

TRANSACTIONS SECTOR, INNOVATION AND COMPETITIVENESS¹

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ABSTRACT: This paper reviews contributions of transaction cost economics to regional competitiveness. At the macroeconomic level it extends a previous paper by comparing the share of the transactions services sector in the Gross Domestic Product with the published measures of the competitiveness for a small sample of countries. At the microeconomic level this paper extends other recent work on the lessons of transaction cost economics for the governance of innovation processes and suggests a potential route for empirical testing of a diagnostic tool for innovation processes. This paper suggests that a regional economy will not be competitive if it does not govern its innovation processes well and if it does not have an adequate transactions sector.

1. INTRODUCTION

This paper reviews contributions of transaction cost economics to competitiveness.

At the macroeconomic level the share of the transactions sector in the economy measures the market allocation of resources to the task of overcoming the friction of transaction costs. The transactions sector assists in completing transactions. Complex transactions are necessary to create the conditions Porter (1990) prescribes for industry competitiveness. The paper uses some available data to present the hypothesis that there is a positive correlation between the share of the transactions sector in a regional or national economy and the competitiveness ranking of that economy.

At the microeconomic level the paper argues that the Porter (1990) conditions for sustained industry competitiveness require an economy to achieve faster, more frequent, more efficient and more reliable innovation in the business environment than competitor economies achieve. This requires that attention be given to the frequency, speed, efficiency and reliability of the processes of innovation which are used in the business environment.

Transaction cost economics provides a comparative static analysis of the efficient governance of complex transactions. The paper applies this analysis to the innovation process and suggests an approach to testing and improving the frequency, speed, efficiency and reliability of innovation processes.

2. TRANSACTIONS SECTOR SHARE AND COMPETITIVENESS

2.1 Transaction costs and the transactions sector

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The concept of transaction costs, those costs of buying and selling in markets which are not passed on in the transaction, was introduced to the economics literature by Ronald Coase in 1937 (Coase 1998, p. 114).

Transaction costs include the costs of search, negotiation and dispute resolution which are incurred in conceiving, executing and sustaining a transaction. In an economy, transaction costs act like friction in mechanics. Transaction costs are by definition not passed on in the price of the goods or services exchanged. The omission of transaction costs from prices also means that they are included in measures of economic product (e.g. Gross Domestic Product) only to the extent that transaction services are sold to buyers and sellers in markets in order to facilitate transactions.

Transaction services assist in the completion of transactions. Some transaction services are provided by households, without charge, and some are purchased by buyers and sellers from the transactions sector. The transactions sector provides the transaction services which are included in measures of economic product. Transaction services can be purchased directly, as in legal fees or in buying through intermediaries such as retailers, or can be incurred as labour services costs, as in purchasing officers.

The share of the transactions sector in economic product has been estimated for several economies following the pioneering work of Wallis and North (1986).

2.2 A business environment for competitiveness

True competitiveness ...is measured by productivity. ...Many nations can improve their prosperity if they can improve productivity. The central challenge in economic development ...is how to create the conditions for rapid and sustained productivity growth. (Porter, 2004, 31)

Porter (1990, 2004) defines the features of the business environment which are necessary for industry competitiveness as the factor conditions (skills, capital, infrastructure, technology etc.), the quality of local demand for the products of the key industries, the quality of the local industries which support their leading industries, and the context for firm strategy and rivalry, which encourages investment, improvement and vigorous competition.

Porter's four part prescription for a competitive business environment can be interpreted as a definition of the areas in which innovation may be necessary in order that a national or regional industry should achieve competitiveness as follows:

1. increasing the rate of creation, improvement and specialisation of advanced factors of production for specific industries, improving the efficiency and effectiveness of their deployment, and accelerating innovation to overcome deficiencies (Porter 1990, p. 74, 76, 82);
2. learning early about the emerging needs of leading and demanding buyers, distributors and end-users including transactions in competitive, growing local market segments which saturate early but anticipate global markets and attract mobile customers or consumers;
3. developing internationally competitive suppliers and related industries, which provide competitive supplies and responsive service, and coordinating

research and technical development across the industry to support innovation and upgrading, and

4. changing the formation, strategies, goals, managerial style, global orientation, incentives, processes and products of companies, increasing the number of domestic rivals and the intensity of domestic rivalry, adapting capital markets, and changing popular attitudes towards skill development, wealth, risk and the industry, to better match the sources of competitive advantage in the industry.

Innovation is the process which creates these conditions for a competitive business environment. To be effective in creating a competitive business environment the innovation process must implement change rather than simply generate new knowledge.

2.3 Hypothesis

A working hypothesis in this paper is that an economy in which the transactions sector occupies a larger share of output is better equipped to complete the complex transactions which create the conditions for competitiveness described by Porter (1990). If so, such economies should achieve higher rankings in competitiveness studies than economies in which the transactions sector occupies a smaller share.

2.4 Data sources

There are now available estimates of the share of the transactions sector in the Gross Domestic Product of several countries covering several years. (Wallis and North 1986, Dollery and Leong 1998, Dagnino and Farina 1999, Bischoff and Bohnet 2000, Sulejewicz and Graca 2005 and Chobanov and Egbert 2007). Porter and others have developed and published rankings of the global competitiveness of nations in The Global Competitiveness Report (Sala-i-Martin 2004).

2.5 Results

The collected estimates of the transactions sector share of market economies shown in Table 1 differ in timing. Roughly contemporaneous measures of transactions sector share are available for USA, Argentina and Australia from about 1910 to 1981, for West Germany, Argentina and Australia from 1981 to 1991, and for Bulgaria and Poland from 1997 to 2002.

However the rankings of business competitiveness (Table 2) or company operations and strategy (Table 3) and the quality of the national business environment (Table 4) are available in Sala-i-Martin (2004) only from 1998 to 2004.

The most recent estimates of the share of the transactions sector in GDP in Table 1 are for Poland and Bulgaria from 1996 to 2002. The estimated share of the transactions sector in the GDP of Poland is larger than that reported for Bulgaria. Poland has higher rankings than Bulgaria from 1999 to 2003 for business competitiveness (Table 2), for company operations and strategy (Table 3) and for the quality of the national business environment (Table 4). These

results are consistent with the hypothesis and the data sets are contemporaneous.

Table 1. Transactions Sector as percent of GNP.

Year	Country					
Country	USA	West Germany	Argentina	Australia	Bulgaria	Poland
Source	Wallis & North 1986	Bischoff & Bohnet 2000	Dagnino & Farina 1999	Dollery & Leong 1998	Chobanov & Egbert 2007	Sulejewicz & Graca 2005
1870	24.19					
1880	26.97					
1890	30.82					
1900	32.14					
1910	33.44					
1911				32.341		
1920	37.17					
1921				28.72		
1930	40.81		25.0			
1933				34.16		
1940	41.92					
1947				43.209		
1950	44.63					
1960	45.36					
1961				39.186		
1970	46.66		28.0			
1971				48.469		
1980			35.0			
1981				44.171		
1982		48.52				
1985		47.21				
1987		46.06				
1989		44.79				
1990			35.0			
1991		43.63		59.515		
1993		41.77				
1996						49.6
1997					37.4	51.9
1998					41.0	57.4
1999					47.5	61.5
2000					51.0	63.4
2001					51.7	64.6
2002					53.5	67.2
2003					52.7	

From 1980 to 1993 Table 1 contains estimates of the transactions sector share of GDP for Argentina (2 estimates), Australia (2 estimates) and West Germany (6 estimates). The estimated share of the transactions sector in the GDP of

Australia increased rapidly from 1981 to 1991 whereas the estimates for West Germany fell steadily, and both of these remained larger than for Argentina during this period. The Business Competitiveness Rankings for 1998 to 2004 (Table 2) show Germany ranked as more competitive than Australia and both of these more competitive than Argentina (Ranked 34). The Company Operations and Strategy rankings for 1998 to 2004 (Table 3) show Germany ranked higher than Australia and both of these higher than Argentina. The Quality of the National Business Environment rankings for 1998 to 2004 (Table 4) show Germany ranked higher than Australia in every year but 2003, and both of these ranked higher than Argentina (Ranked 34). These results are consistent with the hypothesis but the estimates are not contemporaneous. Further, the estimates of transactions share are for West Germany whereas the estimates of competitiveness are for unified Germany.

Table 2. Business Competitiveness Index Rankings

Year	Country					
	USA	Germany	Argentina	Australia	Bulgaria	Poland
1998	1	4	34	15		41
1999	1	6	40	13	54	37
2000	2	3	45	10	55	41
2001	2	4	54	14	68	42
2002	1	4	65	14	68	46
2003	2	5	64	11	68	46
2003 sample Rank	1	2	5	3	6	4

Source: Porter, 2004: Table 1, p. 37.

Table 3. Company Operations and Strategy Rankings

Year	Country					
	USA	Germany	Argentina	Australia	Bulgaria	Poland
1998	2	1	30	22	-	38
1999	1	5	39	19	52	38
2000	2	1	45	20	54	36
2001	1	4	53	24	70	55
2002	1	2	57	19	72	46
2003	2	1	60	18	73	43
2003 sample Rank	2	1	5	3	6	4

Source: Porter, 2004: Table 1, p. 37.

From 1910 to 1971 Table 1 contains estimates of the transactions sector share of GDP for Australia (6 estimates), Argentina (2 estimates) and United States of America (7 estimates). With the exception of the years 1970-1971, Table 1 shows that the estimated share of the transactions sector in the GDP of the United States of America was higher than in Australia, and the estimated share in both of these countries was higher than the estimate for Argentina. From 1998 to 2003, much more recently, the Business Competitiveness rankings (Table 2), Company Operations and Strategy rankings (Table 3) and the Quality of the Business Environment rankings for these countries (Table 4) are consistent with the hypothesis for these measures.

Table 4. Quality of the National Business Environment Rankings

Year	Country					
	USA	West Germany	Argentina	Australia	Bulgaria	Poland
1998	1	8	34	12		40
1999	1	5	40	10	54	38
2000	2	6	44	7	54	41
2001	2	4	53	7	65	40
2002	1	4	68	11	63	45
2003	2	9	65	7	67	44
Latest Sample Rank	1	3	5	2	6	4

Source: Porter, 2004: Table 1, p. 37.

While the available data are limited in scope, the results obtained by comparing available studies of the share of the transactions sector in Gross Domestic Product of a small set of countries for various time periods with published competitiveness rankings concur with the hypothesis. However the data are not sufficient to provide a robust test of the hypothesis. The results are encouraging but more data for the transactions sector of more countries in more recent years will be required before this hypothesis can be thoroughly tested.

3. INNOVATION AND A BUSINESS ENVIRONMENT FOR COMPETITIVENESS

A business environment which fosters excellence in innovation everywhere, in factor markets, in product markets, in firm strategy and in supporting industries will deliver Porter's necessary and sufficient microeconomic conditions for competitiveness.

3.1 Innovation

Innovation is the implementation of sustained and widespread change.

Innovation requires that there is sustained change in the practices, products, services and processes which affect our lives. Invention is the origination of an idea, thing or process, possibly through research and perhaps leading to a patent. Invention requires only that the feasibility of the idea is demonstrated. Invention can be a solo activity but innovation is always a social process because implementation of change always involves others (Baumol 2000). Being a social process, innovation is likely to be a local process.

The speed, cost and effectiveness of innovation processes therefore affects the competitiveness, prosperity and vibrancy of a regional community.

Innovation can produce significant benefits for the society. It can also produce unanticipated costs. Innovation in financial markets has unanticipated consequences in the current global credit crisis. Faster innovation imposes social risk and may result in regulations restricting further innovation. Sustained innovation requires risk management, a capacity to identify the injured and the means to care for them.

In a process of innovation a group of people who are familiar with the status quo, become doubtful about it, agree on an analysis of the present and a vision of the future, define pilot projects to change the situation, select a change based on pilot test results, and implement their preferred change in competition with the status quo. If their change succeeds in being implemented widely, then innovation has occurred (NESTA 2007).

Rapid innovation is necessary for survival in a rapidly changing world. Innovation is costly in time and resources, uncertain in outcome and prone to unanticipated consequences. Speed, reliability and economy require the application of good governance to the processes of innovation to provide order, resolve disputes and accelerate outcomes. If the innovation process is to continue and to accelerate it will be important to choose efficient modes of governance.

In seeking to achieve competitiveness through innovation it is necessary to understand how to govern the complex transactions necessary to a rapid, efficient, reliable and sustained innovation process while managing risk.

Innovation is a social process of evolution which has economic and social consequences. North has noted that "in the larger context of social evolution [transaction costs] are all the costs involved in human interaction over time." (North 1997: 1)

The literature on innovation has plenty of references to the influence of networks on behaviour. Sethi, Smith and Park (2002: 16-17) report that innovation is favoured by low levels of social cohesion and allegiance, by encouragement to experimentation and risk taking, and by close monitoring and demonstration of the importance of the project. McFetridge (2008:3) notes that:

Any important innovation threatens existing interests and entitlements, and threatened interest groups might be able to forestall innovation politically. It is the degree to which the political process insulates itself from the pressures of entrenched interests that is the mark of an innovative society.

Florida, Cushing and Gates (2002:20) find that communities with high levels of social capital, strong social networks bound by shared norms, trust and

reciprocity do not enjoy high rates of innovation.

There is an interesting contradiction between these results and those of Wear (2008) who reports that in the contemporary innovation literature:

Innovation is an activity that involves the whole community. This is underpinned by informal governance structures that draw on established networks and relationships....in communities with a strong culture of participation in networks (even if these are not directly related to production systems), all things being equal, there will be more economic innovation. (Wear 2008:202)

Wear's regression results (Wear 2008: Table 3, p.207) show a significant ($p < 0.05$) positive association between patent registrations in communities and rates of membership in organised groups, but a strongly significant ($p < 0.01$) negative association for both the rate at which people report that they like living in the local community and the rate of volunteering. This apparent contradiction makes clear that strong networks can both encourage and oppose innovation. As Wear (2008: 209) puts it:

Innovation is a dynamic activity, and involves destruction of the old as well as creation of the new.

If the process of innovation is to continue, the network of change makers must be capable of resisting the existing network of defenders of the existing practice. The application of transaction cost economics to the innovation process turns on an assessment of the relative strengths of these networks. Transaction cost economics provides such an analysis.

3.2 Transaction cost economics

The transaction cost economics literature provides a comparative static analysis to select efficient forms of governance (market, hybrid with credible commitment or hierarchy) for the completion of transactions which involve particular features (asset specificity, uncertain environments and continuity) (Williamson 1991).

Governance is the process of restoring order following a disturbance. (Williamson 2005: 1). The three generic modes of governance are: market; hybrid with credible commitment or long term contract, and hierarchy or vertical integration. Williamson has shown that these modes of governance (market, hybrid, hierarchy, public bureau, etc.) are differentiated by their incentive intensity, administrative control and access to a form of contract law (Williamson 1991: 281-284. Reprinted in Williamson 1996: 105-109).

Markets have very strong incentives, no administrative control and have access to common law; they adjust rapidly and at low cost but specific assets will become stranded.

Hybrid governance has weaker incentives, some administrative control and some access to contract law. It relies on credible commitments between the parties and adjusts by negotiation. Credible commitments may include an exchange of hostages or a specialised dispute resolution process as well as a contract. Adjustment may be slow but negotiation can be an economical way to manage costs.

Hierarchies have weak incentives, significant administrative control and very limited recourse to the courts. Adjustment can be rapid but the costs of administered adjustment may be high.

It is not possible to replicate within a bureaucracy the incentive intensity of the market without added costs of compromise and politicisation. Promises to selectively intervene to overcome disturbances within a bureaucracy do fail (Williamson 2005: 10-11).

The key properties of transactions are uncertainty about the emergence of external changes which affect equity between the parties, the level of specific assets which the parties have at risk in the transaction, and the frequency of the transaction (Williamson, 1991: 281). Uncertainty about the occurrence of external changes which alter the distribution of rewards within the transaction may lead the parties to seek to restore equity to the transaction or to terminate it. Specific assets in a transaction are assets which retain their value only if the transaction proceeds. They can include established networks and relationships as well as physical or intellectual property. They motivate owners to seek to continue with the transaction. Frequent transactions allow a party to build a reputation, extend production runs and develop economical standards and procedures.

The behavioural assumption used is bounded rationality, under which parties who intend to behave in the mutual interest tend to act out of self interest when circumstances change. Responsible behaviour is bounded by the opportunism of individuals who become guileful and self-seeking when the opportunity arises. Parties do not behave responsibly in order to maximise joint benefits, rather, they renege on promises when it suits their purposes. (Williamson 2005: 8)

Under bounded rationality, external changes which alter the equity of the transaction shift distribution of rewards and costs between the parties and cause the parties to become self-seeking rather than seeking shared values. Where any of the parties have built up specific assets which would have less or no value should the transaction not proceed, then an external change threatens to destroy the value of those assets.

Where there are few transaction specific assets, economy of effort favours the use of the autonomous adjustment of markets and this low cost adjustment may warrant accepting the possible stranding of assets up to a point. Market governance will most efficiently govern transactions which have low levels of specific assets at risk should the transaction not proceed.

As the extent of specific assets increases the parties will seek to apply alternative hybrid or hierarchical governance modes to manage their risks depending on the level of uncertainty about external events. Hierarchy will most efficiently govern transactions with high levels of specific assets at risk should the transaction not proceed. Hybrid governance, using some form of credible commitment, will most efficiently govern transactions with low to moderate levels of uncertainty and moderate levels of specific assets at risk should the transaction not proceed.

These broad conclusions are summarised by Williamson (1991: 292 and 1996: 117) using the base diagram in Figure 1. The results of the following

discussion are presented as an overlay in Figure 1.

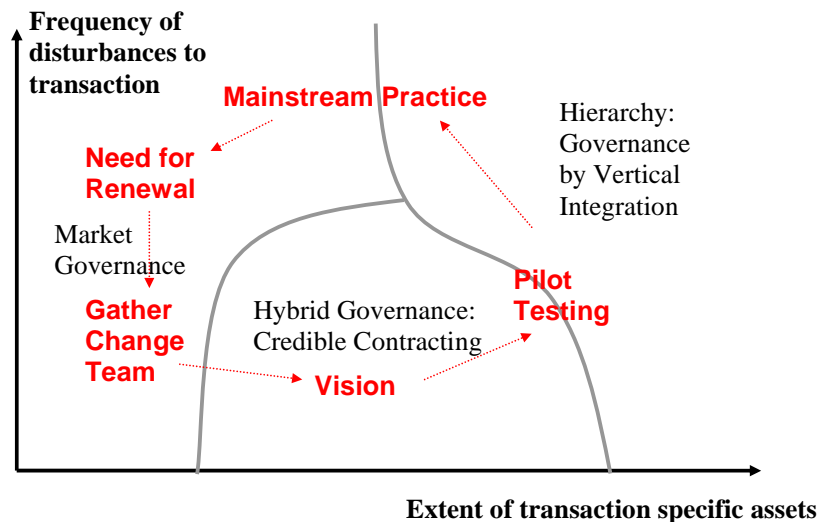


Figure 1 Efficient Governance of Innovation Stages depends on Frequency of Disturbances and Extent of Specific Assets
(Overlay of results on Figure 3 of Williamson, 1991: 292)

The empirical literature "...is remarkably consistent with the predictions of TCE." (Shelanski and Klein 1995: 335)

3.3 Transaction cost economics and the innovation process

The comparative static tools developed in transaction cost economics are readily applied to the dynamic innovation process. Each stage of the innovation process is amenable to a comparative static analysis because at each stage of the process an equilibrium must persist for long enough to reach a conclusion to proceed to the next stage.

3.4 Properties of innovation transactions

The specific assets involved in innovation processes are the networks of change makers which build up as the process continues and which are lost if the process fails to continue.

Uncertain external events can change the pattern of rewards flowing to the change makers in an innovation process and may cause some to drop out. Continuity of innovation processes is important. However, each innovation process has a finite life and will involve a different set of partners.

There may be too little social investment in skills for innovation. The partners in any particular innovation process may place less value on investment

in standardising the innovation process than would the society.

3.5 Governance of innovation transactions

Market governance is marked by the absence of hierarchy or administrative control. Following an external change the parties choose freely to continue to participate or not. No ideas are ruled out or made subject to administrative sanction.

Hybrid governance requires the existence of a credible commitment binding the parties to participate until the next stage. A credible commitment might be a financial contribution which will be forfeited if the parties do not continue.

Hierarchical governance applies where the continuation of the process is the subject of administrative control within a hierarchy. The parties are not free to continue to participate without administrative sanction following an external change. Some ideas are ruled out or made subject to administrative sanction.

3.6 Stage-by-stage analysis of the innovation process

This section of the paper defines the properties of the transactions required at key stages of the innovation process and selects the form of governance which transaction cost economics suggests would be most economic for that stage. The stages of the innovation process are those suggested by the United Kingdom National Endowment for Science Technology and the Arts (NESTA 2007).

The innovation process consists of five stages: 1) dissatisfaction leading to a perceived need for renewal of an existing process, product or service, 2) gathering of change makers, 3) analysis, vision and strategy for improvement, 4) pilot testing, and 5) implementation of an improved process, product or service (NESTA 2007).

The steps in an innovation process are complex transactions. The transaction costs involved can be significant because there will be uncertainty about the need for change, there will be growing resistance from the stakeholders of the status quo, and the process of change may be infrequent and unfamiliar. The process requires considerable analysis and effort, and the network of change makers will need to build the strength to achieve implementation.

The principal differences between transactions at each stage are the extent of transaction specific assets at risk and the frequency of changes in the external environment which may shift the distribution of rewards flowing to the participants. It follows that there will be a different form of governance which is most economical for each stage.

'A: Gathering a cadre of enthusiasts: building a community of change-makers, focused on innovation, and with sufficient authority to deliver collective activities demonstrating its importance.' (NESTA 2007: 3)

A cadre of enthusiasts convenes a gathering of change makers to confirm their decision that current practice may need renewal. Participants develop their understanding of the issues, their dissatisfaction with current practice and their shared interest in proceeding to the next stage of developing vision and strategies for implementation. The group provides the authority to define a plan to

demonstrate innovation.

The transactions involved in engaging change makers may be facilitated by an internal or external change agent.

- Transaction specific assets: At this stage the specific network assets of the change makers are weak relative to the network of users or practitioners of the mainstream product or process. The gathering begins the process of building a specific network among those people within the field who recognise a need for change. This network is specific to the change process and has less value to its members if change does not proceed.

- External events which cause uncertainty about the distribution of rewards among change makers are relatively frequent at this stage because participants will be sensitive to reports of good results from current practice. In addition there may emerge an alternative resolution of the problems identified in current practice, or an event which illustrates the risks of change. Engagement often occurs during times of perceived threat and uncertainty about the future of current practice.

- Continuity of the transaction: Participants expect their gathering to lead to the next stage.

Transaction cost economics recommends the market as the preferred mode of governance where there are few specific network assets and there is a high level of uncertainty about external events which might shift the distribution of rewards among the participants.

A free market of ideas fosters a maximum range of ideas and imposes a few simple restrictions on thought during the gathering stage. Brainstorming is an example in which the rules are that the parties abstain from critical comment and accept for later appraisal each idea put forward. Participants can make free decisions to continue at the conclusion of the gathering. Where the innovative activity takes place within a hierarchy it is advisable for managers to clearly and forcefully encourage teams to be venturesome, to experiment and to take risks, in order to overcome a preference for the familiar. (Sethi et al, 2002)

'B: Arriving at an agreed vision and strategy: the partners jointly decide their regional and strategic priorities and identify realistic activities that promise future change, fire people's imagination, and meet the interests of the main partners.' (NESTA 2007: 3)

This transaction includes visioning and strategy planning and is costly to the parties. In the visioning stage of the process the necessary and desirable features of an improved standard, and the key risks associated with change, are recorded for use in selecting strategy.

Strategy planning begins by brainstorming potential innovations without concern for the necessary and desired features. Options are selected from the brainstormed list by applying the necessary and desirable criteria and considering the potential risks. Then teams are assigned to undertake the task of developing and defining pilot projects which appear to meet key criteria and which could provide early tangible results. These groups define and plan pilot programs and consider the potential risks arising from implementation.

The development of business plans for pilot testing may take some months. Drafting an agreed pilot plan involves groups sharing ideas, discarding some and committing effort to the clarification and development of others. Each group needs some internal leadership structure to facilitate the process. The pilot planning groups may recruit additional participants and collect evidence.

Draft pilot plans may be reviewed at a reconvened meeting of participants and supporters. The review assesses the pilot plans against agreed criteria regarding the necessary, desirable and risk outcomes in order to select those pilot plans which should proceed to testing.

- Transaction specific assets: Visioning and strategy planning builds stronger networks which in turn sustain continuity. Relationships are formed with key suppliers of technology or market knowledge. The network may be more readily sustained if the group can retain members who helped to conceive the initiative as members of the pilot planning team.

- The frequency of uncertain events which would threaten the distribution of rewards among change-makers may decline during this stage because the participants are more acutely aware of the need for change. Unanticipated external demands on the time of participants or a shift in priorities may result in people withdrawing from participation.

- Continuity of the transaction: The participants in the group have an interest in continuation of the group until it presents a pilot plan in a form which gains the support of their colleagues. While working parties have no expectation of long term continuity, some members develop an interest in continuing to implementation.

Transaction cost economics recommends hybrid as the most efficient governance mode for transactions which have high levels of transaction specific network assets and which face low levels of uncertainty about external events which might shift the distribution of rewards among participants. Hybrids provide for credible commitments between key participants which may bring required capabilities for the planning or testing process.

Where the team is drawn from within a single organisation it will be advisable for managers to reinforce and encourage independence of thought during the strategic planning stage, allowing a hybrid governance process to continue within the team.

'C: Piloting novel activities: the coalition test-drives a small number of eye-catching projects that generate wider interest and provide the partners with a vehicle to drive shared interests.' (NESTA 2007: 3)

Pilot testing is a critical step in managing the risk of unintended consequences from innovation.

- Transaction specific assets: The team implementing a pilot project will have developed a network with strong commitment to the project and a willingness to develop modifications which manage risk as participants focus on evaluation. The level of specific network assets reaches a maximum during this stage of an innovation process.

- External events which cause uncertainty about the distribution of

rewards among change makers may increase during pilot testing. Conducting the pilot test will require sponsors to contribute additional resources and will expose the project and its potential risks to increased scrutiny. Changes in market and community conditions will continue to generate external changes which affect the continued support of the participants and of the sponsors of testing.

- Continuity of the transaction: Pilot activities usually do not have an expectation of continuity.

Transaction cost economics recommends hierarchy as the most efficient mode of governance for transactions which have high levels of transaction specific network assets and which face high levels of uncertainty about external events causing change in the distribution of rewards among participants. Hybrid governance suits transactions with moderate levels of transaction specific network assets and moderate levels of uncertainty about external events.

There is an implied or formal agreement between the sponsoring group, the team undertaking pilot testing and perhaps incumbent practitioners. This agreement will describe what is to be implemented, what outcomes are to be assessed, what standard is required for implementation and the anticipated timing for results.

Piloting novel activities will most likely require some formality of governance to provide sufficient incentive intensity to drive performance, administrative control to protect property rights and a contract law to resolve disputes.

'D: Mainstreaming: the results of pilots are sufficient to generate enough interest to attract more resources and recruit a larger set of partners to the innovation journey.' (NESTA 2007: 3)

The transaction of adapting a successful prototype to mainstream practice is complex and risky. It may involve the removal of existing practices and substitution of the prototype practices. The prototype must be replicated in new situations and must perform as expected. The resistance of established practices already in use in the new situations must be overcome.

- Transaction specific assets: The network which has developed and successfully tested a prototype will have developed considerable strength.

- The frequency of external events which cause uncertainty about the distribution of rewards among change makers is likely to increase during this stage. The strong networks built up around previous practices will create obstacles. The change may require persistent effort over long periods of time during which a wide range of external changes may arise to frustrate implementation. Costs may rise and reduce the viability of the prototype design and the rewards for implementation.

- Continuity of the transaction: Advocates expect their tested prototypes to be superior to the incumbent and therefore to win the competition to continue.

Transaction cost economics recommends market or hierarchy as the most efficient governance modes for mainstreaming transactions which have high levels of transaction specific network assets and high levels of uncertainty about changes in the distribution of rewards arising from external events. Market

governance will most often be best for mainstreaming of innovation.

Network members may become risk averse and resist putting their prototype to a market test for fear that failure will destroy their network. Once the lessons of pilot activities have been learned participants may be motivated to apply the new knowledge within their own organisation. They will opt for hierarchy where incentives are relatively weak but administrative control is strong and their network is protected within the hierarchy.

Governance of mainstreaming requires very strong incentives. Markets are most effective at putting innovations into widespread practice using the power of competition to eliminate laggards.

A common practice within firms is to standardise the key components of the prototype and then market the prototype directly or transfer (or sell) the design and the operating knowledge to new sponsors and teams (Baumol 2002). An alternative practice, quite common in government contracting for community services, is to specify the new process or product in new contracts for service. In all these cases the market form of governance is in use.

'E. Renewal: mainstreaming is not the end of the game. The continuous recognition of new challenges re-ignites a new cycle of coalitions, plans and actions and prevents stagnation.' (NESTA 2007: 3)

Renewal addresses new challenges. It can arise in response to perceptions of threat or persistent failures in practice. Some participants in current practice gain new knowledge and face new challenges which challenge current practice. This creates new opportunities but participants may not yet be sure that innovation has become necessary to survival.

- Transaction specific assets: The network asset is weak as people begin to perceive the need for change. The numbers of change makers may be small and their network asset may be weak.

- External events which cause uncertainty about the distribution of rewards among change makers will be relatively frequent during the renewal stage. The participants are uncertain of their observations and are seeking confirmation. A run of good results from current practice may be sufficient for the early signs of a need for change to disappear removing motive and support.

- Continuity of the transaction: In a rapidly changing environment change is continuous. However renewal of particular processes and products is often episodic.

Transaction cost economics recommends market governance as most efficient for transactions for which specific network assets may be relatively weak and uncertainty about the distribution of the benefits of change is high.

This result is reflected in practice. The market, particularly start-up businesses and entrepreneurial enterprises, does undertake the task of recognising the early signs of a need for renewal and acting by commencing the process of innovation and seeking confirmation in the market. There are few institutions devoted to this role.

The defenders of the established order, itself the product of previous innovation, will not voluntarily engage in renewal unless they face a credible

threat.

Competitiveness and productivity growth depend on the pace of innovation. The frequency of initiation of the renewal stage is a key determinant of the pace of innovation. If renewal never occurs innovation may cease. If renewal occurs often but frequently fails innovation may be slow.

Transaction cost economics recommends that the governance of the innovation process should adapt to the frequency of disturbances in the external environment, the extent of the specific network assets developed by the change leaders and the stage which the innovation process has reached. The recommended mode of governance changes as the innovation process moves from stage to stage.

3.7 Discussion

The success of regional communities and economies depends upon their capacity to adapt to changing conditions. Innovation is a process made up of several transactions, commencing with renewal and proceeding through gathering, vision, pilot testing to implementation of improved processes, services or products. The frequency of renewal probably determines the rate of innovation because renewal launches every new round of innovation.

Transaction cost economics identifies the most efficient way to govern each of these transactions. The efficient mode of governance changes as the innovation process proceeds. Failure to apply the appropriate mode of governance has implications for the speed, cost, reliability and effectiveness of the innovation process. In other words, the way communities and economies govern their innovation processes affect the speed, cost, reliability and effectiveness of their adaptation to change and their future success and competitiveness. These results suggest that an economy or society which does not govern its innovation processes well will suffer a loss of competitiveness, productivity and welfare.

Transaction cost economics has a robust body of empirical studies. (Shelanski and Klein 1995, Williamson 2005: 13) However the results of this application have not been subjected to a test. The next section provides some preliminary methodological notes for a test of these results.

4. TESTING THE RESULTS: DEVELOPING A DIAGNOSTIC FOR INNOVATION PROCESSES

This section suggest a simple way to use the records generated during an innovation process to characterise the types of transactions involved (asset specificity and external volatility) and the mode of governance in use for the transactions taking place in an innovation process. The working hypothesis is that successful stages of an innovation process will exhibit modes of governance which correspond to the recommendations of transaction cost economics for the density of the network and frequency of external disturbances which are experienced in practice.

The approach uses a measure of network density derived from social network analysis. (Wasserman and Faust 1994: 164) Social network analysis has

provided a range of important insights into innovation (Steen, Macaulay and Kastle 2008).

It is proposed to test the transaction cost economics recommendations for the governance of innovation processes using measures derived from the meeting records of a variety of successful and unsuccessful innovation processes. The results may provide calibration for a diagnostic tool for innovation processes and this may lead to a means of increasing the frequency of rapid, efficient and successful innovation.

The work requires a means of measuring the results of the process, asset specificity, the frequency of disturbances, the stage of the process and the mode of governance used in each stage.

4.1 Results of an innovation process

The result of an innovation process is a change in a practice, product or service which improves productivity and generates value. The result of a successful stage of a process is continuation to the next stage or to mainstream implementation. All other outcomes are not successful.

4.2 Measuring Asset Specificity

The key specific asset involved in an innovation process is the network which is built up between the parties during the process. The strength and extent of a network can be measured from attendance records at meetings as in the following table.

Meeting Attendees	Meeting 1	Meeting 2	Meeting 3	Meeting 4
Person 1	X		X	X
Person 2	X	X	X	
Person 3		X	X	X
Person 4	X		X	X

This attendance data can be transformed into the following matrix showing the number of times each pair of people has met. The diagonal entries are left blank.

Network Matrix after meeting 4	Person 1	Person 2	Person 3	Person 4
Person 1	0	2	2	3
Person 2	2	0	2	2
Person 3	2	2	0	2
Person 4	3	2	2	0

This matrix can be given a characteristic of density, where the density of the matrix reflects the strength of network. The density of a matrix may be computed as the sum of all entries in the matrix divided by the possible number of entries (Wasserman and Faust 1994: 164). For the example the density of the matrix after meeting 4 is: $(7 + 6 + 6 + 7 = 26)$ divided by $16 = 1.625$.

The stronger the network the greater the network asset at risk and therefore

the greater the resistance the group will have to a diversion from the innovation path. Density therefore drives the persistence of the group and this becomes increasingly important to success as the group moves through the stages of innovation.

4.3 Measuring Frequency of Disturbances

Ideally, the measure of disturbance frequency would arise in the external environment. In practice the frequency of disturbances must be assessed from meeting records or participant recall. A review of the whole set of minutes for each stage of the innovation process may reveal a number of events which have affected the participation or enthusiasm of people attending discussions. Participants may recall during interview events which seemed to impact on participation or interest, or may be able to identify the nature and likely frequency of events which would have affected their participation had they occurred.

4.4 Identifying the Stage of Innovation

The stages of innovation are well defined.

- *Renewal*: The innovation process begins with the recognition of new challenges facing current practice. The discussions held early in a residency should mention renewal or refer to previous discussions of new challenges.
- *Gathering*: The second stage of an innovation process involves change makers discussing the challenges which they have recognised with other participants whose skills or authority will be required to define and promote options for the future.
- *Vision*: The third stage meetings in an innovation process define priorities and the outcomes of required for an innovation to meet the interests of the main partners. It proceeds to develop outlines of several change projects which would address the issues of concern and attract wider support.
- *Pilot activity*: The fourth stage meetings of an innovation process cover the testing of proposals in practice to gather data or demonstrate to others the value of change.
- *Implementing mainstream change*: The last stage of the innovation process discusses the transfer of the pilot activity into practice or into a product or service. The discussion may consider recruiting further partners, licensing information to others or implementation within an organisation.

The particular stage of the innovation process which is being addressed in any meeting should be revealed by the questions which are addressed in the minutes of that meeting.

4.5 Identifying the Mode of Governance

The modes of governance used in each stage of the innovation process are readily observable from minutes of the process meetings.

- *Market governance* is marked by the absence of hierarchy or administrative control. The parties choose freely to continue to participate or not following an external change. No ideas are ruled out or made subject to administrative

sanction.

- *Hybrid governance* requires the existence of a credible commitment, such as a deposit, which will be forfeited if the parties do not continue to participate until the next stage.
- *Hierarchical governance* applies where the continuation of the process is the subject of administrative control. The parties are not free to continue to participate without administrative sanction following an external change. Some ideas are ruled out or made subject to administrative sanction.

If minutes of meetings record or participants recall events which affect participation then the minutes should record or participants should be able to recall how order was restored following the disturbance. The minutes may also reveal disturbances which arose during those discussions and the mode of governance used to restore order when the disturbance arose.

4.6 Analysis

The working hypothesis is that successful stages of an innovation process will exhibit modes of governance which correspond to the recommendations of transaction cost economics for the density of the network and frequency of external disturbances which are experienced in practice. The results of each stage of each of a set of innovation processes would be compared with the density of the network matrix generated at the conclusion of the stage, the estimated frequency of disturbances during the stage, the mode of governance used to restore order following each disturbance. The results of each stage of an innovation process can be recorded using a dummy variable which takes the value 1 or 0 depending on the success or failure of the stage of the process to proceed to the next stage.

The recommended mode of governance to be used to restore order in response to an observed external event will be selected by applying transaction cost economics to the measured network density and the observed frequency of disturbances occurring throughout the entire record of the innovation process. This variable is sensitive to the low, moderate and high ranges selected for the network density and the frequency of disturbances measures. The statistical analysis of results will provide for the calibration of the sensitivity of outcome to each of these variables.

The compliance of the mode of governance with the recommendations of transaction cost economics can be recorded using a dummy variable which takes the value 1 when the mode of governance used to restore order following an external disturbance complies with the mode of governance recommended by transaction cost economics, and 0 otherwise.

4.7 Potential Outcomes

The results of the analysis of data on real innovation processes should identify opportunities for improving and benchmarking the governance, effectiveness, speed, reliability and cost of innovation. The results will provide an empirical test for the application of transaction cost economics to the governance of innovation processes.

5. CONCLUSION

Australia's innovation system is a current topic of policy discussion (Cutler 2008). This paper defines innovation as the implementation of widespread change and suggests a role for an enlarged transactions sector and for improved governance of innovation processes in the innovation policy discussion.

Transaction cost economics contributes to the understanding of economic and social development at a macroeconomic and microeconomic level. The transactions sector of an economy comprises the activities which provide services in the market economy to assist in the conduct and governance of social and economic transactions. Transaction services are also provided in the non-market economy; however these activities are not captured in available measures of the transactions sector.

Porter (2004) argues that the prosperity of a nation or a region depend upon productivity, which is the measure of the competitiveness of its companies and the quality of the business environment. The quality of the business environment consists of the quality of local factors of production, the quality of local demand, the quality of the local industries which support the leading industries and the quality of the local context for firm strategy and rivalry. Therefore the task, for a nation or a region of becoming prosperous, rests on successfully changing the quality of local factors of production, local demand, local suppliers and local rivalry towards world leading practice. These changes require complex social transactions and therefore should be facilitated by a strong transactions sector.

Confirmation of this hypothesis would suggest that an adequate transactions sector may be necessary to enable sub-competitive nations or regions to shift the business environments of their leading industries towards global competitiveness. The results of an analysis of a small number of national economies suggest that the ranking of economies according to the share of the transactions sector in their economy matches their global competitiveness ranking. More empirical work on the recent size of the transactions sector in more countries is required to confirm this result.

The problem of successfully lifting competitiveness could also be approached at the microeconomic level by improving the speed, reliability and effectiveness with which the innovation processes in use in a nation or region implement sustained and widespread change. Innovation is a social and therefore local process which, if it is more efficient, reliable, sustained and rapid, can deliver to a nation or a region the conditions which are necessary for competitiveness. A business environment which fosters excellence in innovation everywhere, in factor markets, in product markets, in firm strategy and in supporting industries will deliver the necessary and sufficient microeconomic conditions for competitiveness.

Innovation is a complex and risky social process. In a process of innovation a group of people who are familiar with the status quo, become doubtful about it, agree on an analysis of the present and a vision of the future, define pilot projects to change the situation, select a process of change based on pilot test results, and implement their preferred process in competition with the status quo.

Transaction cost economics provides guidelines for the governance of the stages of an innovation process. The characteristics of each successive stage of the innovation process differ and the efficient mode of governance changes as the process passes from stage to stage.

The analysis illustrates how social networks influence innovation processes. It can be tested empirically. Some recent work does provide some support for these propositions, particularly as regards the significance of social networks to the innovation process.

The propositions of this paper point social development policy towards enlarging the transactions sector in regional and national economies and towards enabling regional and national communities and enterprises to better govern innovation processes. For innovation policy this paper suggests that improving the capacity to govern the process of innovation might be an effective and efficient way to accelerate innovation and improve competitiveness.

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