Industrialization Led Growth in Tanzania: Running with Two Legs in the 21st Century?

by

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Industrialization Led Growth in Tanzania: Running with Two Legs in the 21st Century?

Lars Osberg

Let me begin by saying that it is both an honour and a great pleasure to be speaking to you today on the subject of "Institutions and Industrialization Led Growth in Tanzania". Almost 49 years ago, in July 1968, I was a fresh young economist landing at Dar es Salaam airport and this same issue, albeit discussed using a slightly different vocabulary, was then a crucial item on Tanzania's political and economic development agenda. 2017 also marks the 150th anniversary of Canada's existence as a nation, and Canadians have always wanted to be more than "hewers of wood and drawers of water" who export raw materials for Americans to make into something useful – so for essentially all of Canada's history, growth in manufacturing jobs has also been at or near the top of Canada's economic policy agenda. Growth in manufacturing employment (or the lack thereof) is also now at the top of policy concerns in the many countries around the world where manufacturing jobs have been lost, and not replaced, in recent years. But over the past 50 years, policy perspectives on "Industrialization-Led Development "[1] have shifted and the conditioning realities of technologies and markets have also changed fundamentally. So I would like to talk a little today about why I think industrialization remains so important for Tanzanian development and, from a Canadian perspective, about what has changed and what remains the same.

My own experience with Industrialization Led Growth in Tanzania began as part of my job duties as economist[2] from 1968-1970 for Tanzania Sisal Corporation in Tanga. The TSC was the para-statal which ran the sisal estates which had been nationalized following the Arusha Declaration[3] (and did so, under Tanzanian management, considerably more efficiently than the previous expatriate owners). Part of its mandate was to develop forward linkages and to further the local processing of agricultural exports. So a fascinating part of my job was to do the costings

[1] The Tanzania Human Development Report 2014 uses the term "industrial" to include the mining sector, as well as manufacturing. This paper omits discussion of the mining sector on the grounds that the foreign-owned modern sector in Tanzania is a highly capital intensive enclave with few backward or forward linkages. Since little local labour is employed, profits are exported and tax revenues have been very small, the mining sector creates GDP growth in an accounting sense, but little more. See Osberg and Bandera (2011 or 2012) for further discussion.

[2] My actual job title was "Mtalamu wa Mipango na Maendeleo".

[3] Most expatriate personnel were fired after nationalization, but it was easy for me to see (partly because the TSC used the same accounting system as the old Bird and Co. estates) that Tanzanian management, under the leadership of Reuben Naburi, delivered both lower financial costs and greater operational efficiency at all stages of the production process. Unfortunately, world market prices declined more than costs of production, but nationalization of the sisal estates (and the cost-cutting it enabled) produced additional employment and output that would otherwise not have occurred, if the estates had simply closed after cutting out their mature fields.

and help negotiate the establishment of sisal baler twine and binder twine factories in Tanga and elsewhere. It was an exciting time, when there was a real sense of possibility about a better future for Tanzania. Government was then seen as having the ability, and indeed the responsibility, to play an active role in economic development and structural change. And there was also a sense of urgency – somewhat captured in Mwalimu's saying that "We must run while others walk" – that rapid structural change was necessary if Tanzanians were to escape the grinding poverty of subsistence agriculture.

For a Canadian, Tanzania's industrialization strategy of the 1960s also seemed quite familiar. My high school history books[4] had told me of how Canada's "National Policy" had, after 1878, raised tariff barriers to protect infant industries from American competition, create a common Canadian market and enable the domestic emergence of manufacturing in Canada. When the World Bank issued its 1961 report on the "The Economic Development of Tanganyika", it had followed a basically similar line. That report noted that, in Tanganyika as in Canada, tariff revenues had been essential to public finances (and hence to infrastructure construction and growth) and that tariff protections had been crucial to the limited manufacturing sector that had emerged. In 1961, the World Bank was being entirely mainstream when it concluded that "within the limits set by total demand, consideration must be given to the possibilities of import substitution" (1961:234)[5]. Through para-statals and joint ventures, the government of the day had heeded that advice. Tanzanians then wore locally-made kitenge (from the Friendship Textile Mill) and rode to work in buses whose bodies were fabricated in Dar es Salaam[6].

In those days, the central focus of development economics was structural change. In a largely agrarian society, improvements in agricultural productivity and output were of course essential to raising incomes in rural areas, which is where the vast majority lived (and where 70.9% still live[7]). However, it was then also recognized that one cannot run very fast with only one leg. Increasing agricultural productivity means that it takes fewer workers to produce the same, or even larger, amounts of output – so if agriculture modernizes and sheds labour, those people have to go somewhere. When agricultural output increases, it also has to be sold to somebody – but unless there is growing demand for food from an expanding non-farm sector[8],

[4] Brown (1958:419); Beaulieu and Cherniwchan (2014: Figure 1, page 149) show that from 1880 to1910 Canada's Import-weighted average tariff was about 30%, and tariff revenue was 30% to 40% of federal government revenue.

[5] The specifically suggested "most promising possibilities" were beer, cigarettes, cement, sugar, textiles, footwear and rubber tires (1961:234).

[6] The drivetrain and chassis were imported (often Bedford lorries), to which locally made bus bodies were added.

[7] This paper will, unless specifically otherwise noted, take population numbers from NBS (2014). Note that the 2012 NBS numbers do not align with those of the UN UNSD Demographic Statistics. Updated population estimates for 2017 are that total population is 56.770 Million. http://worldpopulationreview.com/countries/tanzania-population/

[8] Or unless, as in Western Canada, wheat exports can supply a dependable foreign market. For a historical discussion of self-sufficiency and 'food security' in the Tanzanian context, see Bryceson (1990).

increased supply will meet unchanged demand and prices will fall[9]. Industrial employment growth is thus crucial. Non-farm job growth is "the other leg" of structural change and development, because jobs are needed to absorb the surplus labour that is displaced from the agricultural sector and the wages of workers newly employed in industry are needed to provide the market demand to absorb growing agricultural output and raise the incomes of the rural poor. I think that this core insight of mutual dependence between agricultural modernization and industrial development remains just as true and just as important today as it always was, but times have changed. So the sub-title for this paper is "Running with Two Legs in the 21st Century?" because so much of the context and the constraints facing public policy for industrialization led growth has changed[10].

The expansion of education in Tanzania has enabled a huge increase in institutional capacity for public policy, which means that many of the requirements for industrialization-led growth in Tanzania have already been ably discussed – in, for example, the 2014 Human Development Report or the National Five Year Development Plan 2016/17 – 2020/21. But as noted earlier, the issue of industrialization led growth is crucially important for many nations and "Institution" is a fairly broad term[11].

Because "institutions" have affected industrialization led growth in multiple ways, which have varied over time in different contexts, the plan of this essay is to emphasize some aspects of the Canadian experience – readers can decide for themselves how much of that discussion might also be relevant here. Section 1 begins by asking what the emerging technologies of the factory of the future might imply for future demand for labour market skills, and discussing how Canadian institutions have tried to adjust. Section 2 then notes that Canada has had for some time, and Tanzania may soon acquire, the problems of managing a petro-currency, and in the Canadian context the exchange rate has been a crucial determinant of the level of manufacturing employment. Section 3 then discusses briefly the new institutional uncertainties of global trade governance and the differing policy options that countries have at each stage of development. Section 4 notes the acceptance in Canada of a shrinking policy space for governments and questions whether it should always be unquestionable. Section 5 concludes.

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[9] Food demand is relatively price inelastic. Hence, if the non-farm population remains unchanged when agricultural output increases, the decline in agricultural prices can be large enough that farmers end up with lower incomes.

[10] One of the biggest changes has been in education. Tanzania's 2012 census reports that 5.6% of the mainland population of 43.625 Million in 2012 was over 65 years of age, which implies that about 95% of the population of Tanzania now have no personal memory of what education was like in the 1950s, when the British colonial government of Tanganyika only funded four senior high schools for Africans. In 1958, a total of 170 African students in Tanganyika completed their Standard XII examinations - out of a population which was then 8.8 million. [See George, 1960: 32] In 2012/2013, enrolment in Tanzanian universities and university colleges was 204,175 - see Ministry of Education and Vocational Training (2014:64). Educational progress has been spectacular.

[11] The Merriam-Webster Dictionary defines "Institution" as (1) a significant practice, relationship, or organization in a society or culture (2) an established organization or corporation (as a bank or university) especially of a public character <financial *institutions*>. The Oxford dictionary definition is: (1) An organization founded for a religious, educational, professional, or social purpose: *'an academic institution'* (2) An established law or practice: *'the institution of marriage'*.

1. Robots and The Factory of the Future

Within rich countries, there is in 2017 a new level of concern that long-term trends to greater technological sophistication and higher labour productivity may have entered a qualitatively new phase. Over many decades, increasing capital intensity of production and more sophisticated automation have meant that millions of manufacturing jobs have disappeared in North America and Europe and employment in manufacturing has shrunk as a percentage of the labour force. However, machine learning, new sensors and "Big Data" computer technology have recently created new worries that "it is largely already technologically possible to automate almost any task, provided that sufficient amounts of data are gathered for pattern recognition" (Frey and Osborne 2013:23). If so, occupations from truck driver to legal assistant that were once thought to be "safe" from replacement by computers may soon also become obsolete.

Estimates of possible impacts on employment vary widely. Frey and Osborne (2013) used an occupational classification to argue that 47% of all persons employed in the US are now working in jobs that could be performed by computers and algorithms within the next 10 to 20 years. Using a disaggregated task-based approach, Arntz, Gregory and Zierahnon (2016:4) have a much pleasanter (but still large) estimate – that "on average across the 21 OECD countries, 9 % of jobs are automatable". A point of agreement in these studies is that although the highly skilled and the well-educated have been and will be less affected, industrial jobs for low-skill workers are at severe risk. Hence, a crucial social problem in North America and Europe (and plausibly a principal cause of the political instability now jeopardizing the global trading environment) is the shrinkage of employment opportunities for the poorly educated – and particularly for poorly educated men.

Robots[12] are only part of the massive technical change which is now revolutionizing manufacturing. The development of specialized new materials, of bio-technology, of advanced sensors and artificial intelligence in machine operation (e.g. driverless cars and trucks) and of Additive Manufacturing technologies (3D printing)[13] are also having major impacts. The multiplicity of technologies which jointly affect manufacturing processes, their interactions and the speeds of their development make trying to forecast the "Factory of the Future" risky[14].

[12] The International Federation of Robotics (IFR) definition of a "Manipulating industrial robot" is "as defined by ISO 8373: An automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications" (IFR, 2012), see also ISO definitions here: https://www.iso.org/obp/ui/#iso:std:iso:8373:ed-2:v1:en

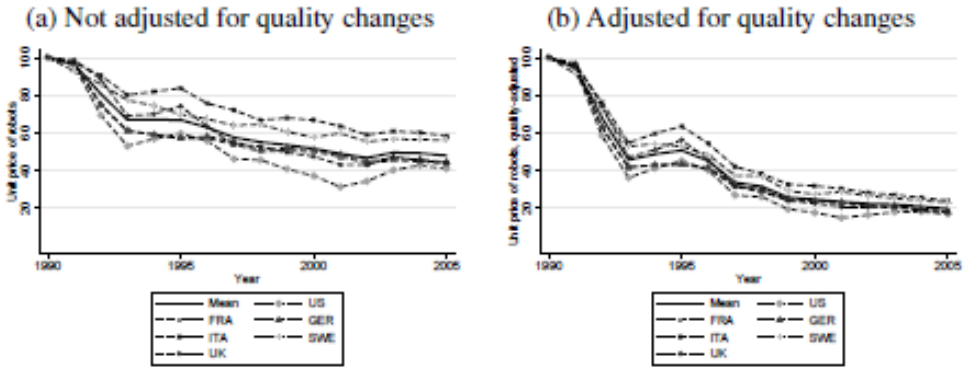
[13] See Smith (2015) and Baumers, Hollweg and Rowley (2016)

[14] Foresight (2013) is a major report published by the U.K. Government. The Goldman Sachs perspective can be found at http://www.goldmansachs.com/our-thinking/pages/factory-of-the-future.html?cid=PS_01_38_07_00_01_16_01&mkwid=F6SsTs7T

However, the role in economic development of the factories of the past – which used to absorb low-skilled migrants from rural areas – is clear. During the industrialization phase of the economic history of the U.K., the U.S., Canada, Japan and China, many millions of poorly educated workers left low-productivity agricultural work and moved to factories in the cities. Learning on the job, they needed only a basic education to do repetitive, low skill tasks on assembly lines. Firms invested in specialized, but also inflexible, capital equipment and achieved economies of scale with large production runs of standardized goods. In the U.S. and Canada, the productivity of "Fordist" factories often enabled assembly line workers to achieve middle class consumption norms. But recently the rapid spread of manufacturing systems organized around robots and the new manufacturing technologies has massively disrupted these old production models.

The price of industrial robots has been falling dramatically in recent years. Graetz and Michaels (2016:3 – see Figure 1) estimate that "by 2005 quality-adjusted robot prices were about one fifth of their 1990 level." Since these nominal price declines have to be compared to nominal price changes in competing inputs and since nominal wages grew on average by 105 percent in these six countries, the comparative price decline was much greater – relative to labour costs in rich countries the quality-adjusted price of robots in 2005 was about 10% of the 1990 level.

Figure 1: The Price of Robots in Six Countries 1990-2005



Source: Graetz and Michaels (2016:42)

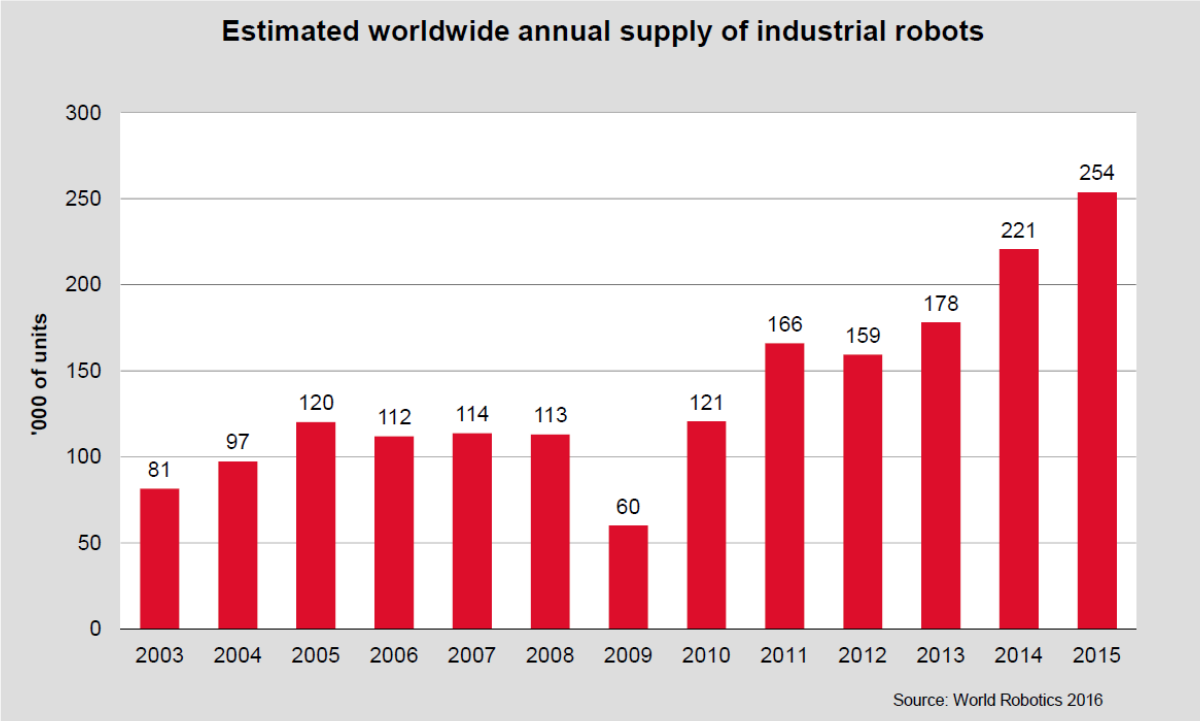
Robot prices continue to drop. In January 2017, industry sources estimated that "Complete with controllers and teach pendants, new industrial robotics cost from $50,000 to $80,000. Once application-specific peripherals are added, the robot system costs anywhere from $100,000 to $150,000. Reconditioned robots are a less expensive option. Typically, used robots cost half as much as new robots[15]." Typical applications of industrial

[15] https://www.robots.com/faq/show/how-much-do-industrial-robots-cost

robots include assembling, dispensing, handling, processing (for instance, cutting) and welding, all of which are prevalent in manufacturing industries; as well as harvesting (in agriculture) and inspecting of equipment and structures (common in power plants). Graetz and Michaels (2016) note that "case studies indicate that investing in robots can be highly profitable, with repayment periods of 2-18 months. Our calculations suggest that this reflects high rates of return, on the order of 25-200 percent annually."

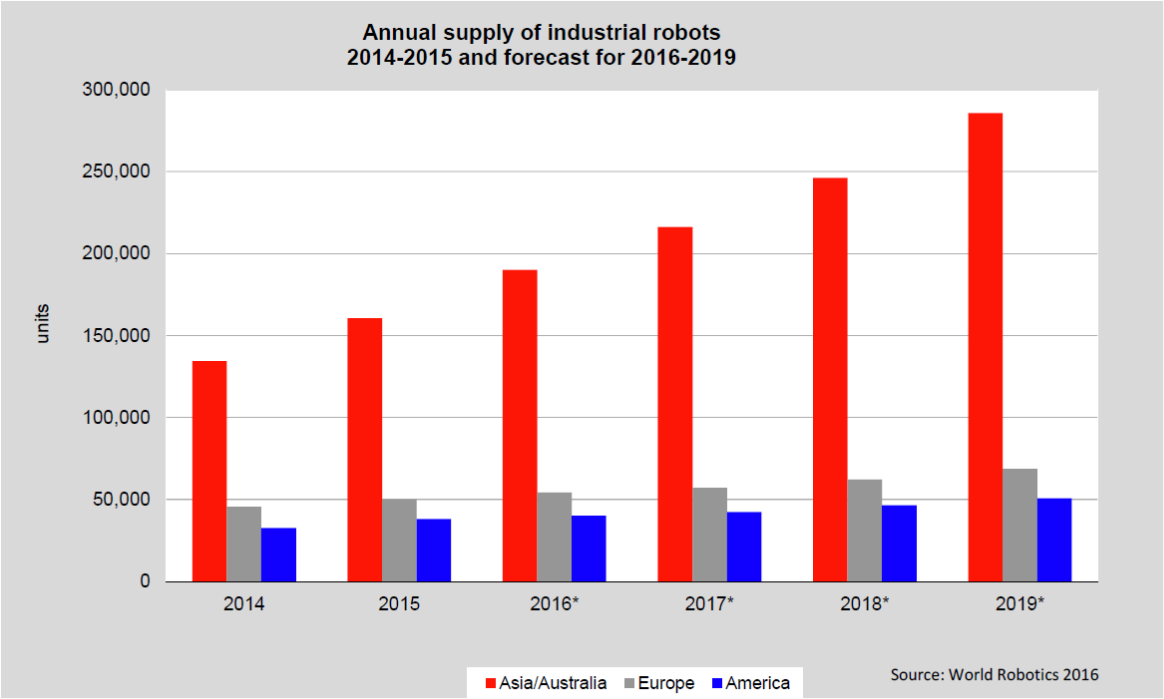
Not surprisingly, global sales of industrial robots have increased rapidly (Figure 2) and are forecast to go even higher (Figure 3)[16].

Figure 2



[16] Figures 2 and 3 are taken from http://www.ifr.org/fileadmin/user_upload/downloads/World_Robotics/2016/Executive_Summary_WR_Industrial_Robots_2016.pdf

Figure 3



Tanzania has very low wage labour in great abundance, and industrial jobs are sorely needed. But the question for Industrialization Led Growth in Tanzania is how many Tanzanians will have the skill mixes that will be needed in the factories of 2020 and 2030. Currently, less than one fifth of one percent of industrial robots sold worldwide are installed in all of Africa,[17] but this paper will argue that it would be a mistake to base an industrialization strategy for Tanzania around the assumption that low wage labour can always substitute for robots, additive manufacturing and the other new manufacturing technologies.

Saving direct labour cost is only part of the profitability advantages of robotics. At particular stages of many production processes, machines just do it much better – the consistency and precision of robots can enable major savings in materials wastage and huge improvements in product quality and reliability. Robots can do dangerous tasks in toxic environments, thereby reducing work place accidents and plant downtime. Robots can often perform operations in places that are impossible for human labour, at speeds that humans cannot match. If properly

[17] Specifically, Africa was the destination for 428 robots out of 220,571 sold in 2014 and for 800 out of the 414,000 which are forecast for 2019 – see Table 1 of http://www.ifr.org/fileadmin/user_upload/downloads/World_Robotics/2016/Executive_Summary_WR_Industrial_Robots_2016.pdf

maintained, they can operate 24 hours a day, 365 days a year, never going on strike or asking for a raise.

These advantages ensure that in some operations in many production processes, robotics are a dominant production strategy, *whatever the wage rate of labour*. Human labour can sometimes compete because not all stages of manufacturing processes always require high precision and absolute consistency. Low-skill, low-wage labour can be a complement to robots, because human labour can be cheaper to use in some operations of the production process, such as final finishing or assembly or inspection and packaging[18].

In particular, the *National Five Year Development Plan 2016/17 – 2020/21* has identified (2016:50) the "Machinery and Automotive Assembly Industries", as a flagship project for the Central Development Corridor. Automobile assembly is today one of the most intensive users of robotic technology, partly because their precision and dependable quality in some operations (e.g. frame assembly) cannot be matched by humans. Automobile manufacturing remains a major employer, however, because some types of parts and some assembly stages are still labour intensive, where unskilled labour can also do the job.

Highly skilled workers are still needed in factories with many robots because humans can solve unanticipated problems. In principle, computer-aided design should mean that specifications flow electronically from the designer's computer terminal to the factory floor – but in practice there are many glitches. The downside of robotic consistency is that although a properly programmed robot can make 300,000 perfect welds and not be tired, an improperly programmed robot can make 300,000 missed welds and not know the difference. Human labour is still needed to catch mistakes and to reprogram robots.

Since expensive mistakes can have subtle origins, which can often only be detected by smart, highly motivated and highly skilled workers, in highly automated factories the soft technology of worker motivation and organization is just as important to profitability as the hard technology of capital equipment and cognitive skills. As an example, there is an aircraft engine component plant near Halifax where for years the machines have run 24 hours a day, 365 days a year, even though on night shift there is only one person on the premises – a security guard watching video monitors for fires and intruders. Components are transferred by robot from machining station to station and robotically stacked in the warehouse on completion. The 300 people employed on the day shift are there because adjustments are always needed when new components are tool-proofed. To optimize production, workers have to combine practical machining skills with knowledge of programming languages and an understanding of the geometry and specifications of component designs. The plant manager's example of how multi-skilled employees, working in teams, were needed to solve production problems was of how inconsistent machining on one part was finally traced to differences in temperature between the sides of the plant nearer and further away from the windows. Even with air conditioning in the

[18] See Osberg, Wien and Grude (1995) for some case studies.

plant, slight differences in plant temperature, which varied between sunny days and cloudy days, made a difference to the tolerances achieved in machining, because metals expand at different rates – but this glitch in production could not be foreseen in the initial design stage.

For long production runs, some manufacturing operations need the consistent, high speed accuracy of robots, which in turn requires highly-skilled operators to debug glitches in programming and set-up. As a consequence, the employment of low-skill workers in other stages of the same production process depends on the availability of a cadre of local people with the necessary skills. And "the necessary skills" include more than just cognitive knowledge. Social skills (since team work is characteristic of high performance workplaces), problem-solving aptitude and the ability and eagerness to learn new technologies and "grow with the firm" are also required. Since it is absolutely clear to management that available technologies are changing rapidly, management wants workers who buy into the company's goals, who will be self-motivated to anticipate and solve production problems before the problems become costly[19] and who invest extra effort in their jobs even when nobody is watching. Hence, the firm has to guarantee[20] continuing employment to their core cadre of permanent workers, which implies that the skilled workers that are hired in 2017 have to be able to learn, and excel in, the production techniques that will be coming into play in 2027, 2037 and 2047. "Ability and willingness to learn" is thus crucial. It is, of course, certainly important for the firm that workers have a good education at the time of their hiring, but skilled workers will for certain also have to learn a lot more during their work life.

The flexibility of additive manufacturing (also known as 3D Printing) and the development of a huge variety of new materials for a wide range of end uses implies that today "variety can be produced at zero marginal cost" (Baumers et al, 2016:15). For short production runs, and custom manufacturing, it is a revolutionary technology. Many analysts forecast that warehouses of spare parts will someday be largely a memory, replaced by libraries of computer code and a few 3D Printers – which may help reduce capital equipment downtime in isolated locations. Nevertheless, small imperfections in the build process of 3D Printing can generate significant wastage costs, so skilled machine operators are just as central to productivity in additive manufacturing as they are for robotics.

There clearly are huge uncertainties about the labour market implications of the new manufacturing technologies, and around the world there are a variety of international models for

[19] In capital-intensive continuous process manufacturing – e.g. paper mills, oil refineries and (increasingly) underground mining – *capital productivity* is the key to profitability. One of my favourite quotes from a management consultant is that he could always tell a low productivity paper mill from a high productivity paper mill as soon as he walked in the door, because everybody works so hard in a low-productivity mill (to fix the machines which are not running well). By contrast, in a high productivity mill nobody seems to be doing much, since potential problems have already been, and are being, anticipated – and the machines are always running full tilt.

[20] Unlike many continental European countries, Canadian employment law has very few restrictions on the dismissal or layoff of employees, and most (84%) of Canada's private sector employment is non-union. Hence, it is the implicit contract of company policies which guarantees stable jobs for core employees (who are often combined with a pool of workers on temporary contract terms).

how best to provide the education and training that the factory of the future will need. In the Canadian educational system, there is an emphasis in primary and secondary school on producing both cognitive factual knowledge and social skills and general problem solving abilities. The high school system introduces some directly job-relevant skills, but mostly it is also oriented to producing these different types of "General Human Capital".

The Canadian "technical/community college" system follows secondary school completion and builds on these general purpose skills[21]. It is oriented to directly job-relevant production skills, and course offerings are tightly coordinated with employer needs and aspire to offering "state of the art" training. The college system offers both introductory courses and short advanced refresher workshops for experienced workers, often designed in close consultation with advisory boards of local employers (which is particularly important in high-technology occupations). It is not seen as unusual for university graduates to enroll in community colleges, in order to complement their general education with directly job-relevant specific skill training.

Other nations' school systems have somewhat different arrangements of vocational training and general education, but the basic issue is that in the factory of the future the jobs of unskilled workers will often depend on the availability of a few highly skilled technicians. The skilled technicians of future factories will need both a good general educational background and specific industrial training on state of the art equipment. However, a particular problem in the Tanzanian context is that the social skills and problem solving abilities that are crucial to high-technology success are also more difficult to produce when teaching strategies reinforce rote memorization and large class sizes preclude individual attention.

[21] Vocational Training is discussed by the National Five Year Plan (2016:180). A useful portal to access vocational training information in Canada is https://www.vocationalschools.ca/

2. Central Banks and Industrialization Led Growth in a Petro-Currency

One item of very good news in Tanzania in recent years has been the discovery of large natural gas deposits. However, making the most out of the potential of oil and gas can also require re-evaluating existing policies to see if they are appropriate to the new circumstances. Fortunately, REPOA has been in the forefront of analysis of the potential and the pitfalls of Tanzania becoming a petro-state[22]. Many lessons could be drawn from Canadian experiences, but this paper will argue that managing the implications for the manufacturing sector of becoming a petro-currency has not been one of Canada's success stories. Canada's experience does illustrate, however, how the central bank's institutional capacity to manage the challenges of a petro-currency can be crucial for Industrialization Led Growth, because unless offset, the volatility and unpredictability of world oil prices can be transmitted to employment in the non-oil sectors of the economy, through the exchange rate.

Figure 4 is just one of many time series that could be plotted to illustrate the long term volatility of oil and natural gas prices. Figure 5 is included as an illustration of the perils of oil price prediction and is drawn from a technically excellent IMF working paper (Benes et al., 2012) which assessed in detail the likely growth of world oil demand, the geologic constraints on future oil production and the likely future evolution of extraction technology. It is to be noted that their projections have a 90 % confidence interval which for 2016 spans the considerable range of $100 to $170 (U.S.) per barrel, increasing to the range of $120 to $240 per barrel by 2021. One could wonder how useful such a wide confidence interval for oil price estimates is for policy making.[23] However, this range has been insufficient. A year ago, during March 2016, West Texas Intermediate traded in the range $34.56 to $37.99, trending slightly up thereafter – this year, it was trading at $53.21 on February 14th. *The actual price of oil in 2016-2017 has thus often been considerably less than <u>half</u> of the lower bound of the 90% confidence interval on predicted prices.*[24]

[22] See http://www.repoa.or.tz/publications/category/working_papers

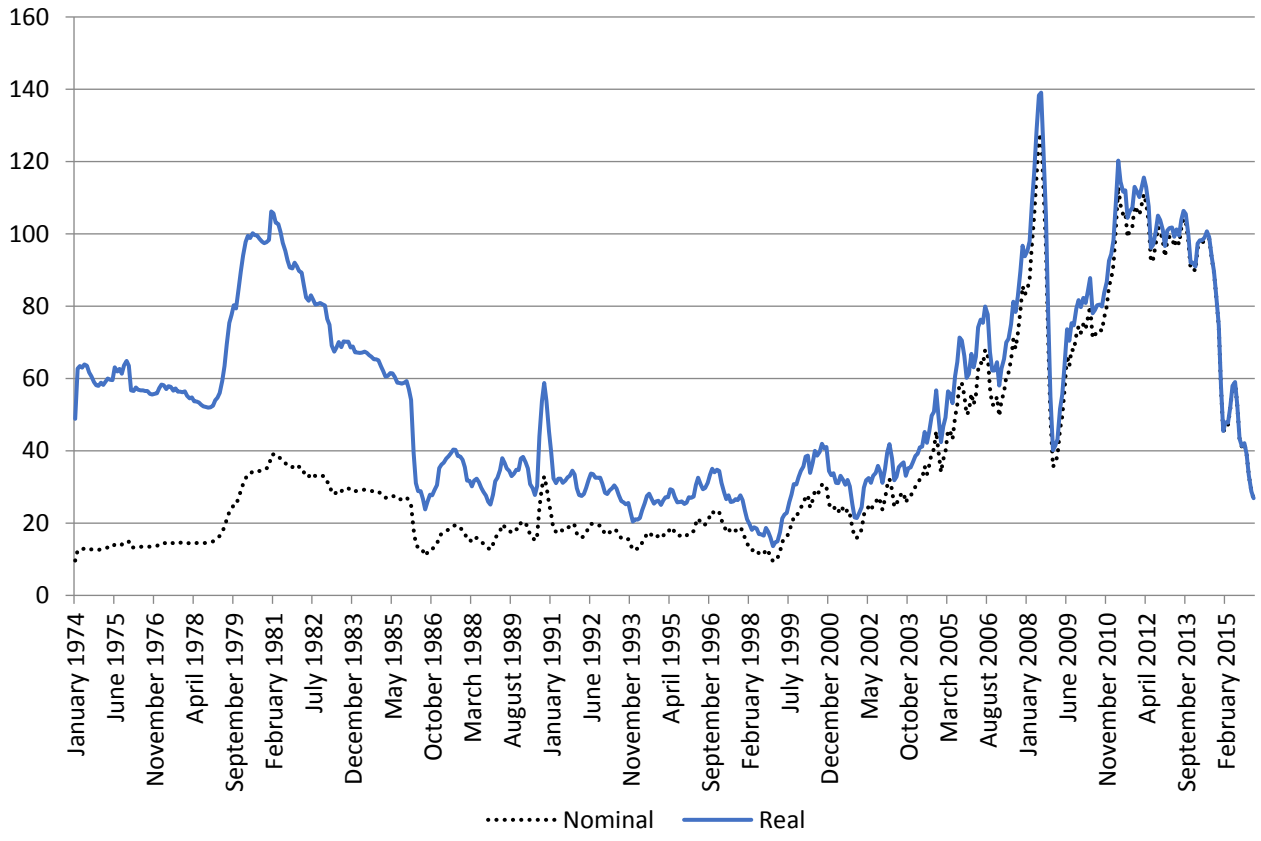
[23]The April 2016 IMF World Economic Outlook projects a similarly wide confidence band for oil prices in 2020 – but the lower range of $15 to $120 per barrel – see Figure 1.SF.1 IMF (2016)

[24]See https://ycharts.com/indicators/crude_oil_spot_price

Figure 4:

Real and Nominal Average Price of Imported Crude Oil, United States,

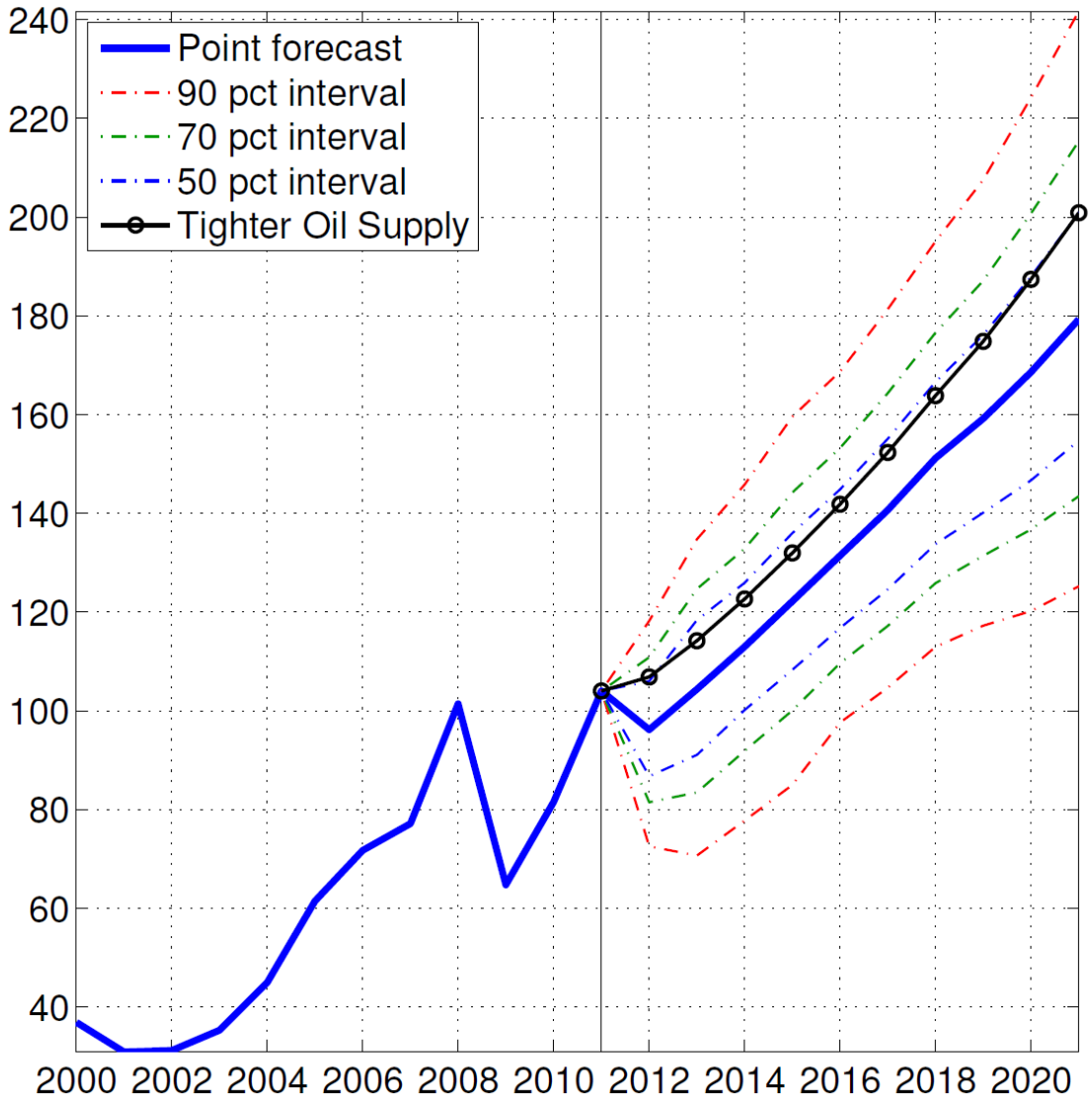
U.S. Dollars per Barrel, 1974-2016



Source: EIA Short-Term Energy Outlook, https://www.eia.gov/forecasts/steo/data.cfm?type=tables

Figure 5

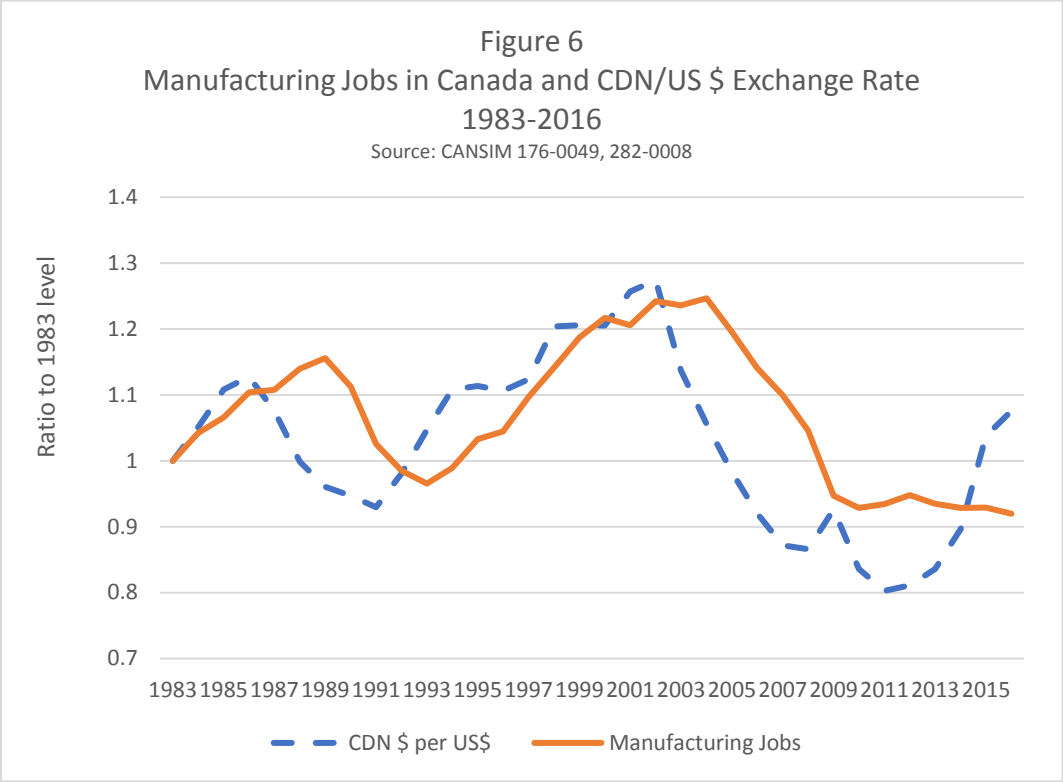
Real Oil Price Forecast with Error Bands, 2011 U.S. Dollars per Barrel



Source: reproduced from Figure 11 in Benes et al. (2012:31)

So if petroleum energy prices are volatile and unpredictable, what happens to industrialization led growth when a country's currency becomes linked to oil and natural gas prices? Figure 6 plots manufacturing employment in Canada (expressed as a ratio of its 1983 level, which was 1,842,800 jobs) and the Canada/U.S. exchange rate (also expressed as a ratio of its 1983 level, which was $1.23 CDN = $1 US). As Figure 6 illustrates, the exchange rate has historically lead manufacturing employment in Canada by a little under two years. Until recently,

one could usually depend on the proposition that when the Canadian dollar was cheap, exports boomed and imports slumped and Canadian manufacturers made money and hired workers. Conversely, when the Canadian dollar appreciated in value, net manufacturing exports slumped, factories closed and manufacturing jobs disappeared.



In the U.S., the share of manufacturing in total employment declined throughout the 1990s, but as the Canadian dollar exchange rate depreciated from $1.14 CDN per $1 U.S. in 1991 to $1.57 CDN per $1 US in 2002, Canadian manufacturing employment increased by 29% – adding 509,700 jobs between 1993 and 2002. [25] Canadian manufacturing employment was then a higher percentage of total employment than in either the U.S. or the U.K[26].

As Figure 4 illustrates, oil prices started to spike upwards in 2002, and the Canadian dollar followed. From 2005 to 2014, Canada saw the other side of the exchange rate effect of being a petro-currency – as the CDN $ exchange rate appreciated, manufacturing employment collapsed (a loss of 586,200 jobs, 2004-2014).

But although there has been a significant depreciation of the CDN $ since 2013, and the normal two year lag means that manufacturing jobs should have started to return in 2015, this has not yet happened. The earnest hope of Canadian policy-makers continues to be that the historic pattern will hold and manufacturing jobs will return to Canada but the seasonally-

[25] In the late 1990s, Canada also had free trade access to the U.S. market and U.S. consumer demand was booming as the U.S. Fed under Greenspan let unemployment go below 4%.
[26] See CANSIM TABLE 176-0064 and Pilat et al (2006) Figure 2, page 6

adjusted estimate of 1,682,000 manufacturing jobs in January 2017[27] was the lowest recorded total since CANSIM data began in 1976[28].

Despite a 32% depreciation of the CDN $ since its above-parity heights in 2011-2012, manufacturing jobs have not returned to Canada. As Stanford (2017) notes, in Australia, whose currency also followed the swings of the resource super-cycle, appreciation of the exchange rate has combined with trade liberalization to eliminate entirely the local auto industry. The closing of the last three assembly plants (GM, Ford and Toyota) by 2017 both marked the end of an Australian industry and killed off a network of supplier firms (which makes any future reopening of assembly operations much less likely)[29]. So a current Canadian anxiety is whether the impact of foreign exchange value fluctuations on manufacturing employment has become asymmetric, in the sense that an exchange rate appreciation can close unprofitable factories but an exchange rate depreciation may not be able to bring them back to life any more. (A hypothesis that becomes more plausible as low-skilled labour paid in domestic currency becomes an increasingly unimportant component of total costs, and therefore ineffective as an important incentive to re-establish plants once they are closed.)

It should be noted that in overcoming the impacts of petro-currency volatility on manufacturing employment, Canada has some advantages that Tanzania can never expect to get. Most of Canada's manufacturing capacity is no more than an hour's drive from the U.S. border and its 320 Million consumers. Free Trade agreements have encouraged the continental integration of manufacturing operations for the past thirty years. Both Canadian-owned and American-owned firms often have operations on both sides of the border and it has often been easy for them to switch some operations between plants and thereby alter the balance of production in the direction of the cheaper currency, while maintaining the option of shifting back if the exchange rate moves the other way. Canadian manufacturing has a long history and an "eco-system" of suppliers, service providers and training institutions which has been established for decades. All these factors assist the resilience of Canadian manufacturing firms in the event of petro-currency induced exchange rate volatility – but Canada still has not yet seen a resurgence of manufacturing employment.

Since the likelihood of exchange rate volatility depends partly on whether and what a country's Central Bank attempts to do anything about it, the choice of Central Bank policy regime is an "institutional" decision with important implications for Industrialization Led Growth. Monetary policy in Canada has, since the 1980s, targeted the inflation rate[30] as its sole

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[27] CANSIM Table 282-0088

[28] As of February 15th 2017, the Canadian dollar was at $1.3089 CDN = $1 US.

[29] Stanford argues that the Canadian automotive industry's locational and scale advantages make a demise less likely, but it remains hostage to exchange rate trends and increasingly unbalanced flows of trade in the new generation of "free trade" agreements.

[30] The legislated mandate of the Bank of Canada remains that specified in the Bank of Canada Act (1934)"to regulate credit and currency in the best interest of the economic life of the nation, to control and protect the external value of the national monetary unit and to mitigate by its influence fluctuations in the general level of production,

policy objective. This policy has successfully attained a stable 2% inflation rate since the early 1990s, but an implication of having only one macro-economic variable as the policy target is that other macro-economic variables (like the exchange rate) are ignored in monetary policy making. Manufacturing sector employment volatility in Canada provides a cautionary example of one of the implications of this strategy[31].

3. The Institutional Context of International Trade: Implications for Manufacturing

At a workshop on industrial policy in March 2017, one has to inject a note of uncertainty that just six months ago would probably not have even been mentioned. Prior to the election of President Trump in the U.S., it was a pretty general expectation that the architecture of the institutions governing global trade, which the United States has been so instrumental in constructing over the last seventy years, would continue to operate unchanged. The long term trend to decreasing tariff barriers and the expansion of trade agreements increasingly constraining the non-tariff policy space of national governments seemed irreversible. With ever faster telecommunications and ever cheaper shipping, the power of economies of scale in the "global value chains" of transnational corporations seemed unstoppable. It seemed clear that these firms would assign the locations for components manufacturing and assembly in the increasingly differentiated, but globally integrated, production process.

It now appears that the world has a new layer of uncertainty, hazards and possible opportunities. If the U.S. now retreats from its traditional role of trade openness and active engagement in multilateral trade governance, it is unlikely that a vacuum would persist for long. As competing powers (e.g. China) seek to influence trade governance, the question for smaller nations is whether, at their own particular stage of economic development, their interests would be better served by the current governance model or by other trade governance models. Hazards abound but also opportunities.

Free trade agreements constrain the tariff policy choices available to government to encourage industrialization and, in addition, they can constrain the technologies available – the protection of intellectual property rights has become a major theme of some free trade

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trade, prices and employment." By agreement between the Bank of Canada and the Minister of Finance, this has been reinterpreted as 2% inflation (+ or - 1%).

[31] The Bank of Tanzania Act (2006) could allow for some interpretation of the primacy of inflation or growth objectives: "The primary objective of the Bank shall be to formulate, define and implement monetary policy, directed to the economic objective of maintaining domestic price stability, conducive to a balanced and sustainable growth of the national economy of Tanzania". However, the Bank itself declares inflation to be "the Nation's Economic Enemy Number One" http://www.bot.go.tz/AboutBOT/BOTFunction.asp The preamble to that statement primarily emphasizes "the growing consensus throughout the world" regarding the goal of price stability – no reference is made to any research documenting the optimality in the Tanzanian context of aiming solely at price stability. The author of this paper is by now old enough to remember several previous international consensuses regarding the goals and methods of central banks.

agreements – which represents a significant change from the technology transfer possibilities in place when today's rich countries industrialized. During the 1800s, in the early stages of its own industrialization, the U.S. copied the factory technology of the UK when it was profitable to do so. Japan and China similarly copied foreign technologies as their manufacturing sectors emerged. Historically, patent rights are a relatively recent invention and prior to their enforcement, innovators had to expect to be copied.[32] Paying for the rights to industrial technology has never been in the interest of emerging manufacturing nations. But now that the U.S. (and to a lesser extent Canada) have themselves industrialized and now own patents and technology copyrights, it is perhaps not surprising that views on technology transfer have changed.

As Section 1 discussed, industrial technologies which used to be embodied in specific capital equipment and in the manual skills of an experienced workforce, learned and passed on over decades, have been increasingly digitized into the computer code which runs multi-purpose industrial robots and 3D printing stations. Since this code can now easily be copied and transmitted, the technical possibilities for instantaneous and costless technology transfer are now immense. The constraint, however, is global enforcement of intellectual property rights. One of the institutions which influence the benefits and feasibility of industrialization led growth therefore is the global trade governance regime – which may be entering a new era of flux. And if international trade rules are subject to new levels of uncertainty and if discussion of intellectual property rights is part of a possible renegotiation agenda, would the interests of Tanzania be better served in a world where less attention is paid to the protection of, and payment for, intellectual property rights? Would Tanzania also be better off without having to give as strong guarantees for the protection of investor rights and the compensation of loss of potential profits?

In general, Canada and Tanzania have very different economies but in international trade issues both countries have adopted a similar set of trade policies over the last thirty years. Both Canada and Tanzania have cut tariffs on imported goods substantially. Canada's average tariff rate was 7.2% in 1989, dropped to under 2% since 1997-1998 and in 2015 was 0.96%. In Tanzania, tariffs went from an average 18.3% in 1997-1998 to an average 7.2% in 2007 and 6.5% in 2015[33]. Both countries have also joined multiple free trade zones – in Tanzania's case, COMESA, EAC and SADC, and in Canada's case, the FTA, NAFTA and now CETA[34]. Both countries have thereby foresworn the possibility of using tariff protections to shelter infant industries, or of using "managed trade" agreements as an instrument of industrial strategy. In

[32] See Mokyr (1990) – especially pages 247-252.
[33] http://databank.worldbank.org/data/reports.aspx?source=2&series=TM.TAX.MRCH.WM.AR.ZS&country=
[34] In addition, Global Affairs Canada lists some 87 bilateral agreements at https://www.international.gc.ca/trade-commerce/trade-agreements-accords-commerciaux/agr-acc/index.aspx?lang=eng

both nations, a new faith in unfettered markets has replaced the old policies of import substitution, infant industry protection and managed trade.

Canada now has a sophisticated manufacturing sector, albeit one that in 2016 provided only about 9.4% of employment. But Canada did not acquire this sector under institutions of trade governance that were remotely similar to its current official perspective of ever-greater trade liberalization. As noted earlier, when Confederation in 1867 brought together the British North American colonies, tariffs were the principle source of government revenues. Creating a common economic space, behind tariff walls, was then seen as a nation-building exercise. Since the U.S. has always been richer, much larger and very nearby, many Canadians then believed that without a "National Policy", trade flows would run North-South rather than East-West and large established American manufacturers would use their economies of scale and established market presence to undercut any emergent local manufacturing sector. The recognized disadvantage of protectionism was that although American firms established branch plants in Canada (most often in Southern Ontario or Quebec) to supply the Canadian market and manufacturing employment rose, the shorter production runs to service a smaller Canadian market increased average costs.[35] [36]

In Canada's case, "Managed Trade" offered, in some sectors, a solution to the cost issue. Canada signed an Auto Pact with the U.S. in 1965 and as Stanford (2017: S62) notes: "The Auto Pact eliminated tariffs on trade between the United States and Canada in passenger vehicles, heavy trucks, and automotive components, but conditions were attached to the liberalization: The Canadian industry was provided with safeguards[37] to ensure it retained at least a proportionate share of total production even as the industry rationalized along north–south lines. Companies that did not meet those safeguards risked losing their tariff preferences (which would snap back to MFN levels); this was not a hypothetical possibility, and the threat of tariff re-imposition was successfully wielded by the federal government to leverage additional investment in Canadian assembly and components operations. The Canadian industry became a net exporter of vehicles by the early 1970s."

With some product lines produced north of the border and some produced south of it, the 1965 Auto Pact enabled the U.S. Big Three (GM, Ford and Chrysler) to achieve full economies of scale in North American manufacturing, while retaining tariff protection from offshore competitors. Several Japanese automakers also qualified when they established, as their market share in Canada grew, Canadian assembly plants to gain access to the North American market. However, as a sectoral agreement, the Auto Pact was inconsistent with modern models of trade

[35] The western provinces greatly resented having to purchase more expensive Central Canadian products.
[36] Note that additive manufacturing and robotic technologies imply little cost disadvantage for short production runs.
[37] That participating car firms produce as many cars and light trucks in Canada as they sold there and that total value added in Canadian manufacturing (including purchased components) would represent at least 60 percent of total value added sold in Canada.

liberalization. It was largely superseded by the 1994 NAFTA agreement between the US, Mexico and Canada and was abolished in 2001 after a 1999 World Trade Organization (WTO) ruling on a complaint from other Japanese car-makers. Nevertheless, the expansion of the Auto Pact period left a legacy of production facilities, supplier firms, skilled labour and training institutions across Southern Ontario. A few Canadian auto parts suppliers (e.g. Magna) have also grown into major international players in the industry.

Although the actual establishment and growth of Canada's automotive industry occurred in the context of tariff protections and managed trade agreements which have now been discarded[38], one possible "counter-factual" hypothetical question for Canadians is: would this growth have happened anyway, if Canada in the early 1900s had adopted the tariff structure and trade openness of, for example, Tanzania in 2017? But policy makers in Tanzania today have to ask themselves an even tougher question, given the technological changes in automotive manufacture that have occurred over the past century.

Today's highly robot-intensive automobile assembly plants rely on the absolutely dependable "just in time" delivery of fault-free components from their auto parts supplier networks, which implies that assembly operations now depend on simultaneously establishing a complex of linked, high performance firms. As already noted, Tanzania's *National Five Year Development Plan 2016/17 – 2020/21* has identified (2016:50) the "Machinery and Automotive Assembly Industries", as a flagship project for the Central Development Corridor. But what institutional mechanisms are now available to make this happen, given existing free trade agreements and given also a general commitment to low tariffs and trade openness multi-laterally?

The intellectual case for free trade agreements rests on the proposition that total output is maximized when market forces allocate resources and economic activities over space, because expanding the geographic space for unencumbered trade increases opportunities for trade and, thereby, the aggregate gains from trade. In the "neo-classical" trade models which underlie this belief, firms use market prices as the signals that guide the allocation of activities and governments do not interfere with these market signals. Total output is expected to increase under free trade <u>because</u> it is expected that some activities will be reallocated across countries after the agreement. In the North American context, some firms will move from Canada and the U.S. to Mexico because they are attracted by low wages while others will move from Mexico or Canada to the U.S. to benefit from agglomerations of similar firms (e.g. concentrations of specialist expertise in the financial sector, or existing parts suppliers in the auto industry).

[38] Canada's past dependence on now prohibited policies is not unusual. In decades gone by, home-grown automobile makers in Japan and Korea (like Kia and Honda) grew behind tariff walls in highly directed economies from origins in motorcycle manufacturing. In comparatively less dirigiste market economies like Australia or Argentina, auto assembly started because already established global car makers like Ford or GM saw the tariff advantage that local manufacturing would get over competitor firms. In China, automobile assembly got started in a planned economy.

Implicit in the policy objective of maximizing total output is the assumption that either the distribution of gains and losses from free trade does not matter or that any distributional issues are satisfied by other mechanisms. If total output increases, the winners *could* compensate the losers, and still have something left over, so if free trade increases total output, it is at least *potentially* a Pareto-superior outcome. It is assumed that the electorate is satisfied with potential, and not actual, compensation. Also implicit in the objective of maximizing total output is the assumption that the electorate does not care about the structure of production and *how* incomes are made. Since "the market" allocates investment, industrial policy largely disappears. There is no space in the free trade vocabulary for historic Canadian concerns about being forever "hewers of wood and drawers of water" (or for Tanzanian aspirations for industrialization). Individuals are also assumed to have standard neo-classical preferences – thereby ruling out as "irrational" any preferences for local community or sovereignty or historic ways of doing things[39].

Political stability is another implicit assumption in the "ceteris paribus – holding other things constant" neo-classical methodology which underlies free trade agreements. It is assumed that nation states, and their commitments to other nation states, will continue unaltered into the future. In 2016, the Brexit vote in the U.K. and the Trump election in the U.S. clearly called into question the realism of these assumptions. Whatever the merits of the theoretical economics case for free trade zones, the world is in the process of discovering whether the political economy of free trade is sustainable.

What happens when local governments within free trade areas are not content with letting "the market" allocate investments and jobs? Canada's experience is that within a free trade area like NAFTA, large firms in every industry effectively now invite bidding wars for new plant locations. Sub-national jurisdictions (e.g. Canadian provinces and Mexican and U.S. states) are expected to compete for new plant investment with bids of grants, loans, tax holidays, infrastructure investments and other investment incentives. Some jurisdictions are clearly non-competitive for a given plant and do not bid, while regions with an already established network of supplier firms and already built infrastructure can be competitive even with a smaller incentive package. But once one jurisdiction starts to offer location incentives, others do not want to risk being left behind for new plants (in both manufacturing and footloose services, such

[39] The Canada/EU agreement (CETA), for example, requires "national treatment" for foreign suppliers in public procurement – it will become illegal for local government to help out local businesses. The premise of the agreement is that people have no sense of community and do not care if workers from outside are brought in to work on local projects. Trade agreements now also demand substantial constraints on the policies of signatory governments – e.g. in copyright and patent laws which codify the protection of intellectual property or in the planning permissions and environmental laws which might constrain the prospective profits of foreign investors. Whether or not differential policies would actually reduce social well-being, the sovereignty issue is whether the local democratic process has any more "the right to be wrong."

as call centres). Competition for the location of new automobile assembly plants is particularly intense[40].

To use the auto industry as an example of the policy dilemma this creates, the 2012 Census reported[41] that 226,936 Tanzanian households (2.5% of all households) owned a motor vehicle. This statistic can be seen from two angles, since it reflects both the small current size of the Tanzanian market for automobiles and the massive potential for increased future market demand, as real incomes and population grow. By 2025, UN projections forecast the Tanzanian population will be 72 Million[42] (larger than France) and at some point, growing incomes will generate a sufficiently large local market that local assembly plants are plausible. However, South Africa clearly starts now with many major locational advantages within the SADC because already established plants have existing local supplier linkages. Because the agglomeration advantages of a South African location increase with time, the cost of an incentive package to lure a new assembly plant to Tanzania is also likely to increase.

If a direct public sector role is ruled out (see Section 4), mega-million dollar incentive bids are the game that is played for large new private sector plant location decisions in a free trade world. For governments seeking to establish a new industry in places where it did not already exist, competition for new plants can be very pricey and very complex. In addition to deep financial pockets, this competition for large plant investment requires substantial institutional capacity because:

(1) governments need to calibrate the design of the package of incentives offered sufficiently finely to avoid giving away all the benefits of attracting the new industry;[43] and

(2) to make the locational bid package successful, a complex of new and interdependent firms is required, so governments need access to a wide spectrum of expertise to meet the full range of their operational needs.

However, another lesson from the Canadian experience with trade liberalization is that encouraging small business is feasible and there are many small niches in global and national marketplaces. Sometimes there may be an element of chance in why a particular plant servicing a particular niche arose in a particular place, but once started the firm has survived so far – so if a

[40] For example, industry sources report that Georgia's incentive package to Kia was $400 million in 2006. Faced with southern competition, established regions responded – in 2009 Michigan gave GM $779 million. (Chappell, 2012)

[41] NBS, 2014 Table 11.13 page 143 – 435,459 Tanzanian households owned motorcycles.

[42] https://esa.un.org/unpd/wpp/DataQuery/

[43] As an example of institutional capacity, the Automotive Policy Research Centre at McMaster University (http://aprc.mcmaster.ca/about) provides detailed background analysis of issues affecting the industry – e.g. http://aprc.mcmaster.ca/sites/default/files/pubs/sweeney-industry-profile-min-1.pdf

firm is there, public policy in Canada typically aims to try to keep it healthy and, if possible, growing[44]. Particularly for the less affluent Canadian provinces, the policy stance is one of supporting whatever has popped up in small and medium size businesses – because it can be much less costly and much less risky to marginally improve existing firms than attempt to attract very large new plants (such as auto assembly operations). This "bottom-up" approach to industrial assistance has much in common with agricultural extension work. Industrial outreach work builds on what small businesses are already doing and asks what public support (e.g. training programs, assistance in international marketing, shared infrastructure or R&D) might help them to do even better as an industry. Using Tanzania's first nationally representative survey of small businesses (The Micro, Small and Medium Sized Enterprise Survey (MSME) 2010), Diao, Kweka, McMillan and Qureshi (2016) have recently emphasized the potential importance to aggregate growth of productivity improvement within Tanzania's small scale, informal sector.

A case in point, to illustrate the difference between "bottom-up" and "top-down" policy approaches, might be public policy with regard to the small scale furniture manufacturing sector, which Tanzania's *National Five Year Development Plan 2016/17 – 2020/21* noted (2016:29) now provides 14.0% of manufacturing employment (i.e. 7,071 jobs). As it happens, the MSME data was collected during the time when I was working at REPOA in 2009-2010, and living out at Mbezi Juu. The many houses being built in the area got almost all their manufactured inputs, from cinder blocks to window frames, from small workshops in the area. Sitting in traffic on the way to work along the Bagamoyo Road, it was easy to see first-hand, from the car window, the ingenuity, entrepreneurship and severe under-capitalization of the informal furniture manufacturing sector[45] whose product furnishes those houses – and to wonder how much a few more machine tools or a bit of marketing or technical assistance might assist productivity and wages. In a nation whose urban population is growing at over 5 % annually there will be continually growing demand for the output of the furniture and building supply sector, both locally and regionally, and small informal firms are emerging to supply that demand. Diao et al (2016, Table 17) provide statistical evidence that access to capital and information are what these small businesses see as the main barriers to their growth.

In situations where small firms in a specific market niche have emerged, a "bottom-up" or industrial outreach policy perspective would ask what public policy can do to help them grow further – on the theory that when jobs are scarce there is no advantage in discouraging any particular type of manufacturing job creation[46]. However, based on the argument that furniture is a sector where both Tanzania's comparative advantage and world demand are falling, the Five

[44] My favourite example is MacKay Meters, who have been making parking meters since 1960 and now sell them around the world from a factory in New Glasgow, Nova Scotia (population 9,075). See http://www.mackaymeters.com/

[45] Mhede (2012) notes that the Bagamoyo Road cluster in one of three in Dar es Salaam.

[46] Admittedly, "Kupanga ni kuchagua", but revising plans to respond to opportunities is also a good idea.

Year Plan has come to a rather opposite policy conclusion (2016:43): "Tanzania should, unless for strategic reasons, avoid directing efforts to this category of products".

4. Self-Imposed Institutional Limits – The Accepted Policy Space of the Public Sector

The impact of free trade agreements on available policy choices is just one example of how the institutions that influence industrialization led growth have changed in the last fifty years. When one compares the situation now and then, in general and not just in Canada and Tanzania, one of the most striking changes has been the self-accepted shrinkage of what governments think that they can and should do. Governments in market economies around the world are institutions that have accepted a huge reduction in their potential role in industrialization led growth – and the lack of questioning of this acceptance is quite remarkable.

Canada has always been a self-described "capitalist" or "free market" society. Canada's experience has never included the level of public ownership and direct state intervention in the development process that Tanzania experimented with in the early 1970s. Nevertheless, in the 1970s Canadian governments nationalized electricity networks and steel producers, owned airlines and railroads and often directly intervened in job creation by establishing new enterprises in area where they were needed[47]. The 1970s were not an aberration. Public sector involvement in Canada's development has had a long history – in 1906, for example, Ontario Hydro was created as a public corporation, mandated to bring low cost electricity to Ontario's growing industries[48]. For many years, the general attitude was that of course Canada has a private ownership, market-based, capitalist economy, but if necessary, if the private sector is not doing at a reasonable cost something that really needs to be done, governments should not be shy about having a "crown corporation" do it. The public sector was then seen as capable of playing both a direct role, if necessary, in establishing and operating productive enterprises and a facilitative role, via infrastructure construction, human capital production, property rights enforcement, etc,

By contrast, state ownership and direct public intervention in the development process has been firmly out of fashion for some time now around the world. In Canada, most crown corporations have been privatized and since 2000 the federal government's role in the economy has shrunk as a percentage of GDP. In developing countries, the "Washington Consensus" has discouraged a directly productive role for the state[49]. In the new orthodoxy of economic development, the private sector is now supposed to supply all the visible actors, while governments are supposed to limit themselves to supporting roles off-stage as set designers and

[47] Specifically, Quebec Hydro, Sydney Steel, Air Canada, CN Rail and Cape Breton Development Corporation.
[48] There are many other examples – e.g. Polymer Corporation (1942) – see Bellamy (2007) – or Atomic Energy of Canada Limited (1952), without which Canada's nuclear industry would not now exist.

[49] Notwithstanding, in Pakistan, Egypt and some others the armed forces remain entwined in multiple commercial and industrial enterprises.

make-up artists. It has become an article of the new faith that governments cannot, and should not, "pick winners" and play a direct role in industrial strategy[50]. In less developed countries like Tanzania, aid consortia and trade rules now reinforce this vision of a purely facilitative state in a way that the Nyerere governments of the 1960s and 1970s never had to face.

The big question is – for whom does the new model actually work better than the old? It is doubtless true that restricting the public sector role in investment has avoided the costs of bad investments but it is also true that this has precluded the benefits of good investments[51]. If the bad investments avoided outweigh the good investments precluded, then limiting government's role should at least have increased economic growth. In Canada it is clear that although GDP per capita has grown, the long term shrinkage of government's role has not been accompanied by growing middle class prosperity. In Canada, the period since 1980 has been one of unbalanced growth, where real median household income and hourly real wages have stagnated while top end incomes have grown strongly[52]. Canadian evidence for an unquestioning acceptance of the redefinition of the institutional role of the state is thus distinctly mixed.

5. "We must run while others walk" – Conclusion

This essay starts from the perception that rapid economic growth and structural change are just as important now as they were fifty years ago to ending the grinding poverty of subsistence agriculture in Tanzania. Slogans like "Kilimo Kwanza" are useful reminders that agricultural modernization is essential to raising the standard of living of the 66% of Tanzania's population[53] who are farmers and pastoralists. But one cannot run very fast on only one leg. Agricultural modernization displaces labour, who need jobs to go to. And the farmers who remain in rural areas need buyers for their increased crops. So the wages of a growing non-farm sector are essential to raising the living standards of both rural and urban Tanzanians. Industrialization Led Growth is "the other leg" of structural change and development.

Over the last fifty years, Tanzania's population has grown to well over 50 million. Total population continues to increase at 2.7% per year, and internal migration means that the urban population is growing much faster – at perhaps 5 % per year[54]. Generating jobs at reasonable wages for this expanding non-farm labour force is hugely important for both the improvement of living standards and for political and social stability. And part of the good news of the last fifty years is the increased institutional capacity of Tanzanian society (both state and non-state actors) to make this happen. The spectacular expansion of education in Tanzania means that there is a

[50] The development experiences of Japan and South Korea are seen as irrelevant.
[51] And it is also possible that restrictions of the public sector role have been asymmetric, in the sense that gains have been privatized while losses are socialized, as U.S. and Irish taxpayers experienced when some of their banking sectors became insolvent during the 2008 Financial Crisis.
[52] See Osberg (2014, 2016) or Duclos and Pellerin (2016) and references therein.
[53] NBS (2014 Table 12.1, page 149)
[54] HDR 2014 page xiii

potential pool of personnel available to staff simultaneously both "bottom up" industrial outreach programs to support, and help grow, small-scale manufacturers and the design and implementation work necessary for large-scale industrial projects. One can now use the existing pool of highly educated local personnel to build the expertise to have both "bottom-up" and "top-down" industrial strategy initiatives at the same time – in a way that was simply not possible years ago.

The bad news, however, is that it is now a bigger leap from the shamba to the factory floor than it ever used to be. When countries like Canada or the U.S. industrialized, the gap between the skills developed on the farm and the skills useful in industry was, for much of the manufacturing workforce, not nearly as great as it is today. An expanding industrial sector was then able to absorb the millions who left agriculture. However, in rich countries manufacturing employment has been trending down for decades and there is now an unprecedented level of anxiety about the ability of the manufacturing sector to produce jobs in future – and especially jobs for workers with high school or less education. Even with long established manufacturing sectors and developed institutions for industrial design, marketing assistance and skills training, manufacturing jobs are disappearing. The worry in rich countries is that new manufacturing technologies – in particular, robotics and additive manufacturing – are creating a job structure in manufacturing that has little place for unskilled labour.

With respect to less developed countries, Rodrik (2016) has recently warned of the economic and political implications of premature deindustrialization. The Tanzania Human Development Report 2014 has noted (2015: xviii) that "economic transformation has failed to create well-paid and productive employment for the majority of Tanzanians. As a result, surplus labour has taken refuge in the low productivity and low pay of the informal sector." Like this paper, the HDR emphasizes the potential importance of growth of manufacturing, but it also worries (2015:26) that "jobless growth" will not help solve Tanzania's problems. In this paper, the "?" in the sub-title is there because there are many uncertain shoals for policy-makers to navigate – but the stakes for economic and social development are so high that there is no feasible alternative[55].

Currently, wage levels that are now a small fraction of wages in North America and Europe mean that Tanzanian workers can "price themselves in" for some manufacturing jobs that would be automated in a higher wage environment. However, this essay has argued that a strategy for industrialization led growth in Tanzania cannot afford to ignore the training of skilled workers who can use the new manufacturing technologies, where cost-effective. Because the advantages of robotics and 3D printing at some stages of manufacturing production processes cannot be outweighed by low real wages, skilled technicians and low skill/low wage labour are

[55] UNCTAD (2015:114) puts a positive spin on its finding that "the story of growth in Africa over the past decade can be partly explained by the remarkable growth in the service sector", but they also emphasize the importance of linkages to manufacturing for future services growth. They are less than clear about how the past rate of growth in services can survive the end of the commodity super-cycle.

complements in production – i.e. jobs for low skill labour often depend on the simultaneous availability of a cadre of technicians who can monitor and adjust and adapt the new technologies.

[1] A crucial institution for Industrialization Led Growth is the technical/vocational college system, and in particular its ability to produce the advanced manufacturing technology skill sets that some jobs in future factories will need[56].

Since the output of domestic factories in Tanzania is not much sheltered from foreign competition by tariffs any more[57], the relative prices of domestically produced and imported manufactured goods depend on the real exchange rate. Canada's experiences as a petro-currency are an illustration of the implications for the manufacturing sector of exchange rate volatility and the crucial importance of the framework policies of the Central Bank – but Canada has some special characteristics (e.g. location) which limit the lessons that can be drawn. Nevertheless, it is clear that both the level of the real exchange rate and its variability over time affect the viability of a domestic manufacturing industry, and that monetary policy is of central importance to both.

[2] Becoming a petro-currency will pose new problems for Tanzania's optimal monetary policy. Since the feasibility of industrialization led growth depends in part on the stability and level of the exchange rate, it will be important to recognize the tradeoffs between monetary policy impacts.

As noted in Section 3, in both Canada and Tanzania, policy instruments like protective tariffs or managed trade or domestic subsidies for infant industries were once important for industrialization but have been signed away in free trade agreements and are now not part of the public policy toolkit. The policy levers still available include local government initiatives to assist in training, market development and sectoral R & D, which have often become important for small scale firms. Large firms have become adept at orchestrating competitions between local jurisdictions for job creating investments and thereby extracting, via incentive packages of loans, grants and reduced taxation, locational rent from local governments. Both industrial outreach work with small firms and participation in bidding wars to attract large firms require significant institutional capacity.

[56] The direct beneficiaries of advanced vocational training will be high school graduates, and more often than not they will be male. However, the indirect beneficiaries are the low-skill workers whose jobs are enabled because factories are built and the farmers whose crops are sold – and their families. It is these indirect beneficiaries which enable the achievement of Millenium Development Goals for pro-poor growth and gender equity.

[57] The delay and costs of port congestion in Dar es Salaam now act as an implicit tariff on all imports, so expansion of capacity at Bagamoyo will have both positive (lower imported input costs) and negative (less effective protection on finished product) implications for local industry.

[3] Small business assistance and industrial outreach programs can provide "bottom-up" assistance to small-scale informal manufacturing now servicing the local market, to help overcome barriers of access to markets, capital and expertise.

[4] The establishment of major new industrial complexes – e.g. automotive assembly – within a free trade area depends on government's willingness to either (a) compete in expensive bidding wars for new investment by private corporations or (b) directly invest via state enterprises.

Although Canada and Tanzania have very different economies and histories, in recent years their public policy frameworks have shared some fundamental aspects – a diminished role for the public sector, lower tariffs and enlarged free trade agreements, price stability as the sole objective of monetary policy, etc. In both countries, GDP per capita has grown but there is dissatisfaction with the stagnation of middle class living standards. In both countries, but particularly in Tanzania, the availability of jobs in manufacturing in future years will be crucial for economic growth and future political stability. Time will tell if existing policy models are up to the task, or if more active and direct public sector initiatives are required.

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