Natural resources and inclusive growth

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Introduction

> *'We have not stopped working to harness our potential. The achievements made so far indicate that we are on the right path. By continuing on this tangent, this industry can be one of the catalysts to transform the non-oil sectors of our economy.'* Chief Executive Officer of Petroleum Commission, Ghana, 2015

This statement followed news of expanded estimates of oil reserves in Ghana. Such news is routinely greeted with great optimism, and yet away from the excitement of a particular discovery there is often circumspection about the merits of large-scale natural resource exploitation: it causes Dutch disease; it undermines other export activities with more long-term potential; it undermines institutions and risks creating terrible corruption and a lack of accountability.

This note reviews some of the theory and evidence around possible problems with natural resource extraction and considers the possible role of natural resources in structural transformation and inclusive growth.

It shows that that the first part of Dutch disease, which stimulates demand for non-tradeable goods and services, may reduce productivity in particular sectors but will not reduce average output per worker across the economy once the increase in natural resource exports is taken into account. In low-income countries, labour is very likely to shift out of low-capital traditional agriculture towards non-tradeable services, and this of itself is likely to involve average labour productivity increases even within the workforce that shifts. In general, all export industries cause Dutch disease (which should not be called a 'disease') and often this second-round effect creates more employment and more 'inclusive growth' than the export industry itself.

There are problems with the evidence suggesting that Dutch disease undermines productivity gains and longer-term growth. There are also problems with the evidence suggesting that natural resource 'dependence' causes institutional problems. There clearly are examples of countries where massive natural resource endowments go hand in hand with a very low standard of governance and where natural resources appear to feed institutional problems. However, the general relationship is very weak and in many of the examples it is not at all clear that governance would have been great without the natural resource discovery.

There is a major caveat that the impact of natural on institutions is likely to depend on the initial condition of institutions – which means that trying to estimate the average impact of natural resources on institutions could be an erroneous and misleading task.

It is notable that although most sub-Saharan African countries seem dependent on natural resources for GDP, and especially exports, most do not produce a very high value of natural resources per capita, by international standards. Only Equatorial Guinea has oil/capita at Persian Gulf levels. This means that even the pessimistic estimates of the impact of natural resources on growth and institutions do not imply very great damage in most African countries, because the level of natural resource exploitation is quite low.

There are no doubt risks to governance from natural resource extraction, but they are not insuperable. There is also scope for productivity gains in natural resources – but as with all sectors this requires research and knowledge, and an environment that rewards innovation.

The main conclusion of this note is that neither natural resources nor most other export sectors are very employment-intensive. Thus, the way they drive inclusive growth, which may be rather similar in low-income country settings, is by driving increases in output and demand, including demand for non-tradeables, which are rather more employment-intensive. Because of this, sustained growth episodes led by either manufactured exports or natural resources, or a mixture, may each be characterised by a large shift in employment from traditional agriculture to services. This is illustrated by the experiences of China and Chile.

Natural resources and competitiveness

Should we expect a resource windfall to push a country into a competitiveness trap, or help it out of one?

One pessimistic view is that natural resource endowments causes a competitiveness trap, or 'Dutch disease' – but the evidence that natural resources raise income is much stronger than any evidence that productivity stalls as a result

Natural resource exploitation increases income. There are several arguments, and some supporting evidence, for special external effects of resource exploitation which might alter the economy, adversely, in a dynamic way. The purely economic argument is that natural resource earnings boost consumption and cause a competitiveness trap, or Dutch disease.

Dutch disease has two parts; the first involves the second-round effects of an increase in export income: as income funds consumption, demand pushes up the relative price of non-tradeables. This feature of Dutch disease involves the balance of output and labour shifting to non-tradeables when demand is boosted by an increase in resource exports. There is plenty of evidence for the first part of Dutch disease which produces a relative increase in the production of non-tradeable goods. In fact, most of the conclusive evidence on Dutch disease is about this – significant increases in foreign exchange earnings from resource exports boost demand in the economy, which pushes up the relative price of non-tradeables and shifts labour and capital into non-tradeable production, whilst tradeables are increasingly imported. Examination of Dutch disease in micro data shows that resource booms do draw labour into non-tradeable production and do push up wages (Ismail 2010). NB: this part of Dutch disease can be caused by an increase in export income from any type of exports, not just natural resources.

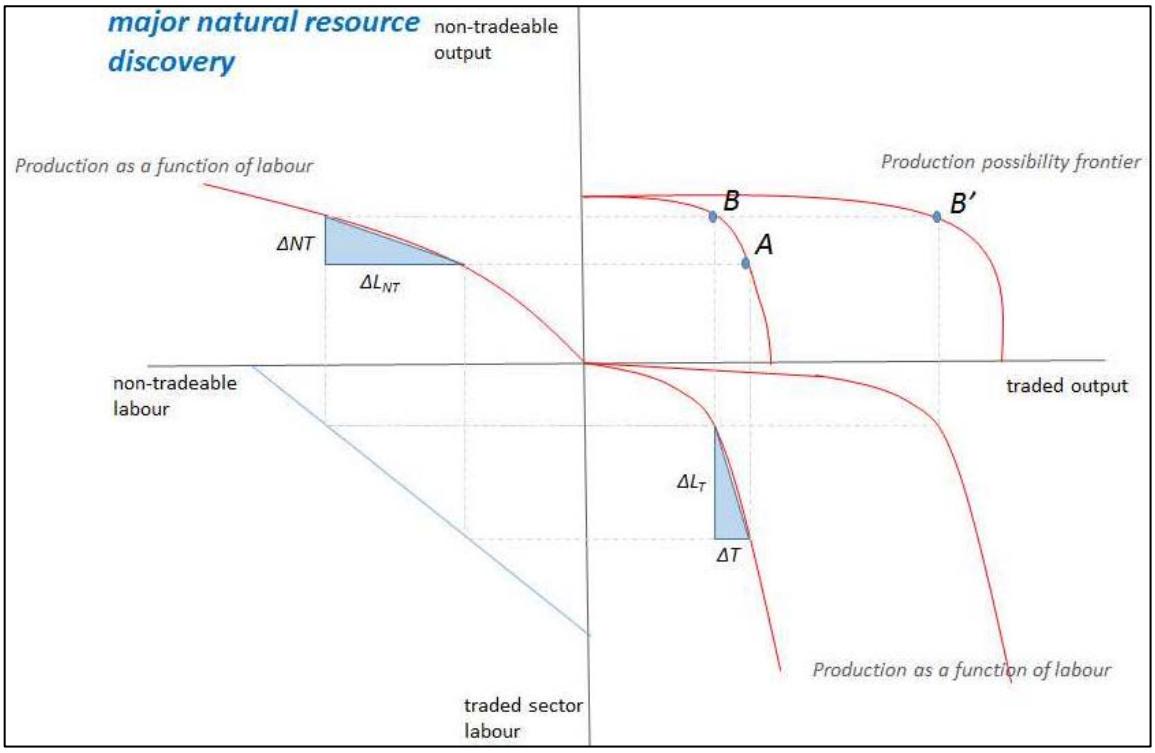
It is important to note that this part of 'Dutch disease' is not inefficient. Demand for non-tradeables may be inflationary, and it may reduce international competitiveness and lead to increased supply but reduced average productivity in non-tradeable production. However, these are the necessary price adjustments to induce the economy to produce the right mix of output – non-tradeables, which are things like housing, education, health, restaurants and other consumer services, are a big part of the needs that are met as people become better off.

If we treat natural resource export income as a 'windfall', the productive part of the economy could become less productive as a result of this Dutch disease effect…

A natural resource discovery is quite often referred to as a 'windfall' – as though the income is generated without effort or without employing any resources. If we do treat it in this way then the exogenous increase in income increases demand for all goods and services but pushes up the relative price of non-tradeables because they have to be supplied locally. In Figure 1, the top right quadrant shows production possibilities in a two-sector economy, the bottom right quadrant shows tradeable production as a function of labour (only), and the top left shows production of non-tradeables as a function of labour only. The exogenous income gain produces an increase in non-tradeable output and a decrease in tradeable output – A shifts to B along the

unchanged production possibility frontier. Labour productivity declines in the non-tradeable sector – in many cases, average labour productivity in the economy would decrease.

Figure 1



…but if we treat extractives as an industry, it is clear that output and income should increase overall from the new exploitation of natural resources.

There is a sense in which natural resource extraction is disposing of an asset which is already there, which is slightly different from other types of production. However, it does employ labour and capital to extract the resources, and the result is output. Thus, it makes at least as much sense to treat a natural resource discovery as an increase in production of traded goods rather than as a 'windfall'. In Figure 1 we assume capital-intensive, high labour productivity natural resource extraction is added to the traded production function, shifting the traded production function out and also shifting the production possibility frontier out. Therefore A shifts to B', not B. There is the same amount of inflation and an increase in non-traded production. There is also a net shift of labour out of tradeables into the non-traded sector to achieve this. However, because of the natural resource extraction, tradeable production has still increased very significantly, with less workers, so there is more traded and non-traded output and average output per worker is clearly increased. Note that capital is not represented in the graph but it is assumed that a large (mobile) capital investment is made to enable the resource extraction and the very high labour productivity at the left-hand side of the new traded production function. So, average capital intensity increases as well as average output per worker.

It is notable that for a low-income country the transfer of labour from traditional agriculture to non-traded services could easily embody real labour productivity increases.

In poor countries with spare or under-employed labour and very little non-resource, non-agricultural tradeable production, Dutch disease primarily acts through shifting the balance of production from traditional agriculture to non-tradeables, not out of manufacturing or other more capital-intensive traded production (Ross 2012). In Figure 1 , the left-hand side of the new traded sector production function shows very high marginal labour productivity, from resource extraction – i.e. output increases a lot for every worker added. However, on the right-hand side this declines sharply: where most of the traditional agricultural workers are, and where marginal productivity is low, output increases by small amounts for each new worker. The labour taken out of the traded sector – we can say largely out of traditional agriculture – reduces traded production by ΔT, and that labour produces an extra ΔNT of non-tradeable production. In this case, ΔNT is greater than ΔT and the average productivity of this labour increases even though average productivity falls in the non-tradeable sector.

The second part of Dutch disease relates to a reduction in productivity in a dynamic way… This effect would apply only when the export earnings are generated with natural resources. This is damaging to growth, and becomes a competitiveness trap if non-tradeable production has dynamic disadvantages compared to non-resource tradeable production, typically meaning manufacturing. The normal proposition is that the scope for learning and productivity improvements is much greater in tradeables, which include manufactures, than in non-tradeable services. Dutch disease 'part one' means a significant natural resource discovery reduces competitiveness in manufacturing, possibly in a sustained way. If these dynamic impacts are strong, the one-off increase in income levels which the resource endowment generates is ultimately superseded by the slower growth resulting from non-tradeable specialisation. But, of course, there might be no dynamic penalty to this at all. It should increase average productivity if workers transfer out of traditional subsistence agriculture even to low-productivity self-employed services. This might be expected to have a positive effect on technology spillovers and growth – if relatively capital-intensive non-tradeables have greater scope for learning and productivity advance than ultra-low-capital agriculture.

…there is much less evidence for the dynamic impacts of Dutch disease.

The original cross-country evidence, notably (Sachs and Warner 1995)), shows strong inverse correlations between dependence on natural resources and growth. The conclusion is that it is quite possible that the dynamic impacts on productivity growth associated with natural resource exploitation could dominate the income gains after some years. However, this type of evidence looks quite dated now – it is problematic because it relates growth to the share of resources in the economy, *natural resources:total output* or *natural resource exports:total exports.* If this was a contemporary study there would be much more discussion about the endogeneity of this relationship. The problem is that even though there were lots of control variables, natural resource output is part of output, as is non-natural resource output. If natural resource earnings are exogenous, these 'resource dependence' ratios are determined by the size of non-natural resource output or non-natural resource exports. For given resources a poor country looks more resource dependent – this is not the same as showing that resources have made the country poor. Evidence that looks at the impact of *resources per capita* shows a positive impact on income levels and growth (Alexeev and Conrad 2009), just as we would expect in the simple model, rather than the pessimistic version.

Natural resources and institutions

Should we expect a resource windfall to push a country into an institutions trap, or help it out of one?

The second pessimistic view is that natural resource endowments undermine democratic tendencies and reinforce economically damaging institutions, and even promote conflict – but the evidence is mixed and the link to growth remains weak. The main political argument suggesting that natural resource extraction could be detrimental is that natural resource earnings accrue mainly to government in an un-transparent an unaccountable way, reinforcing closed-access, undemocratic institutions which crush competition and innovation in the economy and ultimately harm potential productivity in the non-resource sectors.

There is substantial historical evidence that institutions help determine economic development. The institutional trap, or immiserising institutional path, is a compelling theory and evidence set explaining the long-term lack of convergence of countries (Robinson and Acemoglu 2012). There are different types of problematic institution but if they can be generalised they refer to a system of closed-access institutions where the legal system, property rights, competition rules and political power are used to favour a small controlling group, imposing excess costs and risks on other potential investors, stifling innovation and potential productivity gains and making investments unprofitable for most actors. This is great for the elite group but bad for growth. It is a 'path' because closed-access systems entrench their elite beneficiaries in power, which ensures the reproduction of the system despite it being sub-optimal for other groups. This is potentially important for resource-rich countries because if oil or other resources open up possibilities for rent seeking, this may entrench groups who will not limit their rent seeking to natural resource sectors.

It is certainly true that countries with very high per capita levels of natural resource endowment, which nearly always means oil or gas, do not tend to be very democratic. (Ross 2012) shows that since the 1960s, major oil producers have transitioned towards democracy less often and later than other developing countries. This is attributed to the nature of oil revenues: they allow a large state to provide public and private goods with a low level of general taxation and with a low level of information about the size of non-tax revenues, thereby reducing pressure to become democratic.

There is some evidence that natural resource extraction holds back progress in a dynamic way via institutional impact rather than via competitiveness. Some researchers claim to show evidence that high natural resource endowments cause generally worse institutions. (Sala i Martin, Xavier; Subramanian 2003) – (henceforth "S&S")estimate the impact of the share of natural resource earnings in GDP on the quality of institutions, and also the impact of institutions on growth, reaching an indirect estimate for the impact of natural resources on growth via institutions. The graph below translates this into predicted impact for sub-Saharan Africa's leading oil producers, although the small amounts of oil in sub-Saharan Africa tend to produce small effects there, even using this estimate.

This research suffers from very similar endogeneity problems as Sachs-Warner. Perhaps the *S&S* result is just driven by natural resource exploitation that pushes up

earnings without improving institutions – that is not the same at all as natural resources making institutions worse. Like Sachs-Warner, they use *natural resources:total output* as an explanatory variable, but, as before, there is an endogeneity problem with this. If countries A and B are the same, but then B discovers oil, B will have higher income, but might have the same institutions as before. Therefore B's institutions look backward for its (new) income level. This is sometimes known as the Beverly Hillbilly effect[1]. Alexeev and Conrad point out this problem and show that by incorporating a prediction of non-oil income, an otherwise similar estimation to *S&S* shows that oil producers have institutional quality no worse than their peers. Ross also shows that countries with very high natural resource income do not exhibit systematically worse institutions in terms of government effectiveness and corruption.

Are institutions that simple? We can reduce 'institutions' to a single measure of quality like the World Governance Indicators (WGI), and this can be useful for many purposes. The component institutional scores in the WGI are very correlated with each other, and with income. However, institutions are far from one-dimensional – they are the effective rules, the shared expectations about how things will work out, which set the incentives for all economic and political – and even very personal – decisions. Thus, there are many permutations of institutions. The correlation of institutional scores with income level can hide wide variations in institutional quality at any particular income level.

Should we even be looking for the average impact of natural resource exploitation on institutions? It might be a big mistake to look for the average impact of oil and gas discoveries on institutions since the whole point about institutions and development is that institutional change itself depends on institutions: history matters. (Torvik 2016)) discusses how pre-existing institutions determine the impact of external shocks on institutions: '*The resource curse literature has been too occupied with studying the average effect of resource abundance*,' i.e. the average of Norway, Saudi Arabia and Nigeria's experiences tell us little. Various forms of limited-access governance systems can arise without any natural resource rents – but 'grabber-friendly' pre-existing institutions are likely to mean that natural resource windfalls end up in private hands and that institutions deteriorate further. Conversely, countries with open institutions are likely to escape the resource curse. Even institutional reforms are likely to have a different impact in different countries. Torvik contrasts sovereign wealth funds in different settings. In Norway the sovereign wealth fund has reinforced Norway's conservative approach to oil revenues and has worked very well. But if institutions were more 'grabber-friendly', would the existence of a sovereign wealth fund increase the incentives to disassemble checks and balances so that the fund could be looted? This has happened: for example, in Chad in the 2000s.

So even if S&S's cross-country evidence is problematic, it could be that natural resource extraction is detrimental in poor countries even if the average impact is neutral. This is salutary. Even if we are sceptical about the evidence that natural resource discoveries will harm institutions on average, the average may be an irrelevant distraction. Perhaps the real question is: given the type of institutions

[1] https://en.wikipedia.org/wiki/The_Beverly_Hillbillies is a TV show about a poor backwoods family who move to Beverly Hills, California, after striking oil on their land and who do not fit in with their rich neighbours

prevailing at the point of natural resource discovery, how is the impact of the discovery likely to play out?

The exact type of institutions and the political economy of a particular regime will have a lot of impact on how a 'windfall' is utilised. Bourguignon and Gunning (2016) think about the impact of the external shock of foreign aid in different theoretical institutional environments in a 'distortive redistribution' model. This is relevant because foreign aid is a windfall. They describe a continuum of regimes from the 'egocentric-autocratic', which divert all resources to a small elite group, to the 'very democratic', which redistributes all available public resources to the poor majority. A key feature of the model is that the regime's resources derive from aid and distortive taxation – and the taxation, as well as expenditures, are a big part of the redistributive process. Of course, all taxation is somewhat distortive, even VAT and corporation tax, but in some regimes discretionary/unfair collection of taxes might be used to generate rents for insider groups and be very much more distorting of economic incentives than 'normal' taxation, and therefore very much more injurious to investment and growth. A key insight is that in an intermediate sort of regime, a foreign aid donor might want to make aid conditional upon reduction of distortive taxation, rather than an increase in public expenditure on public goods. Or the regime itself might want to do that if it cares about growth. Both options are a redistribution towards the poor but the reduction in distortive taxes may have major economic efficiency benefits and therefore increase overall income.

The possibility of using un-distorting natural resource rents to substitute for highly distorting tax and rent extraction in the rest of the economy suggests how natural resources can be used to boost the quality of institutions in the right political environment. The Bourguignon model is about foreign aid, but the 'shock' of new foreign aid is very similar to the 'shock' of new natural resource revenues. The implication is that in an intermediate regime with some highly distortive taxation that may be holding back investment, it might be better to use some of the fiscal space created by a natural resource windfall to reduce that distortive taxation and compensate the losers, if necessary, in a more open and efficient way, and boost investment and growth, rather than spend the entire windfall on public goods. This might be an even better policy if it is known that the windfall is finite and that funding public goods from it has sustainability problems.

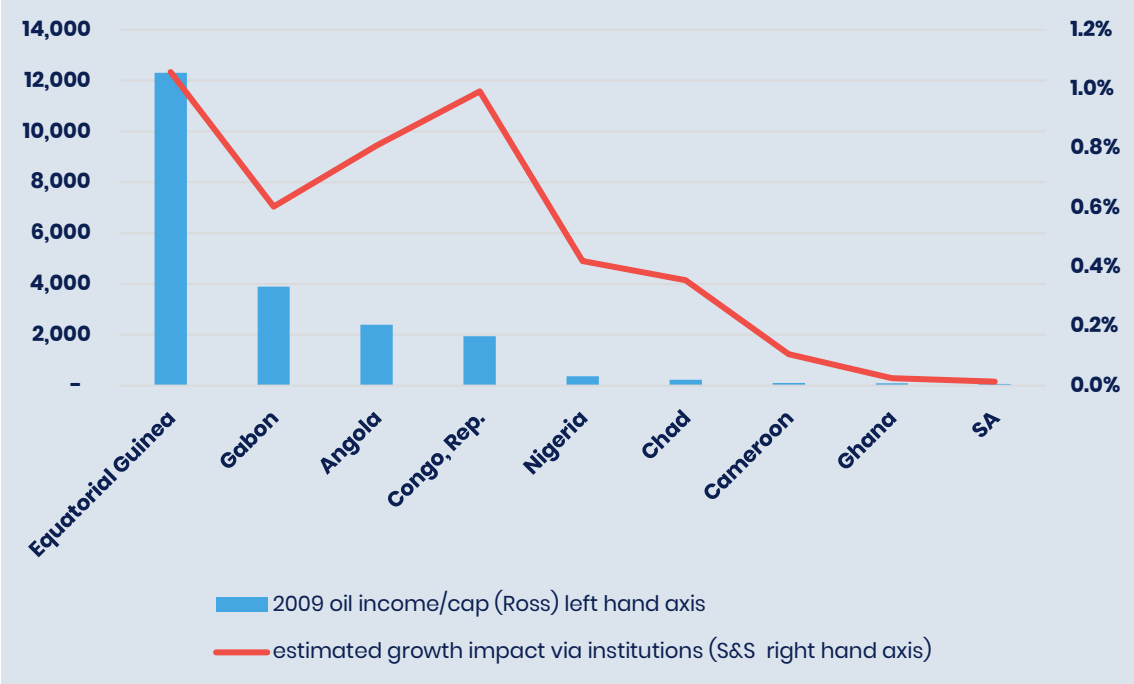
Natural resources in Africa

The scale of mineral and oil endowments in most sub-Saharan African countries is nowhere near as large as in Gulf states. The chart below shows there are only a handful of sub-Saharan African countries with very large oil endowments per person. Only tiny Equatorial Guinea has production akin to Gulf states such as Qatar, Kuwait and Saudi Arabia. The brown line shows, on the right-hand scale, the estimated negative impact on growth that this sort of endowment would produce according to Sala-i-Martin and Subramanian's (*S&S*) estimates. Nigeria's production per capita is far lower, although according to *S&S's* formula, oil's influence on institutions in Nigeria is estimated to depress annual growth by 0.4%, which is quite significant.

Even accepting the (problematic) estimates of the average impact of oil and gas on institutions, few African countries have enough oil and gas to make much difference. As mentioned above, not everyone accepts these estimates, but the main point is that outside a handful of countries, even these disputed estimates of oil's deleterious impact on growth via institutions cannot explain why most sub-Saharan African countries have weak institutions and have been low-income countries into the 21st century. We must look elsewhere for the explanation.

Most sub-Saharan African countries do not have enough oil to cause much of a penalty on growth via the impact on institutions

Figure 2



Dutch disease and other types of low-income trap are observationally similar and most African low-income countries exhibit the signs of these traps, regardless of their resource endowment. The table below shows five African countries, including Nigeria, and two poor Asian countries. The African countries share low incomes, high or very

high shares of natural resources in exports, and low or very low shares of manufacturing in GDP, and, finally, low Ease of Doing Business rankings. So, each of the African countries looks a lot like a case of Dutch disease or competitiveness trap, with resourced-based exports, non-tradeable production and low productivity. However, from 2010 to 2015, of these countries only Nigeria has had significant oil production, and Kenya and Uganda have had very low levels of oil or mineral exploitation.

Figure 3

2010–2015 average	Income per capita US$	Natural resources in merchandise exports %	Manufacturing in GDP %	Ease of Doing Business rank
Ethiopia	411	89	4	147
Ghana	1,563	85	6	113
Kenya	1,061	63	12	119
Nigeria	2,439	96	8	170
Uganda	649	71	9	129
Bangladesh	864	8*	17	173
Vietnam	1,500	30	13	92
WORLD	9,840	29	16	95

*over 80% of Bangladeshi exports are garments

Being low-income is a 'non-average' characteristic and might help explain why Africa countries appear to exhibit Dutch disease. Most of the research on the 'resource curse' is focused on countries with very high natural resource production per capita, and resource dependence at middle or high incomes. Less attention is paid to low-income countries but they are a special case. They are a special case because high natural resource:total output and natural resource:exports ratios might be generated by a massive resource sector, which creates Dutch disease and supresses non-resource tradeable production, but these ratios can also be achieved simply by having very low income, and thereby low non-resource exports and non-resource output.

It is very likely that African countries could extract a lot more natural resources than they are doing. Even Nigeria's oil production per capita is relatively low – nothing like a Gulf state – in 2007 the US, the UK and Australia all produced 65% more oil per capita than Nigeria. Figure 3 hows that Africa's exports are dominated by natural resources but this does not mean that natural resources are being fully exploited there. Exploration is much less complete than in some other regions: for example, the US. There is likely to be scope for considerable growth in this type of export.

Productivity gains and investment can produce growth in resource extraction for a sustained period. The characterisation of natural resource extraction as a 'windfall gain' is sometimes convenient and is sometimes misleading, and it is likely to

encourage the view that there is not much involved, in terms of skills and know-how, in extracting resources. But, of course resource extraction can be very capital-intensive and very hi-tech. Heavy engineering equipment is required, and mines are like huge civil engineering projects. More than that, deposits have different geological characteristics and different technical solutions can improve the efficiency (completeness) with which resources are extracted. The ancients collected seeping 'rock oil' thousands of years ago – much less effectively than it is collected today. Lederman and Maloney (2012) shows how technology revived copper mining in Chile, with massive productivity gains and therefore improved competitiveness with other copper fields using lesser technology. Just as with agriculture and manufacturing, the most effective exploitation of natural resources requires research and knowledge.

Perhaps Africa could be like America. Wood *et al*. (2002) note that from a factor endowment perspective – no doubt also for other reasons – Africa might be a long way from competitiveness in most export manufacturers but that this might not need to inhibit investment and growth. A path of development based on natural resource exports and large-scale employment in non-tradeable services plus some not-for-export manufacturing is essentially what Latin America has achieved. It is also what North America has achieved, although it consumes more of its own resources and mixes in a lot of export manufacturing and high-end services exports too.

Natural resources, non-tradeables and inclusive growth

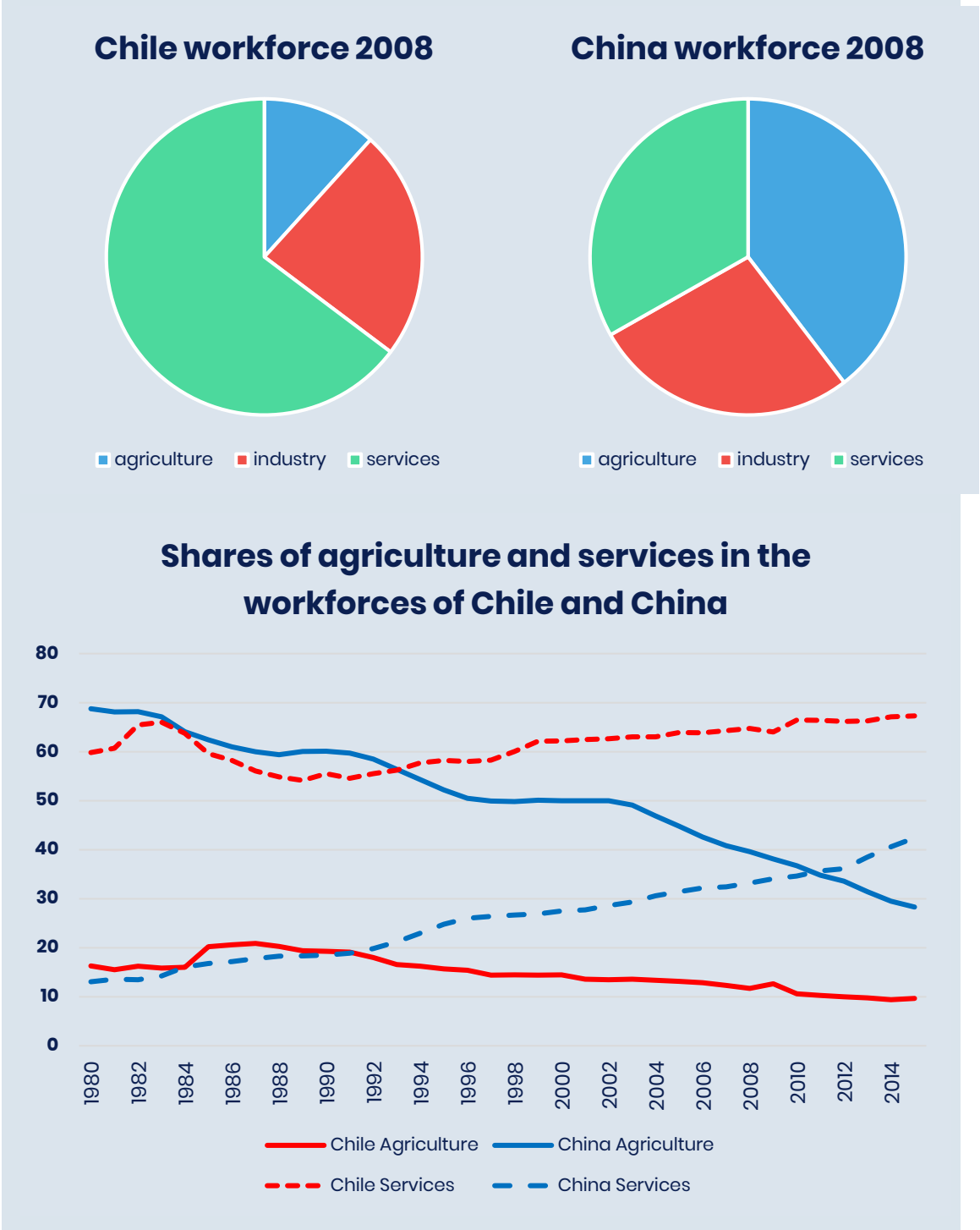
The sister Oxford Policy Management note 'Non-Tradeables and Inclusive Growth' explains how Dutch disease and non-tradeable demand can be the mechanism for translating export growth into inclusive growth. That note (Lee and Vanino 2018) explains that all export activity produces 'Dutch disease'. Natural resource extraction, manufacturing and sometimes large-scale agriculture are capital-intensive productive activities with high labour productivity – but of course high labour productivity means a low amount of labour is absorbed for given increases in output. And if jobs are the main channel by which growth is converted into inclusive growth, modern export industries alone may generate returns for investors, the government and a relatively small number of workers. When these returns are converted into demand for non-tradeable services, a lot more jobs are likely to be created and this can be what we mean by 'inclusive growth' in practice.

That note observes that, in modern times, structural transformation in poor countries involves a shift of labour from traditional agriculture to non-tradeable services. Communist/ former Soviet countries and countries with very large oil production per capita sometimes have more industrial employment and less service employment than most other countries, perhaps because there is relatively high investment and low consumer demand in those countries. However, there is really only one pattern of structural transformation in terms of labour. Britain may once have had half its workforce in industry, and 40% in manufacturing, but it seems those days are gone.

If competitive exports generate income, and the resultant demand enables workers in traditional agriculture to be re-employed in non-tradeable services, the key to inclusive growth may not be so much the labour intensity of export sectors as the competitiveness of export sectors and the business environment for non-tradeable production.

This point is illustrated with reference to China and Chile. China had about 100 million manufacturing jobs in 2008, but it had a workforce of almost 700 million. Thus, even in China the big shift in employment since 1990 has been from traditional agriculture to non-tradeable services (24% of the workforce), with only a much smaller shift to manufacturing (8%). In graph 4 a, b, c, d and e in the three panels below, the first shows the makeup of the workforce by broad sector. 27% of China's workforce is in industry (including lots of construction workers and miners etc), but in Chile 23% of Chile's workforce is in industry. The striking difference is that Chile's agricultural workforce is smaller and its service sector is larger. In the second panel it is clear that in both countries there has been a labour transition out of agriculture and into services in recent decades – faster in China, but Chile's agricultural workforce was already much smaller at the beginning of the period. In the final panel we see that Chile's GDP/capita is substantially higher than China's, but also that whilst China's exports are very predominantly manufacture, Chile's are very predominantly not – they are minerals and agricultural goods. In both countries there has been substantial economic development driven by different types of exports. A major mechanism for making this growth inclusive, in both countries, has been non-tradeable services.

Figure 4


Chile workforce 2008
agriculture
industry
services
China workforce 2008
agriculture
industry
services
Shares of agriculture and services in the workforces of Chile and China
80
70
60
50
40
30
20
10
0
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
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2002
2004
2006
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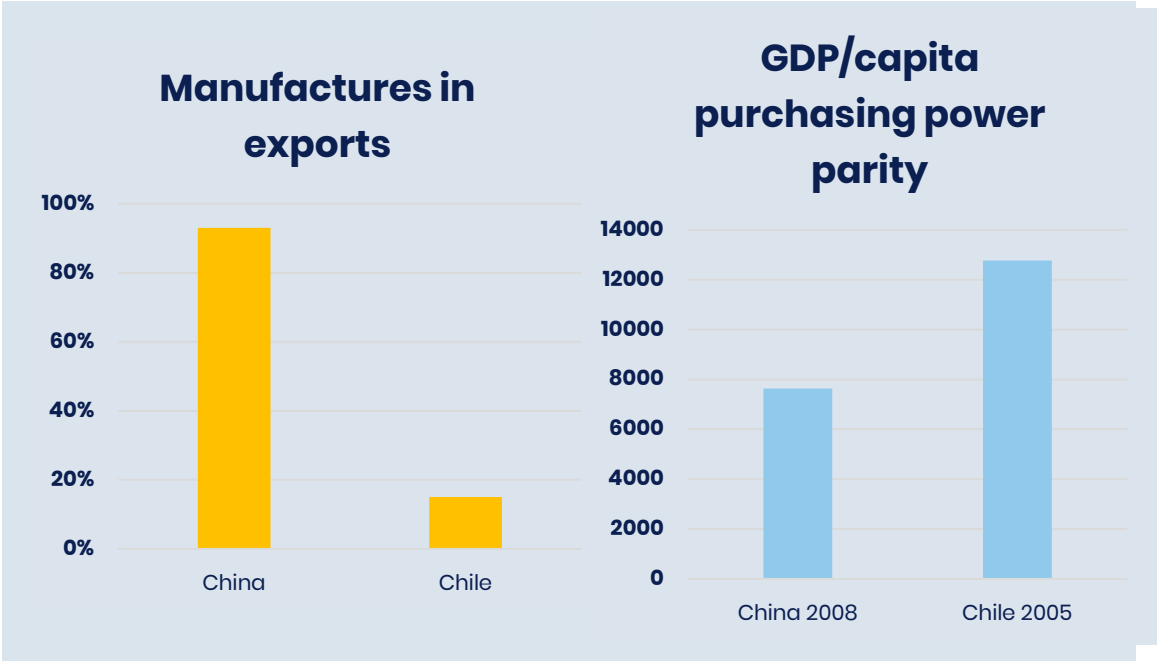
2010
2012
2014
Chile Agriculture
China Agriculture
Chile Services
China Services


Manufactures in exports
100%
80%
60%
40%
20%
0%
China
Chile
GDP/capita purchasing power parity
14000
12000
10000
8000
6000
4000
2000
0
China 2008
Chile 2005

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