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**Policies Fostering the Participation of Businesses in Technology Transfer
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Outline

- What Technology Transfer (TT) is
- Why TT is under utilized by business
- Are incentives needed ?
- Should Government provide incentives?
- A survey of the policy initiatives in many countries to foster more TT
- Examples of the implementation of those policy initiatives
 - Some from developed countries
 - Some from developing countries
- Is it useful to look at the policies and initiatives of developed countries?
 - Are they relevant to developing countries?
 - I think it is.
 - Suggestions for how some of these policies in developed countries can, with modification, be adopted and made applicable by developing countries



What TT is

- TT describes the process by which the knowledge of technology
 - Is shared, or
 - Moves from creator to user
- Numerous mechanisms are used to achieve this transfer of technology:
 - IP License
 - IP Assignment
 - Research collaboration
 - Sponsored Research
 - Contracted research
 - Consultancy
 - IP assigned or licensed to a spin out company
 - Industry Training for industry adoption



Why TT is under utilized by business

1. Some universities and research institutes have no tech transfer capability

- They generate technology
- That technology is useful to business
- But there is no TT office that
 - Facilitates TT
 - Promotes TT opportunities to business
- As a result TT opportunities are not realized
 - University or research institute does not achieve its mission of its research outcomes benefitting the community
 - Business does not have the opportunity to participate in the achievement of that mission
- Either no TT office,
- TT office with insufficient skills or
- TT office with insufficient resources



Why TT is under utilized by business

2. Contracting R&D by businesses can be expensive

- The expense of R&D can deter businesses
- Research contracted to a company, which must work for a profit, is expensive
- Even research contracted to a university or research institute can be expensive
- R&D Expense can be out of the reach of SMEs



Why TT is under utilized by business

3. Collaboration may compromise confidentiality and competitive advantage

- Business collaborating together is perceived as requiring them to share their IP and confidential information
- That is perceived as compromising competitive advantage
- Lack of confidence that confidentiality and non-use obligations are adequate
- Even engaging a university or research institute to undertake research can be perceived as risky and may not occur
- Deters collaboration and engagement which could have led to TT



Why TT is under utilized by business

4. Lack of knowledge on where to access expertise

- A business may have no knowledge of where to go to access expertise
- It may not occur to it that a university or research institute might have the expertise needed
- Even if it occurs to businesses to make contact with a university or research institute
 - They may not know with whom to initiate that contact
 - Or, there may be no TT office with which to initiate that contact



Why TT is under utilized by business

5. Previous negative experiences with universities and research institutes

- Some businesses are deterred from engaging with universities and research institutes based on previous negative experiences that they don't want to repeat
- Two scenarios:
 - University deals with business where each experienced dealing with other
 - experience each has minimises points of negotiation stress
 - University deals with business where either
 - University has little or no experience in dealing with the needs of the business
 - The business has little or no experience in dealing with the needs of the university
- In each case a high risk of conflict, position setting, and feelings of “they won, we lost”
- Can deter further engagement by business



Why TT is under utilized by business

6. Myths

- Forbes magazine, 28 March 2013 issue
- “Eight Myths That Keep Small Businesses From Claiming R&D Tax Credit”.
 1. the R&D tax credit is only for companies that are inventing something brand new
 2. the R&D tax credit is only for companies with laboratories and test tubes
 3. the R&D tax credit isn't for companies in my industry
 4. the R&D tax credit is only for the big companies
 5. the R&D tax credit won't help me with my state taxes
 6. the R&D tax credit won't help my bottom line
 7. it's all too good to be true – it must be snake oil
 8. we are going to have tax reform and the R&D tax credit is going to go away.



Do businesses need incentives?

- Do businesses need incentives to participate in TT?
- Investment in R&D has much technical risk.
 - It is speculative
- Businesses cannot always afford the investment and are deterred by it
- That is particularly so for SMEs, whose lower profits result in greater comparative risk
 - Participation by SMEs ranges from casual to not at all
 - SMEs in particular need their participation in TT to be fostered



Should Government provide incentives?

- In a free market economy, amongst the purposes of government policy is
 - to fix something that is not working, or
 - to improve something that is not working well enough.
- Many countries focus on under utilisation of TT in their policy making
- Awarding grants
 - Generally and in priority research areas, such as agriculture, food, climate and or the environment, or promoting export earning industries
- Taxation policies
 - Which promote TT amongst all industry sectors
- Policies aimed at specific segments in the economy,
 - Such as SMEs, or exporters



Taxation Policies

- Aim to encourage R&D
 - Operate more broadly than just TT, as encourages “in house” R&D where no TT takes place.
- Ways tax incentives can be given:
 - Tax deduction, and
 - Tax credit
- **Tax deduction**
 - Normally, non-capital expenditure incurred by a business is 100% tax deductible
 - R&D expenditure made deductible at greater rate: 125%, 200%, or more
 - Greater tax deduction means that tax revenue is forgone by Government
 - In that way it encourages R&D and TT



Taxation Policies

- Singapore
 - Tax deduction:
 - 400% for the first SGD\$400,000 of R&D expenditure annually,
 - 150% over this amount
- result of such a generous rate is that the deduction covers the R&D expenditure itself, and continues to offset income

<u>Country</u>	<u>Rate</u>
United Kingdom	225% for SMEs, 130% for large companies.
Sri Lanka	200%
Malaysia	200%
Thailand	200%
China	150%
South Africa	150%.



Taxation Policies

- **Tax credit**
 - tax deduction enables tax to be reduced
 - criticism is that a business that does not make profit has no income against which to get the benefit of the greater tax deduction
 - means that some businesses, like technology start up companies, are neglected
 - addressed by the tax credit incentive
- Percentage of R&D expenditure by the business either:
 - applied as a tax credit offsetting the tax otherwise payable, or
 - to the extent that credit not fully applied because there is no tax, or no further tax to pay, it is repaid back to the business.

<u>Country</u>	<u>Rate</u>
Portugal	32–50%
France	30-40%
Canada	20% (35% for SMEs)
Ireland	25%
South Korea	20% (30% for SMEs)
Norway	18% (20% for SMEs)
Taiwan	15%
Japan	8-12%.



Taxation Policies

- **Tax exemption or lowering**
- That is, no tax (or reduced tax) payable on income derived from TT activities

- Malaysia
 - 100% tax exemption for income from R&D services
 - 50% tax exemption for income from commercialising research outcomes
 - Has encouraged many company spin outs from universities

- France
 - Reduced 15% tax rate on income from licensing out IP (33.33% other income)

- United Kingdom
 - Corporate tax rate for income from commercialising patents reducing 24% to 10% from 2013 to 2017 (24% for other income)



Taxation Policies

- More and more countries choosing tax incentives to encourage R&D and TT.
 - According to OECD:
 - 1995 – 18 countries implemented tax incentives
 - Today – 26 countries
- Fiscal incentives are not perfect
 - Some companies have no income to offset a tax deduction
 - Some companies that are eligible for the incentive, and claim it, are not necessarily engaging in the most effective TT
 - There is typically no merit assessment
- Grants, based on merit, are more targeted to specific outcomes sought



Demand-side research grants

- Research grants were once assessed only on scientific merit
 - Ensured that most cutting edge research was undertaken
 - These (supply side) grants continue
- More recent years some categories of grants assessed on the dual criteria of
 - Industrial application
 - Merit
- Indicator of industrial application is that an industry partner joins in or supports the funding application
- Industry partner must co-invest in the research, financially, or in kind, or both
- TT occurs from the technology creator (university) to the technology user (industry partner)



Demand-side research grants

- **United Kingdom – LINK Grants**
 - project must involve collaborative research
 - 1 research organisation collaborator
 - 1 business collaborator
 - business collaborator must provide cash or in kind contributions at least 50% of the full cost of the project
 - grant no more than 50% of the full cost of the project, and
 - agreement between the collaborators by which they agree upon matters concerning the ownership, exploitation and management of IP
- 2012 evaluation of LINK scheme
 - More IP arose than in supply side grants
 - IP more likely to be industrially relevant
 - 10% of projects led to start up companies, a further 12% were expected to do so



Demand-side research grants

- **Australia – Cooperative Research Centers**
 - Long term research joint ventures (7 years or more)
 - 10 to 20 (sometimes more) Participants from
 - IP creators (research organisations, government labs)
 - IP commercialisers (public companies, multinational companies, SMEs)
 - 50% grant, 50% from participants
- 2012 evaluation
 - since 1991 (when the program began) measurable economic impact from TT arising from CRCs,
 - new products and services, and cost savings,
 - \$14.45 billion
 - (only 62% of CRCs as data not available from earlier in the program)



Demand-side research grants

■ Ireland – Innovation vouchers

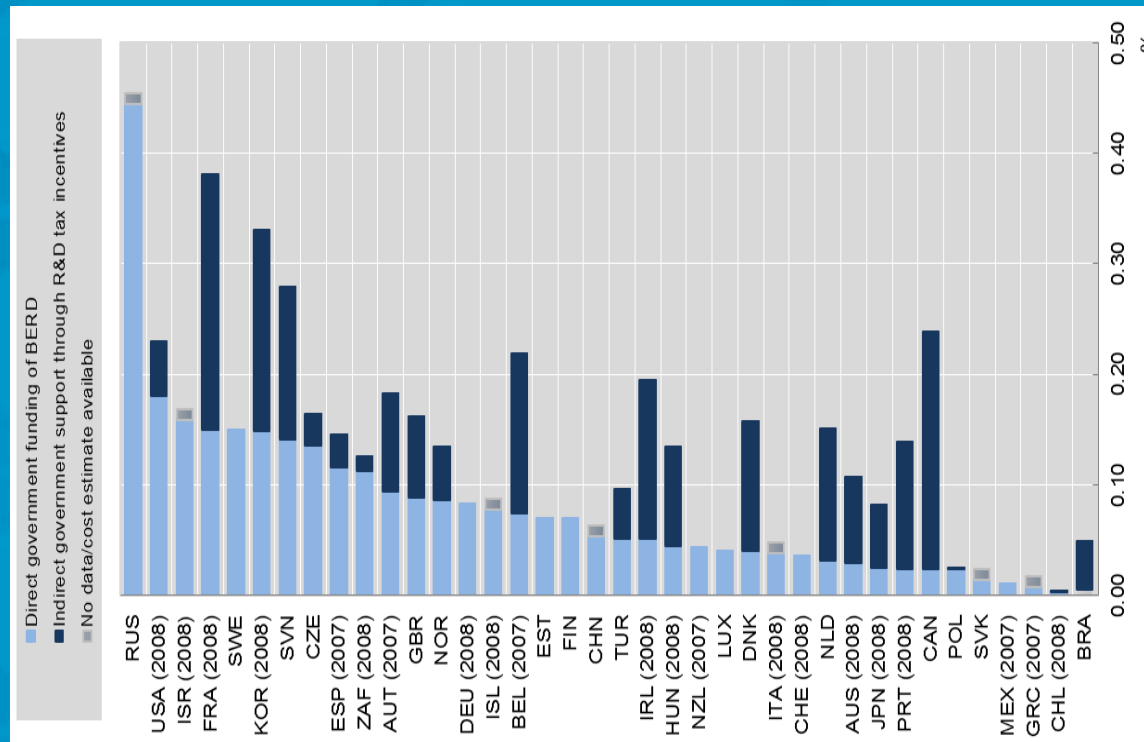
- operates like a cheque
- drawn by a government agency, entitles SME, to use the “cheque” to pay for research / consultancy services they choose by university or other research organisation
- Amount is modest
- object of the innovation voucher is
 - create a cultural shift in SMEs’ approach to innovation
 - To be “icebreaker” which facilitates collaboration
- 50% of innovation voucher projects led to follow on collaboration on new projects

<u>Country-Province-State</u>	<u>Voucher Amount</u>
Alberta (Canada)	\$15,000
Austria	€5,000
Connecticut (USA)	\$10,000
Czech Republic	Kč 75,000 (~ €3,000)
Lebanon	€10,000
Lithuania	Lt 10,000 (~ €3,000)
Singapore	\$5,000
Victoria (Australia)	\$25,000
United Kingdom	£5,000.



Mix of Taxation Policies and Grants

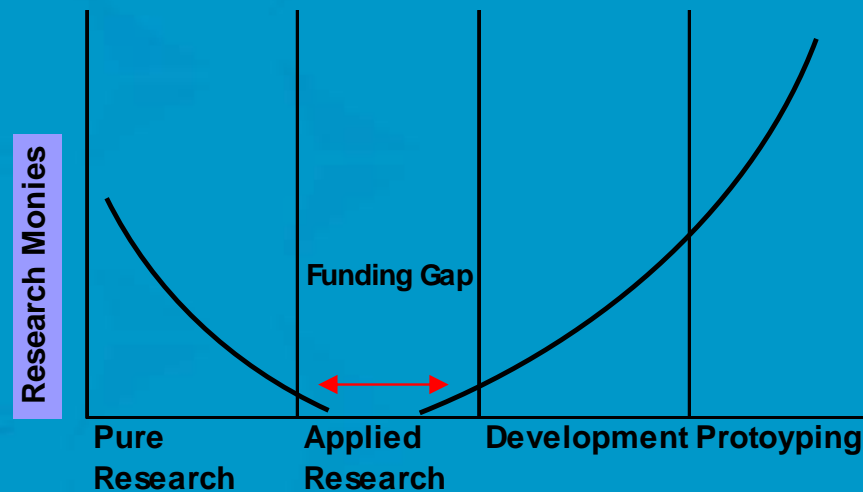
- Mix of fiscal policies and grants



- Incentive solely grants: Germany, Sweden
- Incentives solely tax: Brazil
- Emphasis on grants: Russia, USA,
- Emphasis on tax incentives: Belgium, Netherlands, Portugal, Canada, Australia
- A balance of tax and grants: France, UK, South Korea, Sweden

Policies facilitating access to finance

- Policies aim to address the funding gap – the gap between public sources of monies for research, and industry sources of funding



- Bridged by a VC sector
- Policies therefore aim to kick-start a VC sector



Policies facilitating access to finance

- **United States**
 - US experience was an explosion in VC investment into technology after 1980 with the passing of the Bayh Dole Act (permitting universities to own and commercialise IP outcomes arising from federally funded projects)
 - That explosion in US arose because
 - US already had a mature VC sector
 - US has an entrepreneurial culture and willingness to take risks
- **Other countries**
 - Had no need for a Bayh Dole Act (their universities already own IP)
 - But have neither
 - A VC sector
 - an entrepreneurial culture like that of the US
- How to kick start a VC sector ?



Policies facilitating access to finance

▪ **India**

- 1985: levy of 5% on technology import payments (ie a withholding tax on royalties paid to overseas licensors) to fund the first VC fund
- 1995: tax exemption on dividends and capital gains realised by VC funds from investment in manufacturing and IT sectors
- 2000:
 - tax exemptions to all investments made by VCs in all industry sectors
 - options granted to employees in technology companies taxed at the time of exit, and not at time of the options being granted, and
 - restrictions on share swaps and option swaps from Indian companies to foreign companies removed for the employees of a technology company
- 2015: There are over 300 active VC funds in India. Many are US VC firms operating in India



Policies Assisting the De-risking of R&D

- The earlier the stage of research and development:
 - greater the
 - speculative nature of the R&D
 - uncertainty of the course, and the outcome, of the R&D
 - higher risk of technical failure, and
 - greater the disincentive to proceed

- Makes an investment decision to support early stage research and development a difficult one to make
- Or, a very easy decision to make: the decision not to undertake early stage R&D
- Earlier stage projects need more de-risking if they are to be undertaken.



Policies Assisting the De-risking of R&D

- **United Kingdom** – Smart Program – Proof of concept funding
 - assists businesses de-risk speculative research by making grants for proof of concept work.
 - Work that qualifies as proof of concept work includes:
 - initial feasibility studies
 - proof of technical feasibility
 - prototyping
 - Projects funded up to 60% of total cost, with a maximum £100,000
 - Businesses having de-risked their project, become more attractive
 - investees for venture capitalists,
 - research collaboration partners for potential licensees



Government procurement policies

- Governments
 - often the largest buyers of goods and services in a nation
 - uniquely placed to support innovation, and TT, by their suppliers
- Their purchasing monies paid to a supplier buys the services it needs
- In addition:
 - provides capital to that supplier to develop or complete an innovation
 - facilitates the supplier obtaining capital from other sources,
 - facilitate TT processes by:
 - Upskilling
 - Creating new technology that can be exploited to customers other than Government



Government procurement policies

▪ Sri Lanka

- Government's ICT Agency (ICTA) is Sri Lanka's largest buyer of ICT services
- In tender evaluations, ICTA allows up to 15% of score to local firms
 - gives local firms competitive advantage over international firms
 - encouraged local firms and international firms to jointly bid
 - resulted in TT from the international firms, to local Sri Lankan firms
- Sri Lankan firms have benefitted from knowledge and skills transfer
- over 90% of ICTA's projects are now delivered with a local Sri Lankan ICT firm
- More than this, Sri Lankan ICT businesses compete internationally to be engaged to undertake ICT work.
- Sri Lanka's ICT sector has therefore become a significant exporter



Policies Encouraging University / Business engagement

- Obstacle to TT occurs when limited (or no) interaction between research organisations and businesses
- means that TT that might otherwise have occurred, does not take place

- When interaction or engagement takes place,
 - each naturally becomes better informed about the other.
 - research organisations
 - better informed about the technical and scientific needs of businesses,
 - able to recognise and instigate opportunities for
 - consulting or technical services,
 - contract research services,
 - research collaborations,
 - licensing and
 - spinning out companies



Policies Encouraging University / Business engagement

- Business becomes better informed about the capabilities of the research organisations in proximity to it,
- when a need arises for
 - technical expertise,
 - contract or collaborative research,business knows which research organisations are best placed where it can access these
- Key is to promote engagement between research organisations and businesses.
- With engagement each becomes better informed about the other, and its needs and capabilities.
- Policies that foster engagement will foster the creation of a climate or landscape where TT opportunities can arise, that otherwise might not have arisen



Policies Encouraging University / Business engagement

- One way that engagement can occur is by having a science and technology park located in proximity to a university campus
- proximity is inevitably a catalyst for interaction and engagement
- can make interaction a very intimate one
- intimacy can lead to opportunities for
 - consulting services,
 - contract research services,
 - collaborative research
 - license opportunities
 - spinning out of companies



Policies Encouraging University / Business engagement

- **South Africa - Technopark near Stellenbosch university**
- Technopark, located in Stellenbosch, 4km from university campus
- started in 1985 - suggestion of Stellenbosch University's Dean of Engineering
 - 40 technology companies,
 - 19 engineering companies,
 - 11 design companies,
 - 8 manufacturing companies, and
 - 22 software companies,
 - hotel, restaurants, banks, lawyers and accountants
- They either already do, or have the prospect of collaborating with the University,
- companies support research and technology transfer with the university



Policies Encouraging University / Business engagement

- **Saudi Arabia – Industry “first peek” rights and engagement**
- King Abdullah University of Science and Technology in Jeddah
- Centre Industry Affiliates Program
- companies join as members - pay an annual membership fee of \$30,000
- Company members enjoy a number of rights, including:
 - “first peek” rights, that is the right to be informed about invention disclosures before any company that is not a member
 - access to research outcome and research results in projects, and
 - the ability to support research of their interest, either solely or in collaboration with others



Policies Encouraging University / Business engagement

- **Tanzania - University of Dar Es Salaam – “incubator without walls”**
- Rather than “incubator with walls”
 - SMEs are co-located in physical buildings
 - nurtured and technically assisted,
 - reaching a point of graduation at which time they are expected to leave
- instead has implemented an “incubator without walls”
 - incubator takes mentoring and technical assistance to the SME’s existing physical location
- Three locations:
 - Kibaha located 40 km from Dar es Salaam (serving some 4500 SMEs)
 - Morogoro located 200 km from Dar es Salaam (serving 19 SMEs)
 - Lushoto located 600 km from Dar es Salaam (serving 32 SMEs)
- principally good manufacturing practice and production techniques



Policies Encouraging University / Business engagement

- **Thailand – Access to biodiverse resources**
- Thailand rich in biodiverse resources - 7 to 10% of the world's resources
- Benefit Sharing Agreement with Novartis
 - Not confined to elusive long term expectation of royalties
 - Novartis provides
 - training to nine Thai scientists in Basel, in drug development chemistry
 - its staff visit Thailand to provide training in laboratories in Thailand
 - makes payments used to purchase of specialist laboratory equipment
 - Thailand gets:
 - Skills transfer to the 9 staff trained by Novartis
 - skills transfer to colleagues by those 9
 - Specialist equipment



Policies Fostering International TT

- International TT, ie TT from one country to another:
 - prospect of improving the economy of the recipient country,
 - generating employment,
 - earning export income,
 - increasing recipient country's income base from which it can levy taxes
 - skills up the workforce of the recipient country
 - Enables skilled up workforce to transfer its skills to additional applications or industries
 - platform for R&D in recipient country, to
 - improve
 - modify
 - adaptthe imported technology to local conditions.



Policies Fostering International TT

- 4 main ways that international technology transfer takes place:
 1. Licensing IP
 2. International trade.
 - importing technological goods gives opportunity to imitate the technology, reverse engineer it or otherwise to learn and acquire knowledge about it
 - knowledge spillover into other industries
 - this is credited with contributing to the rapid technological advancement of Japan, South Korea and Taiwan
 3. Foreign direct investment. International businesses set up facilities in another country. recipient country's employees working in those facilities learn and acquire knowledge which spillover into other applications and other industries
 4. Mobility of skilled labour. When skilled workers move from one employer to another employer, they take with them the skills and experiences that they acquired with their former employer, and apply those skills and experiences in the new position with their new employer.



Policies Fostering International TT

- **Kenya – Export Processing Zones**
- 40 Export Processing Zones
- Businesses attracted by infrastructure designed to meet the needs of manufacturing and exporting businesses, the operating environment in the zones, as well as an attractive package of fiscal incentives
 - income tax exemption 10 years, then reduced rate of 25% for 10 years
 - withholding tax exemption on dividends for 10 years
 - withholding tax exemption on royalties paid under IP licenses, for 10 years
 - VAT exemptions
 - stamp duty exemptions
 - investment allowance deduction on capital expenditure
- 80 foreign companies, as well as domestic companies
- 40,000 workers are employed in the Export Processing Zones



Policies Fostering International TT

- **Africa Knowledge Transfer Partnerships**
- Initiative of the British Council
- Enables British universities' transfer technology to companies
 - initially in Ghana, Uganda, Kenya and Nigeria, expanding to Rwanda and South Africa
- project undertaken in Africa by one of the university's recent graduates
- project initiated by an African company, so demand driven
- graduate supervised by both the university and the company,
- Graduate undertakes project as an employee of the African company for 2 years
- transfers knowledge and skills from the British university to the African company
- areas where projects have been undertaken include IT, agriculture, chemical engineering, and food processing.



Policies Fostering International TT

- **Tunisia – USAID funded skills development - manufacturing capability**
- USAID is the United States' foreign aid program
 - Provides aid to developing and least developed countries
 - large number of projects are in the areas of
 - health,
 - education, and
 - agriculture
- Increasingly, attention is focused upon funding projects that will promote economic development



Policies Fostering International TT

- **Tunisia – USAID funded skills development - manufacturing capability**
- Plastic Electromechanic Company (PEC) is a company in Tunisia
- Manufactures automotive parts and components for the European car industry
- USAID project aimed at
 - improving employment opportunities, particularly for women
 - accelerating economic growth in Tunisia
- project funded training and skills development for 300 new staff, 80% of which were women, for new product lines in the medical products sector.
- program therefore responsible for the transfer of new skills and know-how to the 300 new staff, and the creation of 300 new jobs
- spillover is that the performance of other parts of PEC's manufacturing operations improved with the efficiencies learned, and the introduced culture of continuous improvement.



Policies Assisting University / Industry Negotiations

- United Kingdom, the Lambert Report in December 2003
 - “Business and universities both report that negotiations on the terms and conditions of IP ownership and exploitation can be extremely lengthy and costly... Smaller companies may be deterred from establishing such research partnerships because of the high legal costs and time involved”
- Australia, the Advisory Council on Intellectual Property, in its September 2012
 - Made the same observations
- Reports 10 years apart
 - Same observation:
 - difficulty in negotiations in university / industry collaboration



Policies Assisting University / Industry Negotiations

- Many factors influence the course of negotiations between universities and industry
- True that
 - they can be lengthy, and sometimes time consuming, and expensive
 - This can deter university / industry engagement
- Many negotiation points of sensitivity
 - Ownership of IP
 - Academic publication
 - Control of patenting
 - Diligence obligations
 - etc



Policies Assisting University / Industry Negotiations

- Single biggest factor is inexperience on the part of one, or both
- Where both the university and the company are experienced in TT
 - Issues are less
 - Understanding is greater
 - Solutions are more easily found
 - Negotiation takes the least time
- Where either the university or the company is inexperienced
 - Issues are greatest
 - Understanding is least
 - Solutions are elusive
 - Negotiation takes the longest time



Policies Assisting University / Industry Negotiations

- **United Kingdom – Lambert Toolkit**
 1. Model agreements to assist both universities and businesses in their negotiations
 2. agreement outlines that describe the major issues that need to be addressed
 3. a decision guide tool
 - helps a user assess certain issues
 - suggests how universities and businesses might consider dealing with some of the sensitive issues
- Major value is that they provide a model for how to balance the commercial interests of a university and industry partner
- Therefore facilitate collaboration and TT



Application to developing countries

- In developing countries there are many competing calls upon the financial resources that Governments have available
- A difficult decision is how to balance
 - Short term needs in health, education, agriculture, etc
 - Long term needs in economic development
- A dilemma is that investment in economic development will help alleviate future short term needs, but those short term needs are there now



Application to developing countries

- There is no “one size fits” all solution to the application of some of the policies we have looked at to developing countries
- For example, a developing country that has industrial capacity to take foreign innovations, imitate them, improve them and adapt them, may consider
 - fiscal incentives and
 - demand side grantsto stimulate new local innovations, particularly those with employment creating and exporting potential.
- But implementing these policies in a country without this industrial capacity to imitate, improve and adapt might not yield the same economic advantages



Application to developing countries

- In developed countries policies described implemented with varying degrees of assessment of the merit
- They vary between:
 1. no assessment at all, so all eligible applicants benefit from the policy, without any merit assessment, (fiscal incentives)
 - some (many?) might not have been able to demonstrate merit
 2. some assessment at the outset, (grants)
 - but lack of ongoing assessment,
 - ongoing merit may not have been able to be demonstrated
 3. assessment at the outset, as well as during a project, (rare)
 - So ongoing merit needs to continue to be demonstrated.
- In developed countries there is a lot of waste



Application to developing countries

- To help developing countries in the difficult task of balancing
 - support for immediate and short term needs and
 - support for long term needs,
 - Avoid waste

implementation of some of the policies described could be undertaken with phases of merit assessment

1. initial assessment of merit to select projects that will receive modest funding for feasibility studies,
 - funding in a first phase being confined to feasibility and assessing prospects
2. subject to an assessment of the results, that funding continues
3. Ongoing assessment to ensure that there is ongoing merit, as ongoing funds are paid



Application to developing countries

- This approach
 - Screens projects
 - projects with
 - greatest likelihood of success,
 - more likely to achieve economic benefits
 - create jobs
 - earn export revenue
 - enable a broader base from which to raise taxation revenues
- Projects assessed to lack merit are more likely to be avoided
 - Policies are therefore applied in a targeted fashion
 - The investment into R&D is targeted, instead of “hit or miss”



Thank you