willing to assert that the world is actually like Ricardo's model, we cannot safely conclude what he would have thought about that question. (I cast the discussion in terms of Ricardo's model because he undoubtedly had one even if it was expressed in 'mere' words. He understood perfectly well the distinction between his examples and the hurly-burly of the 'real' world.)

Where does this leave the question of unilateral liberalisation in the 21st century, particularly 21st century Britain? The basic insight into the gains from trade remains as formidable as ever: international trade has been fundamental to both the high levels of welfare in developed countries and the huge strides made in many developing countries. China could not possibly have grown so fast if it had faced the constraint of consuming what it produced; its growth depended very largely on producing a subset of goods very efficiently and selling them abroad, the domestic market being quite unable to absorb such volumes without the price (and hence the incentive to produce) collapsing. Thus the case for trade liberalisation is still formidable.

The argument for unilateral trade liberalisation is also strong. Over the last 200 years, several arguments have been advanced against liberalisation – such as infant industry arguments, fostering innovation and redistributing income internally – but these apply to any liberalisation and I will not deal with them here. The critical question for unilateral liberalisation is whether to make one's own liberalisation dependent on

others also liberalising. Whether to do so depends on the balance between two factors: (a) the extent to which partners' trade restrictions harm our welfare, and (b) the extent to which withholding our own liberalisation will induce them to change their behaviour (which mostly amounts to whether our restrictions harm them).

In the case of small economies, condition (b) is generally binding – they are too small to constitute any serious threat to larger (or much more numerous) trading partners, and so holding out for reciprocity is pointless. This advice is reinforced if you believe, as Gladstone and Cobden did in mid-19th century Britain, that the benefits of free trade will be so obvious that others will follow a unilateralist's lead of abolishing tariffs and hence result in global free trade. In fact, however, Gladstone and Cobden were proved wrong and the world did not follow the UK's push towards free trade, and worse, the policy left Britain with little to negotiate with in the bilateral agreements that it sought during the 1860s (Cain 1999).

For larger countries, reciprocity is potentially a more attractive policy, but policymakers still have to assess whether the long-run gains of freer trade outweigh the immediate costs of continuing to restrict trade in the short run. Textbook discussions of optimal tariffs – the argument that by restricting imports you drive down their price and so improve your terms of trade – and of strategic trade policy – in which governments intervene in markets to bolster the natural market power of their firms – are typically timeless, but the real world is not. If negotiating success is distant or uncertain, it may not be worth maintaining 'negotiating tariffs' even if they are likely to be effective in principle.

There is, however, evidence that trade agreements do satisfy a broad terms of trade reciprocity (e.g. Bagwell and Staiger 2010), although this is consistent with two explanations: that *A* fears *B*'s barriers and so reduces its own in order to get *B* to reduce its barriers, and that *B*'s liberalisation is necessary before *A* can overcome the domestic political barriers to its liberalisation.

Unilateral trade liberalisation has figured in the ongoing controversy about UK trade policy following Brexit. Some researchers (e.g. Miller and Minford 2017) see the UK as a small open economy with no influence over world prices and nothing to gain from negotiations; hence they advocate immediate unilateral liberalisation. Most, on the

other hand, believe that after leaving the EU, the UK will need improved access to other countries' markets if it is to maintain its current level of openness without a significant terms of trade decline. And they believe that being able to offer improved access to its own market in return will improve its chances of achieving this access (e.g. Winters 2017).

The contemporary debate also raises two elements not foreseen by Ricardo or any economist until the last few decades: value chains and standards. In many goods and nearly all services, markets are regulated to try to assure quality and safety standards, and this often raises costs for domestic producers and importers alike. Unilateral liberalisation cannot imply eliminating these standards, and so there is a trade-off between relaxing the standards and maximising the number of suppliers from which you can buy. Once we recognise value chains, however, this trade-off becomes even more complex. If country *A* uses inputs from country *B* to produce a good sold in country *C*, *A* will want to know that *B*'s input meets *C*'s regulatory requirements in order to know that the export will go through. If, say, *C* refuses to accept any chlorine-washed chicken, for example, *A* will not want to include *B*'s chlorine-washed chicken in its chicken pies. *A* cannot, in effect, determine its own standard unilaterally if it wants to keep its value chains intact. The notion of unilateral trade policy more or less dissolves in the face of market realities.

Ricardo was undoubtedly a great economist. It is no detraction from his greatness that he did not solve a problem that arose 200 years after his death. Equally, however, 200 years later we cannot infer from Ricardo's greatness that if he believed in unilateral liberalisation, that is the correct policy prescription for today.

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14 The distributional implications of US trade liberalisation with China

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Board of Governors of the Federal Reserve System; Yale School of Management

The Ricardian model provides a beautiful illustration of the potential gains from trade. In its simplest form, it assumes workers reallocate seamlessly across industries as countries specialise according to comparative advantage. Subsequent extensions of the model – for example, the Ricardo-Viner model – relax this assumption, allowing for some factors to be permanently 'fixed' to their initial industries. In these models, gains from trade may be distributed unequally, and some workers can be made worse off by globalisation.

In recent research, we examined the impact of US trade liberalisation with China on US manufacturing employment (Pierce and Schott 2016a). We think the lingering effects of this trade liberalisation help explain the resurgence of protectionism that sprang up in the US during the 2016 presidential election and which currently hampers efforts towards further multilateral trade liberalisation. We think our research also provides insight into attributes of labour market shocks that may exacerbate distributional losses, and that it highlights areas where additional research might be helpful for developing policies to mitigate these losses.

1 This chapter draws on comments made during the 2017 Jackson Hole Economic Policy symposium sponsored by the Federal Reserve Bank of Kansas City.

US trade liberalisation with China

Our research focused on a specific change in US trade policy towards China that occurred in October 2000, known as the US extension of permanent normal trade relations to China, or PNTR. PNTR was a different sort of trade liberalisation in that it eliminated a major source of uncertainty in US–China trade relations rather than changing the actual US tariff rates applied to Chinese goods. In that respect, it resembles more recent attempts at trade agreements that emphasise increasing predictability in international trade rather than furthering the tariff reductions that have characterised the post-war period.

Before PNTR, US imports from China faced the same generally low import tariff rates as most other US trading partners that were members of the WTO. However, given China's status as a non-market economy, continued access to those low rates required annual re-approval by the president, which could be blocked by Congress. These renewals were uncontroversial during the 1980s, but their success became much less certain after the Tiananmen Square incident in 1989 and subsequent flare-ups of tension between the US and China during the 1990s. Absent renewal by the president and Congress, US tariffs on most Chinese imports would have increased substantially.

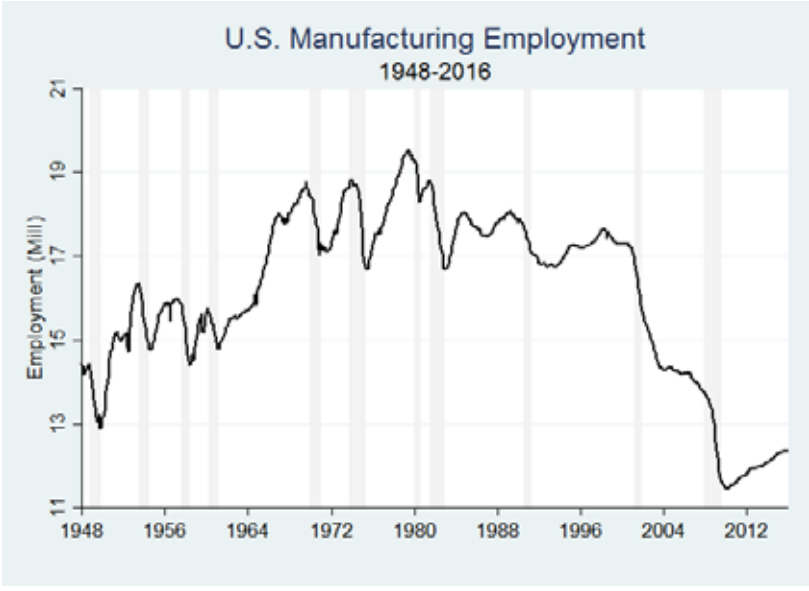
PNTR eliminated the need for annual renewal of China's access to low import tariff rates by rendering China's access to these low rates permanent. As a result, and consistent with the large literature on investment under cost uncertainty, PNTR encouraged US and Chinese firms to increase trade between the two countries.

On the US side, PNTR improved firms' incentives to invest in various activities that might reduce demand for labour in the US, including moving production to China, increasing sourcing from Chinese producers at the expense of US producers, and adopting various sorts of labour-saving technologies to compete with rising imports from China in terms of quality or cost. On the Chinese side, removing tariff-rate uncertainty improved exporters' incentives to scale up production to serve the US market.

Speed of employment decline

We found that the US extension of PNTR to China can be tied to relative changes in a number of economic and social indicators in the US. First, we find that extension of PNTR in late 2000 coincided with both a substantial increase in US imports from China and, as illustrated in Figure 1, a sharp drop in US manufacturing employment between 2000 and 2003.

Figure 1 US manufacturing employment, 1945-2015



Source: Monthly employment data from the Bureau of Labor Statistics.

Formal empirical analysis revealed that industries more exposed to the reduction in tariff-rate uncertainty exhibited relatively higher increases in imports and relative higher declines in employment, and that the overall relative decline in employment was driven by both increased job destruction and decreased job creation. That is, after 2000, US industries more exposed to PNTR experienced both relative increases in firm deaths and firms shedding workers, and relative declines in firm births and firms hiring workers.

The sharp drop in US manufacturing employment after 2000 differs markedly from the more gradual decline in manufacturing employment that occurred during the prior two decades. Indeed, in the 21 years following the peak in US manufacturing employment in 1979 to just before PNTR, US manufacturing employment fell by 2.3 million (or 12%). In the next four years, from 2000 to 2003, it fell by 2.9 million (or 17%). As can be seen in Figure 1, the post-2000 drop is about as large as the decline in the four years following the start of the Great Recession.

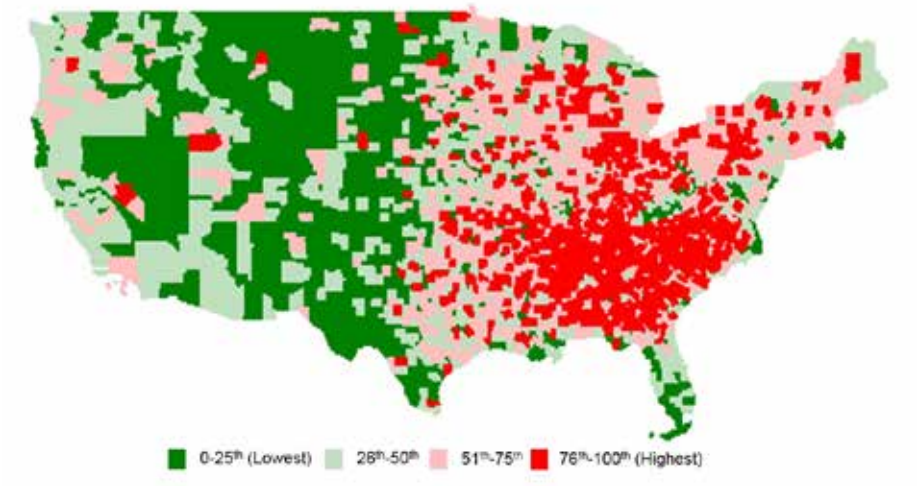
The speed of the post-2000 decline may have exacerbated distributional losses associated with PNTR. That is, to the extent that workers displaced by a change in trade policy are able to transition quickly to employment in other sectors, their earnings losses are likely to be more limited. But if such reallocation is more difficult when a large number of workers needs to relocate simultaneously, the labour market shock may be more disruptive. In that case, reallocation may take longer, displaced workers' earnings may fall more dramatically, and distributional losses may be more severe.

One interesting question that emerges from our analysis is whether the distributional losses in the US associated with China's rapid growth during the 1990s and 2000s would have been smaller if PNTR had been enacted earlier, say in the 1980s. In that case, US and Chinese firms might not have accumulated large levels of pent-up demand for integration that were then released all at once in 2001. In that hypothetical case, integration might have proceeded more gradually, and displaced workers' transitions to other sectors might have been smoother.

Spatial concentration of employment decline

Another important dimension of the employment loss after 2000 is its uneven geographic distribution. Counties with larger shares of employment in industries where the elimination of tariff-rate uncertainty was more binding faced larger employment losses. As shown in Figure 2, exposure to PNTR varied widely across the US, and was particularly high in the southeast. As with the rapidity of the employment decline, this spatial concentration may have magnified distributional losses by making it harder for workers located in the most exposed areas to find alternate employment in a nearby county.

Figure 2 Exposure to elimination of tariff uncertainty with China, by country



Source: Pierce and Schott (2016b).

In fact, our analysis of worker-level earnings data revealed that both manufacturing and non-manufacturing workers located in the most exposed counties experienced similar relative earnings declines, and that these relative declines were concentrated among workers with the lowest levels of education (Pierce et al. 2017). These relative declines among both manufacturing and non-manufacturing workers suggest workers faced substantial frictions in moving to other areas of the country where employment was rising. Our evidence of such frictions here is consistent with findings of similar frictions by researchers examining other changes in trade policy, such as NAFTA (Hakobian and McClaren 2016, Caliendo 2015).

Broader impact

A growing body of research suggests that distributional losses associated with PNTR extend beyond employment and wages. David Autor and colleagues, for example, show that regions experiencing greater import competition from China exhibit declining labour force participation as well as increased take-up of social welfare benefits such as those associated with disability (Autor et al. 2013). Other researchers have found links between exposure to Chinese imports and relative increases in crime (Che and Xu

2016), relative increases in household debt (Barrot et al. 2017), relative declines in the provision of public goods (Feler and Senses 2017), and relative declines in marriage rates (Autor et al. 2017).

These consequences also carry over to health. An influential recent paper by Anne Case and Angus Deaton (2015), for example, documents a striking increase in 'deaths of despair' – suicides, drug poisonings and alcohol-related liver disease – among middle-aged whites. In our own research (Pierce and Schott 2017), we find that counties' exposure to PNTR is associated with long-lasting relative increases in these deaths of despair, and that these relative increases are concentrated among working-age whites, especially white males. This finding is eerily reminiscent of earlier research by Sullivan and von Wachter (2009) which finds that high-tenure workers displaced as part of a mass layoffs in Pennsylvania during the 1980s experience a sharp increase in their probability of death.

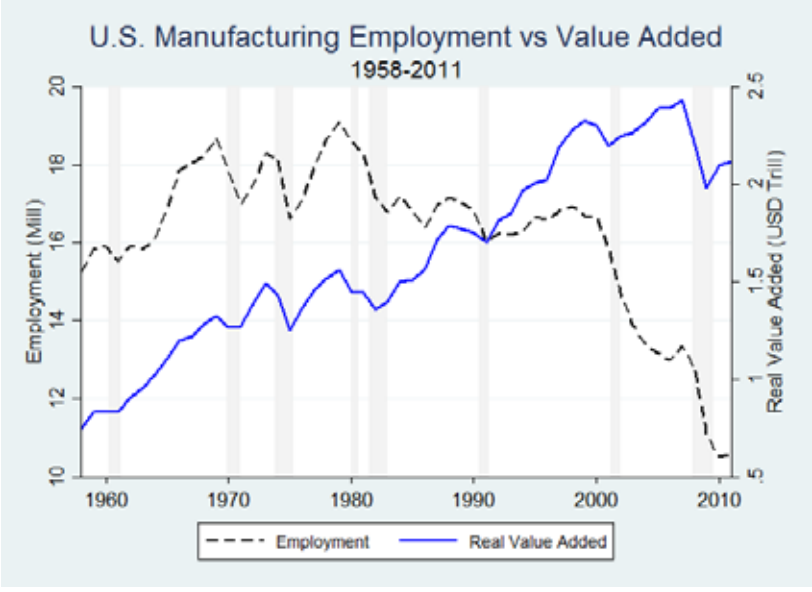
While researchers have linked increases in these causes of death to other labour market shocks, most commonly to downturns in the business cycle, the magnitudes we find with respect to PNTR are much larger. One explanation for the greater magnitudes we find, related to an earlier point, is the severity of the labour market shock induced by PNTR, and its long-lasting impact in terms of increased unemployment rates and decreased labour force participation. An open question is the extent to which the wider disruption caused by these deaths, as well as the likely wider prevalence of declining mental health and drug abuse they suggest, also affect the labour market outcomes of displaced workers.

Manufacturing is not disappearing

It is important to keep in mind that the US manufacturing sector is not disappearing, and that trade liberalisation with China has been found to benefit the US as a whole (Amiti et al. 2017, Handley and Limao 2016). One indication of these benefits is provided in Figure 3, which shows that US manufacturing value added continued to grow at more or less the same post-war pace after 2000, even as manufacturing employment fell so substantially. This large increase in labour productivity reflects a reallocation of US manufacturing activity towards more skill- and capital-intensive industries where the

US has comparative advantage, as well as changes in technology that allow firms to substitute capital for labour.

Figure 3 US manufacturing employment versus value added, 1958-2011



Source: NBER-CES Manufacturing Industry Database.

Whither policy?

A challenge for policymakers, of course, is to figure out how the benefits of international trade can be broadly shared throughout the economy. Though it is common for trade economists to promote education as the solution to this problem, development of appropriate policy responses along this line is hampered by a lack of research into the specific frictions workers face in moving between industries and regions.

An apparel worker displaced by trade liberalisation in the southeastern US, for example, might have sought employment in the growing oil and gas industry in Wyoming, but the data suggest that such movements are relatively rare. Is this lack of movement due to an information asymmetry? In other words, do workers in the south-east not know of job opportunities in other industries in other parts of the country? Or do displaced workers in the southeast know about these opportunities, but face credit constraints hampering

their ability to finance a move or acquire the skills needed to make the transition? Or, is such credit available, but workers are inhibited from taking the opportunity because such moves are risky, and there is no practical way to insure against this risk? Or, perhaps, the limiting factor is the lack of nearby educational institutions at which human capital can be accumulated?

To figure out the answers to such questions, we think labour and international trade economists might try to follow in the footsteps of economists in other fields by devising experiments to identify the factors that are most important in inhibiting worker reallocation, as well as the remedies that might be most effective in mitigating them. Such experiments would no doubt be very expensive to fund, but likely cost effective in the long run.

Moreover, we think the lessons learned from such experiments will be useful going forward, as US labour markets adjust to shocks associated with the implementation of new technologies such as robotics and artificial intelligence.

For example, while industrial robots are already in widespread use in automobile production, their cost-effectiveness in other industries, such as furniture, is estimated to be five to ten years away. Once they become cost effective in furniture, employment in that geographically concentrated industry likely will fall, perhaps rapidly. And, though the number of workers involved in that particular industry might be small compared to the job losses in manufacturing displayed in Figure 1, it is just one of the industries, both inside and outside manufacturing, that might be disrupted.

Investing in research now to learn more about how to address these types of shocks could help preserve the gains from trade that were famously articulated by Ricardo by ensuring that they are broadly shared.

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15 Hostage to fortune: Local labour markets and the case for trade

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In democracies at least, no matter how compelling the theoretical case for freer trade is, governments seeking to strengthen trade ties with other countries need to carry enough public opinion with them. And the public, who may well conflate trade with globalisation more generally as well as with other disruptions to labour markets, are likely to ask the question "Is globalisation good for me?" before deciding whether to withhold their support for freer trade (Scheve and Slaughter 2007).[1]

Coming at a time of wage stagnation in the UK – average weekly pay in real terms in September 2017 was still £32 below its pre-crisis high nearly 10 years earlier in February 2008 (ONS 2017) – the risk that employees won't support any UK government plans for trade deals after Brexit cannot be discounted. Such wage stagnation comes on top of research showing that indicators of mental distress are higher among UK citizens more exposed to international trade shocks (Colantone et al. 2015).

But are concerns about the labour market consequences of trade warranted? The purpose of this chapter is to answer this question, first looking back at the near consensus among economists before the Global Crisis. I then discuss the challenge to that consensus posed by the growing literature on the so-called China Shock to US labour markets, the relevance of which to the UK will be discussed. Finally, I discuss the pros and cons

1 In their analysis of rising support for protectionism in the US in the middle part of the last decade, Scheve and Slaughter (2007) observed "US policy is becoming more protectionist because the American public is becoming more protectionist, and this shift in attitudes is a result of stagnant or falling incomes. Public support for the engagement with the world economy is strongly linked to labor-market performance, and for most workers labor-market performance has been poor" (pp. 34-35). This statement neatly summarises the starting point of my argument.

of different policy responses. Ultimately, I will argue that unless UK labour market performance improves significantly, then making the case for maintaining existing levels of trade openness is likely to be difficult, let alone making the case for ambitious trade deals in the years ahead.

The pre-crisis near consensus on labour market adjustment costs

There is a disagreement about just how seriously economists took the possibility that certain societal groups could lose from trade reform. Some, such as Rodrik (2017), contend that, despite economists' awareness of the finer points of economic theories of the impact of trade reform, when advising governments and talking to the press "the zeal is to display the profession's crown jewels—market efficiency, the invisible hand, comparative advantage – in unvarnished form, and to shield them from attack by self-interested barbarians, namely the protectionists". On this view, concerns about the labour market pain caused by trade reforms were essentially swept under the carpet by economists.

Others, such as Paul Krugman, have retorted that textbook treatments of trade reform have been upfront about the winners and losers. Krugman is reported to have said at the WTO in September 2017 that "[t]extbook economics never said that growth in international trade was painless…I wrote the textbooks so I know we always said there were distributional effects, there were losers, not countries, but people within countries" (*Financial Times* 2017). In fact, in the 2008 edition of Krugman's textbook with Maurice Obstfeld (Krugman and Obstfeld 2008), the following statement about who loses from trade can be found:

> *"Owners of a country's abundant factors gain from trade, but owners of a country's scarce factors lose…[C]ompared with the rest of the world the United States is abundantly endowed with skilled labor and…low-skilled labor is correspondingly scarce. This means that international trade tends to make low-skilled labor in the United States worse off – not just temporarily, but on a sustained basis"* (p. 64).

That trade and trade liberalisation redistribute income, then, has long been known to economics professors and their students. Moreover, in the welfare analysis of trade

reform, the proposition has been established that those who gain from trade reform do so to a greater degree than those whose welfare is reduced, implying that it could be possible to compensate the losers without exhausting all of the gains to trade reform to the former. Note that the argument that trade reform is Pareto-improving depends on income being redistributed from the winners of the reform to the losers. The practical import of these arguments was to make it harder to argue against trade reform.

That trade reform results in resources, including labour, being reallocated across sectors has been known since, at least, Ricardo's *Principles*. But what of the costs associated with reallocating such resources?[2] For example, what of the costs faced by a sacked employee as they search for a new job? Before the recent research on the China Shock became well known, economists came as close to a consensus as one is likely to get among analysts that the adjustment costs associated with trade liberalisation were small and the existence of these costs did not constitute a legitimate argument against trade reform. The following points highlighted in the Executive Summary of a WTO special study titled "Adjusting to Trade Liberalization" (Bacchetta and Jansen 2003) is typical of the prevailing consensus at the time:

> *"Adjustment costs are typically small, sometimes much smaller, than the gains from trade…*
>
> *Governments can adopt policies that influence the size of adjustment costs faced by the economy…*
>
> *Adjustment costs can be reduced if trade policy reforms are underpinned by international commitments…*
>
> *The pace of trade reforms can have a beneficial impact on adjustment costs"* (p. 6).

The message to decision-makers was clear: adjustment costs are small and can be managed by existing policy. Some of the cutting-edge research available at the time, however, was more circumspect. In a series of papers, Carl Davidson and Steven Matusz

2 Tarr and Matusz (2005) describe adjustment costs as "encompassing a wide variety of potentially disadvantageous short-run outcomes that might result from trade liberalization". They give as examples of such short run costs "a reduction in employment and output, the loss of industry-specific and firm-specific human capital, and macroeconomic instability arising from balance of payments difficulties or reductions in government revenue" (p. 4).

calibrated models of trade reform that showed that, in the absence of training costs, up to a quarter of the gains from trade reform could be lost due to adjustment costs. Their preferred scenario, with low training costs, saw a third of the gain from trade reform lost to adjustment costs. Under some scenarios of training costs, they reported that as much as 80% of the gains from trade reform would be lost (Davidson and Matusz 2009). Still, in a paper that surveyed the magnitude of adjustment costs found in published studies, Tarr and Matusz (2005) conclude that "in virtually every instance the estimated degree of adjustment is relatively small compared with the natural dynamics of the labor force. In studies where such comparisons are possible, it seems to be the case that each dollar of adjustment cost is associated with several dollars' worth of efficiency gains" (p. 17).

Moreover, analyses of the impact of trade and trade reform on labour market outcomes before the China Shock literature did not point to significant concerns for policymakers. Autor et al. (2016a) summarise the research findings at the time as follows:

> *"Economists did not find trade to have had significant adverse distributional effects in developed economies, either for low-skill workers specifically or for import-competing factors and sectors more generally. The broad sentiment that emerged in the literature was that labor-market developments were primarily attributable to technological changes that complemented high-skill workers and reduced labor demand in manufacturing. The impact of international trade on these outcomes seemed to be modest, at best"* (p. 206).

Trade reform may redistribute income, then, but not by much – or at least not by enough to be found significant in many of the analyses of labour market outcomes at the time. To paraphrase one well-known article, Western salaries were not set in Beijing (Freeman 1995). Seen in this light, voters who blamed their economic woes on trade reform or international trade in general were wrong, or at least their claims would find no support in the prevailing academic literature. That was to change.

The China Shock and its impact on US labour markets and politics

On 11 December 2001, China became a full member of the WTO. As a consequence of its membership, trade policy towards Chinese exports could no longer be varied at a

whim. Indeed, for countries such as the US, the tariff treatment of Chinese goods did not change, but Chinese WTO membership essentially locked in that treatment. The uncertainty faced by Chinese exporters fell and this may have contributed, among other factors, to the substantial increase in Chinese exports from then on.

The sheer scale of China's export expansion and the accompanying increase in the size of its manufacturing sector has been phenomenal. In recent years, a stream of research has sought to assess the impact of those Chinese exports on the US labour market, election outcomes, and on other socioeconomic indicators of the US population. According to three of the authors central to this stream of analysis – David Autor, David Dorn, and Gordon Hanson – the research:

> *"…challenged much of the received empirical wisdom about how labor markets adjust to trade shocks. Alongside the heralded consumer benefits of expanded trade are substantial adjustment costs and distributional consequences. These impacts are most visible in local labour markets in which the industries exposed to foreign competition are concentrated. Adjustment in local labor markets is remarkably slow, with wages and labour-force participation rates remaining depressed and unemployment rates remaining elevated for at least a full decade after the China trade shock commences. Exposed workers experience greater job churning and reduced lifetime income. At the national level, employment has fallen in the US industries most exposed to import competition, as expected, but offsetting employment gains in other industries have failed to materialise"* (Autor et al. 2016a: 205).

They argue that these findings call for a reassessment of the gains from trade shocks. The circumstances of the local labour market a worker is employed in, the industry or sector initially worked in, and the identity of the initial employer condition, in their view, the magnitude of adjustment costs faced by a worker after a trade shock (p. 235). Assumptions of smooth, adjusting labour markets should be set to one side – they argue that "labour market adjustment to trade shocks is stunningly slow…" (p. 235).

Moreover, on this view, mobility costs account for the slow adjustment and imply that the short-term gains from trade reform would be much lower than the longer-term gains – indeed, net gains may only be positive only once a worker successfully completes

the transition from a declining to an expanding industry. A better understanding of the functioning of local labour markets is called for, especially if workers are reluctant to move geographically.

The surge in imports into the US from China has had effects beyond local labour markets – it is also thought to have had consequences for the outcome of the 2016 US presidential election. Autor et al. (2017) found that increased exposure to import competition in a region resulted in larger shares of the vote in that region for the Republican candidate. They concluded that had the China Shock been only half its actual size, then voters in Michigan, Wisconsin, and Pennsylvania would have swung behind the Democratic candidate instead, thereby ensuring a majority for Mrs Clinton in the Electoral College. In an earlier study, they found that increased exposure to import competition resulted in a reduced likelihood that moderate Congressional candidates would win election (Autor et al. 2016b).

One might ask what the relevance of such findings are for European nations and the UK, in particular? Recent analyses of German labour market outcomes have found that China's appetite for German exports has offset the impact of more German imports of Chinese products (Dauth et al. 2017, Marin 2017). The fact that Germany runs a trade surplus rather than a trade deficit (like the US) is said to be an important factor. Having written this, Dauth et al. (2017) also note that the impact of the China Shock varies across local labour markets, bearing out an important part of the findings for the US.

As far as the UK is concerned, Colantone and Stanig (2016a) found a positive correlation between the share of a region voting to leave the EU in June 2016 and the exposure of that region to the China "import shock" (as they term it). Moreover, they contend that a large fraction of the inter-regional differences in the observed voting shares for Brexit can be accounted for by inter-regional differences in exposure to this import shock.

In a more formal analysis covering Western Europe, including the UK, Colantone and Stanig (2016b) calculated the exposure of regions to the China import shock and then correlated it with the propensity to vote for political parties whose platforms advanced national self-sufficiency, protectionism, and nationalism. They found that exposure to the China Shock was greatest in Northern Ireland, Ireland, the midlands of the UK, Northern Germany, Austria, coastal parts of Sweden and Norway, and Finland.

Controlling for other factors, greater exposure to Chinese import competition was found to increase support for political parties with populist proposals. Those proposals tend not to include signing trade deals and integrating further into the global economy.

What policy response?

If indeed local labour market outcomes are an important determinant of support for national trade policies, then supporters of openness have a problem. In addition to the UK's well-known labour productivity problem, the rate at which UK job-seekers find new employment is much lower than in the US (Smith 2011) suggesting considerable room for improvement. More generally, much more needs to be known about the functioning of local labour markets if the adverse impacts of import surges are to be minimised.

At this point in the argument, trade economists often argue for labour market policies that specifically target job loss due to international trade. These policies could include higher welfare payments to recipients and possibly wage insurance. That employment separations can be driven by factors other than international trade may make it difficult to assess who is eligible for state assistance. Plus, in an age that is often characterised by disruption due to digital technologies, some may question why job losses due to import shocks should be treated differently from other losses.

One reaction might be to support the development of active labour market policies (ALMPs) that facilitate retraining, skill acquisition, and job-hunting skills, amongst others. Surveys of economic evaluations of ALMP programmes involve findings that vary from a limited, positive impact of such programmes under certain circumstances to outright scepticism about these programmes' effectiveness and value for money (Heckman et al. 1999, Filges et al. 2015, Crepon and van den Berg 2016, Card et al. 2017). These surveys do not give many pointers for the design of effective ALMPs. The fact that ALMPs have not been a sterling success in the past does not mean they must fail in the future. But surely their poor track record will adversely influence the reception of any ALMP programmes whose political purpose is to bolster support for freer trade?

Another option is income redistribution. Leaving aside proposals for a basic income – the cost and practicality of which have been questioned by some (OECD 2017) – could support for globalisation be fostered by greater redistribution of income in favour of employees? Schreve and Slaughter (2007) make the case for such redistribution, arguing that payroll taxes should be reformed in the US. Like the UK's National Insurance contributions, the US payroll tax system is not entirely progressive and could be made more so. Yet, surely one concern with this proposal is that it would only benefit individuals in employment. Someone who has lost their job through import competition would not benefit from reductions to payroll tax that they are no longer paying.

If support for current openness to trade is conditional on improved labour market performance, and given the reasons for believing that UK labour markets are indeed under-performing, then there is a double payoff from taking steps to reduce the costs, uncertainty, and fears associated with job market transitions. Ultimately, whatever the wishes of ministers, business people, and academics, UK trade policy is a hostage to (local labour market) fortune.

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Two hundred years ago, with a simple yet profound example about England trading cloth for Portuguese wine, David Ricardo introduced the Principle of Comparative Advantage. This seemingly counter-intuitive logic not only explained why nations trade, it also provided a strong justification for freer trade. But what is the relevance today of this parable of cloth-for-wine?

In this eBook, leading trade policy analysts examine whether Ricardo's insights remain valid in a world where services as well as good cross borders as does data and technology, where there is a rising China whose growth is heavily dependent on exports, and in the face of a backlash against globalisation.

The contributions to this eBook are non-technical and have implications for policymaking, and can inform debates about how open economies should be to the rest of the world and shape decisions by businesses, civil society, and trade unions.

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