In Praise of (Some) Red Tape: A New Approach to Regulation

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Abstract
The costs of removing red tape include a lower chance of detecting recession-generating flaws in the financial system. What we call independent dimensions of regulation (IDRs) operate more or less independently to other groupings. If an IDR's optimality is unknown, it may be risky to remove. Uncertainty thus implies that (some) red tape – i.e. a small amount of overregulation – is justified, in contrast to the Brainard (1967) principle that uncertainty dictates less policy activism. The long run GDP benefit of a 1% improvement in financial services productivity is 0.06% in our CGE model. These relatively modest gains reinforce our conclusion.

Keywords: Banking, Regulation, Monitoring, Financial Crises, Independent dimension of regulation

JEL Codes: G01, G18, G28

Introduction

It is both unsurprising and appropriate after a financial crisis that monetary authorities and regulators around the world close the gates through which the Vandals flooded. Yet for all this, there is the fear that the next crisis will differ from the last one and they will come in via some other route. So alongside the shutting of specific gates there has been a wide-ranging parallel discussion about how to safeguard the financial system as a whole. In Australia, there has been a Financial System Inquiry (FSI) with a wide remit (Murray, 2014) and overseas reviews of policies have occurred at the Bank of International Settlements and the International Monetary Fund (see BIS (2013) and Galati and R. Moessner (2013) for a review).[2]

What many lines of enquiry have in common is the desire to cultivate general principles, or even what some have described as a state of mind (Ellis, 2013) when approaching regulatory issues, rather than focus on context-specific rules. This desire for general applicability is apparent in BIS (2013) as it outlines the development of its core principles:

[1] This paper is an extension of a Centre for International Finance and Regulation (CIFR) commissioned piece *Removing 'Red Tape' Regulation in an Uncertain Environment,* requested by the 2014 Australian Financial System Inquiry (FSI or 'Murray Inquiry') and prepared with their permission. We wish to acknowledge the facilitation of David Gallagher (CEO of CIFR) in both initiating this work and liaising with the FSI over its scope. We also wish to acknowledge feedback from various officers at the FSI, APRA and the RBA – in particular Malcolm Edey, Luci Ellis, John Laker and Melisande Waterford. The discussion of regulatory independence in this paper is the work of Gordon Menzies and the CGE simulations are the work of Peter Dixon and Maureen Rimmer. Menzies wishes to thank Mardi Dungey and Graeme Wells for the invitation to the regulation panel at the 2014 Hobart conference of economists, which motivated the creation of the analytic framework. He is also grateful for the feedback at the 2015 CIFR research pitch day initiated by Robert Faff, and for the research impetus of his research template (Faff, 2015). Finally, he wishes to thank Jean-Charles Rochet and Charles Calomiris for helpful discussions. The authors are very grateful for all this wide-ranging feedback, but any remaining errors are our own.
[2] The World Bank has joined the fray with an 'incentive audit' proposal for national financial systems (Cihak et al. 2013).

> 'To fulfil their purpose, the Core Principles must be capable of application to a wide range of jurisdictions whose banking sectors will inevitably include a broad spectrum of banks … Banking systems may also offer a wide range of products or services and the Core Principles are aligned with the general aim of catering to different financial needs.' (op. cit. pg. 5)

Any proposed revitalization of the financial system leads naturally to intense debate about the possibility of otherwise of 'red tape', or at least this was the case for the Australian FSI. It is the purpose of this paper to speak into that debate, and relate it to notions of independence which we will explain presently.

We take red tape to mean regulation that wouldn't pass on a cost – benefit criterion. Broadly conceived, it imposes costs on financial institutions, with insufficient benefits accruing. But which costs and which benefits are under consideration in this definition?

It would not be unnatural to define red tape as being actions the regulated entity would not have taken, absent regulation – in other words an enforced departure from private optimality. Indeed, this is exactly how things might appear to financial institutions. But in a context where the private and social benefits diverge, it is also possible to define red tape as regulations in excess of *social* optimality. We take the latter definition because it seems to us that anyone who believes in externalities would straightaway concede that some regulation in excess of private optimality is desirable, and undeserving of the pejorative connotations of 'red tape'.

A more important reason why we have adopted social benefits in our cost benefit analysis is that it is the benchmark against which to make the basic claim of this paper. That is, uncertainty of the economic environment may make some regulation desirable *even beyond the socially optimal level*. This contrasts with the Brainard principle (Brainard, 1967) where uncertainty dictates less policy activism.

As noted above, the costs and benefits of regulation were a concern of recent FSI (Murray, 2014). The main FSI recommendation related to red tape (Number 31) was to increase the time available for industry to implement complex regulatory change and to conduct post-implementation reviews of major regulatory changes more frequently.

The same danger of solving yesterday's problem arises with red tape as it does with other reforms in the financial system. In a rapidly evolving environment, regulations can likewise have evolving effects. Sometimes, it is hard to pin down exactly what the benefits of particular regulations are, especially alongside other regulations, making it problematic to conduct a cost benefit analysis one regulation at a time. In the words of an FSI submission, Murray (2014) cites with approval APRA (2014a, pg. 63): 'Many of the specific benefits of prudential regulation and supervision, such as lower losses and increased trust within the financial system, are [difficult] to isolate.'

In keeping with the spirit of the times this paper seeks a 'state of mind'– helpful principles rather than tight rules – about the removal of red tape. The first core idea, which follows directly from the APRA quote, is that red tape is subject to a quantification asymmetry: the costs of regulations are usually much easier to quantify than the benefits.

Some regulations are one off or ongoing accounting costs, with attendant financial records. This is particularly true of so-called behavioral regulation, which is mainly about the protection of consumers.

Behavioral regulation operates at the product, customer, and transaction level, so it tends to have a direct and measurable administrative cost. For example, in his discussion of regulatory burden Murray (2014) recounts how Australia’s four major banks have spent around $1½ billion on the implementation of a whole raft of initiatives: the Foreign Account Tax Compliance Act, the Future of Financial Advice law reform, anti-money laundering, privacy reforms, e-payments, the Financial Claims Scheme, Over-the-Counter derivative reforms and National Consumer Credit Protection. These kinds of initiatives require changes in IT systems, additional staff costs and legal advice, all of which leave a distinct record trail.

Prudential regulation generates fewer operating expenses on top of what the financial entity would or should have spent on its own, since its impact lies in changing the balance sheet. For banks, this includes holding more capital and liquid assets than they might otherwise wish. These involve costs to the bank of foregone profits, but there are also broader social costs, via higher interest rates and reduced economic activity. These costs are harder to model than pure out-of-pocket accounting costs, so for example Elliot et al. (2012) uses a loan pricing model to generate interest rate increases resulting from a suite of different regulations.

Nevertheless, the quantification asymmetry remains in place, even for prudential regulation. It is arguably a much simpler task to model an ongoing cost in a stable environment, as Elliot et al. do, than it is to model the benefit of reducing the probability of a ‘tail event’ crisis at some unknown time in the future. So it will be the case in this paper – we will quantify the costs of red tape in some detail using a CGE model, but the benefits will be a matter for an analytic model.

The second core idea is that removal of regulations can run into nonlinear difficulties. The cost of removing red tape sometimes compounds, via the multiplication of key economic entities – such as the stock of loans times the probability of default. Where regulation removal effects both terms, say by increasing the volume of loans and the risk of default of any given loan, regulators bring potentially nonlinear poison to their lips. On other occasions, nonlinearity difficulties arise because the variance of a key economic entity, such as an estimate for a Loan-to-Valuation-Ratio or the freedom of action of errant institutions, rises non-linearly as each regulation is discarded. Cutting costs runs the risk of plunging the regulator into a cloud of misinformation surrounded by out-of-control institutions.

We conduct a stylized analysis of the costs and benefits of red tape in what follows. In section I, we discuss the nature of an equilibrium where there is the optimal amount of regulation. This turns out to have some interesting policy implications for minimizing expected losses in a crisis.

The kind of regulation we are interested in is the search for recession-generating flaws in the financial system, and their rectification. Fundamentally, the cost of removing red tape includes any increase in the chance of missing a flaw in the financial system. Of relevance to this cost is the fact that some groupings of regulations operate more or less independently to other groupings, as is the case when different agents – not necessarily different institutions – examining the same regulatory issues or monitor the same behaviours independently. It turns out that this independence, where it exists, is helpful to the regulator.

Independence is an important idea in maximization and so it is unsurprising that it rears its head when considering how a regulator achieves their objectives. It is well known that an unconstrained maximization problem yields a higher (strictly, a non-lower) maximal value than a constrained one. And if a constraint creates a dependence between choice variables, relaxing a constraint implies an independence of choice variables, which in turn allows a maximiser to do better than they were operating under a constraint. In statistics, independent observations lower the variance of estimators and therefore reduce the number of inference mistakes. This relates to maximization because any optimal solutions that contain estimated parameters will miss hitting the optimum choice variables to the extent that the variances of the estimators are nonzero.[3]

Just as a mathematician does best at maximizing when choice variables can be varied independently and when she knows the key parameters of interest, so too regulators will be most successful when they can act independently and they possess the independent information necessary to gain an accurate picture of the situation.

We call any existing independent clusters Independent Dimensions of Regulation (IDRs) and demonstrate that if regulation is independent and optimal, it can be very costly to remove. We show some situations where it is wiser to run the risk of over-regulating than under-regulating. In such environments, where regulation is independent but its optimality is unknown, it is risky to remove it. As we proceed, we acknowledge that the creation or discovery of extra IDRs may run into institutional or informational barriers but all the same we feel an IDR is a useful benchmark.

In response to the criticism that section I sidesteps definitive quantification, we note firstly that it is better to be vaguely right rather than precisely wrong, and secondly that the independence of regulatory measures is a fruitful and novel line of enquiry in its own right.

With regards to the favorable side of the red tape quantification asymmetry, in section II we use a computable general equilibrium (CGE) model (Dixon and Rimmer, 2002) to simulate the benefit of removing financial red tape in Australia. We visualize red-tape reduction in the Australian financial system as primary-factor-saving technical change (reduction in capital and labour requirements per unit of output). The gains are modest, justifying (some) red tape – i.e. a small amount of overregulation. This contrasts with the Brainard principle (Brainard, 1967) where uncertainty dictates less activism.[4]

If it is possible to create or find extra IDRs, or make existing regulations more independent, framing the policy choice about low quality regulation ('red tape') solely in terms of 'disband or leave in place' overlooks an important third option. Rather than disbanding or leaving regulation as is, there may be a way to make an existing regulation more independent. This is taken up briefly in section III, which is intended to serve as both a conclusion and as an impetus for further discussion by policymakers.

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[3] Consider a simple maximization problem, such as maximizing utility over two free goods x and y subject to a quantity constraint $q=x+y$. The quantity to be maximized is $U=x^{\alpha}y^{1-\alpha}$ and the solution is $x = \alpha.q$ and $y = (1-\alpha).q$. The constraint creates a dependence between x and y, and in its absence both could be increased independently, increasing U. And, if α is unknown it would have to be estimated using some kind of sample information. Independent sample information would allow it to be estimated with the smallest possible error, and therefore the chosen quantities for x and y would be closer to their optimal values. Independence of action (in choosing x and y) and independence of sampling (lowering the variance of estimated α) are both required for this maximizer to do the best they can.

[4] Brainard's (1967) central bank faces uncertainty about the economy and conducts optimal monetary policy with less active use of the policy instrument than the certainty-equivalent case.

I The Costs of Removing 'Red Tape': Nonlinear Increases in Expected Losses and the Removal of Regulation

I 1 Regulation is a quality control problem

The financial system is very complex, with key variables and institutions subject to large disruptions, arguably more so than in the real economy. Because of these features, and others, informational asymmetries and externalities are common.

Regulation aims to achieve many purposes, such as consumer protection or competitive neutrality, but the aspect of regulation that is the focus of this section is what might be called 'quality control' for the financial system as a whole.[5] The authorities are trying to see emerging systemic dangers, or detect outright fraud, or detect destabilizing activities. Indeed, the alarming possibility of systemic collapse is one reason why regulation of the financial sector proceeds along somewhat different lines to the prescriptions and proscriptions of standard regulation theory (Freixas and Rochet, 2008). We shall refer collectively to these dangerous features of the system as financial flaws. That is, one aspect of regulation is trying to discover and rectify financial flaws.

Looking for financial flaws is mainly the remit of prudential regulation, but other sorts of regulation protect the system from collapse too. It is not hard to imagine that widespread deception by financial institutions towards customers could, in the extreme, trigger a fatal loss of confidence in the system, bringing a conventional financial crisis on.[6]

I 2 What is an Independent Dimension of Regulation?

As a benchmark, we define an Independent Dimension of Regulation (IDR) as a process that is statistically independent of any other regulatory action, which fixes a financial flaw with probability $1-p$, and misses it with probability p. Its independence is statistical rather than institutional, so that institutional independence is neither necessary nor sufficient for statistical independence.[7]

An intriguing analogy of IDRs comes from independent sampling quality control on an assembly line which reduces defectives by a proportion p, or, from a filter on a chimney which captures proportion $1-p$ of a pollutant. In both examples, p is likely to be much smaller than one half, so doubling the cost (conducting the sample again, or adding another filter onto a chimney) does not halve the negative attribute (the probability of a defective item, or the parts per million of the pollutant) but reduces it much more, by a factor of p.

[5] Likening APRA to a shepherd, Littrel (2011) suggests that regulators look for stray sheep (errant individual institutions), actively guide the flock when the leaders are heading in the wrong direction (as in a credit fuelled housing boom), and prepare for inevitable but unforecastable hailstorms (macro shocks). Each of these tasks requires the collection and analysing of information, which is the focus of our model.

[6] For example, if banks were exposed for widespread fraudulent record keeping on ordinary deposits, a bank run would result.

[7] We admit that here we are lumping together all sorts of regulatory actions, such as the creation of rules, the collection of information and supervisory visits. One referee alerted us to a contemporary debate where one side claims that supervision – at least a certain kind of active supervision – is in a class of its own as a regulatory act. We take up their comments in the last section of the paper.

Crucially, the logic works in reverse. Halving the cost increases the negative attribute by a factor of *1/p* which implies much more than doubling the negative attribute. That is, *a linear cost reduction may be associated with a highly non-linear increase in the probability of a negative outcome*.

Is there anything involved in checking for financial flaws analogous to this kind of non-linear response? Perhaps there is. Two potential non-linearities relate to *regulation as inference*, and, *regulation as the control of multiplicative effects*.

For *regulation as inference* suppose that we draw *n* pieces of information X_i to estimate some key quantity, say an optimal loan-to-valuation ratio (LVR). Assume the expected loss from any crisis $\Phi(n)$ is proportional to the variance of our estimator, with constant of proportionality *Z*. The idea here is simply that the more uncertainty surrounds the target of policy, the more frequently mistakes will be made. Further suppose that each X_i has unit variance (for simplicity) and is pairwise correlated with correlation coefficient θ.[8] The Generalized Least Squares estimator for a dependent sample is the sample mean, but the variance is in (1.1).

$$\left.\begin{aligned} \Phi(n) &= Z.V(\bar{X}) = Z\left((1-\theta).\frac{1}{n}+\theta.1\right) \\ \Phi' &= -\frac{Z(1-\theta)}{n^2} \\ \frac{1}{n^*} &= \left((1-\theta).\frac{1}{n}+\theta.1\right) \Rightarrow n^* = \frac{n}{n\theta+(1-\theta)} \end{aligned}\right\} \qquad corr(X_i\ X_j)=\theta \qquad (1.1)$$

It is apparent from Φ that the expected loss falls as more information is collected $(n\to\infty)$, and the more independent it is $(\theta\to 0)$. It follows from Φ' that the marginal benefit of information-collection regulation (which is $-\Phi'$) is particularly high if the cost of any crisis is high; if the correlation between different sources of information-collection regulation is low; and if the number of information collection rounds is low. If $\theta=0$ in this example, *n* is the number of IDRs created for the task of estimating the key parameter.

Of course, dimensions of regulation are not always independent. If θ is not zero in (1.1) one can transform the *n* dependent bits of information into n^* $(<n)$ 'independent equivalent' dimensions by solving $1/n^*=(1-\theta)/n+\theta$ giving $n^*=n/(n\theta+(1-\theta))$ to obtain the same variance. The notion of independent equivalent dimensions allows us to conceive of a given variance as being due to a few independent parcels of information or many dependent parcels. When an agent manipulates data, reporting standards or analyses from multiple sources in order to make them more correlated, the number of independent equivalent dimensions shrinks.[9]

For *regulation as control of multiplicative effects* suppose instead that the cost of the crisis is the product of two variables *X* and *Y*, say the size of an 'potentially at risk' pool of loans, due to prevailing lending protocols, times the

[8] That is, in (1.1) $X_i \sim (\mu, s^2)$ and $corr(X_i,X_j)=\theta$. The sample mean is then distributed as $(\mu, s^2[(1-\theta)/n+\theta])$ and s^2 is set to one. This is without loss of generality because any s^2 could be incorporated into *Z*.

[9] It should also be possible to measure the total impact of a number of layers of regulation, some independent and some less so, in units of independent equivalent dimensions. This measurement could tell us when, under conditions of high but imperfect correlation for most signals, a final layer might be worthwhile gauged by its impact on the number of independent equivalent dimensions.

fraction that become unpayable due to a controllable system-wide cause, such as, say, inept monetary policy. Will regulations that reduce both *E(X)* and *E(Y)*, say by a multiplicative factor *p*, translate into a p^2 fall in *E(XY)*, so that there are nonlinear effects in *removing* regulation? This turns out to be more complex than the first example, but also more instructive.

We begin by noting that the expected value of the product of *X* and *Y*, which is what is relevant for the cost of a crisis, depends on the product of their expectations and their covariance.

$$Cov(X,Y) = E(XY) - E(X)E(Y) \quad \Rightarrow \quad E(XY) = Cov(X,Y) + E(X)E(Y) \qquad (1.2)$$

Regulatory actions that reduce *E(X)* and *E(Y)* by a fraction *p* will therefore impact on *E(XY)* multiplicatively with a factor p^2 if the Covariance is zero. If it is not, then it will depend on how the combined regulatory changes reduce the covariance relative to the factor p^2.

Interestingly, we need also to consider the independence of expertise of the controllers of *X* and *Y*. Suppose, for example, that the experts charged with reducing the risky loan pool are accountants and the experts charged with improving the monetary policy regime are economists. At one ‘dependent expert’ extreme the experts are completely interchangeable. That is, both sets of experts are capable of both seeing and rectifying loan and monetary policy problems. At the other ‘independent expert’ extreme, each group of experts is both blind (can’t see) and incapable (can’t act) with respect to any problem outside their field. Table 2 illustrates these possibilities.

Table 2: Red Tape or IDRs?

		X and Y	
		dependent	*independent*
Expert	*dependent*	Red Tape	Red Tape
	independent	Equation (1.2)	IDRs

Suppose without loss of generality that the authorities are thinking of getting rid of their team of accountants. Clearly, if everything accountants can do can be replicated by economists – the ‘dependent expert’ case shown in the first row of Table 2 – then accountants represent proverbial red tape and can be removed from the organization. If, as is more realistic, this is not the case then we have two subcases along the bottom row of Table 2. If *X* and *Y* are dependent, the total effect will depend on how regulation affects the covariance as outlined in (1.2). If *X* and *Y* are independent we have an analogous situation to quality control and chimneys where if each team can deflate *E(X)* and *E(Y)* by a factor *p* then *E(XY)* is deflated by p^2. In what follows, we will generalize the bottom right hand corner case of Table 2 as *n* independent multiplications occurring to generate the losses to the system.

The resultant IDRs are combined in a stylized way so that the expected loss from the crisis as $K\,p^n$ where *K* is a scaling constant and *p* is the factor reducing each link in the multiplication chain. In doing so, we are well aware that there are many modelling improvements that can be made, from allowing dependent dimensions to allowing different impacts of regulations (not all scaling by *p*) for each dimension. At this point, though, we are only wishing to explore the potential fruitfulness of a framework which could obviously be applied in a far more nuanced way.

I 3 IDRs in an Economic Model

We will now develop a rudimentary banking system in which we can model an expected loss $\Phi(n)$.

A representative financial entity subject to n IDRs experiences a crisis with Bernoulli probability P. Thus, a crisis causes a stochastic discount δ on a loan portfolio L during a crisis, but not otherwise. The loan portfolio cost C only occurs if there is a crisis:

$$C = \delta I L \qquad I \sim Bernoulli(P) \quad I = 1 \; in \; crisis \qquad \delta \sim (\mu, \sigma^2) \tag{1.3}$$

If I and δ are independent, the mean and variance come from a Bernoulli with $P(I=1)= P$. If P^2 is small we can derive the following mean and variance for C.[10]

$$E(C[\delta, I])) \quad = \quad \int_\delta \int_I \delta L I \, f_{I\delta} dI \, d\delta = \int_I (I \, f_I dI) \int_\delta (\delta \, f_\delta d\delta) \, . \; L = P\mu L \tag{1.4}$$

$$V(C[\delta, I]) \quad = \quad E_\delta \left[V_{I|\delta}(\delta L I) \right] = E_\delta \left[\delta^2 L^2 P (1-P) \right] \approx L^2 P E_\delta \left[\delta^2 \right] = P \{ \mu^2 + \sigma^2 \} L^2 \tag{1.5}$$

Consider a representative bank earning profits π_B which include a cost of paying out the owners of capital a return on K equivalent to the lending rate, and an imposed cost of T per regulatory dimension.

$$\pi_B \quad = r_l L - r_d D - r_l K - nT \tag{1.6}$$

The bank's assets consists of loans L; its liabilities consist of deposits D and capital K. (I ignore reserves)

Table 3: The Balance Sheet

Assets	Liabilities
L	D
	K

From the balance sheet:

$$L = D + K. \tag{1.7}$$

We simplify bank profits using (1.7).

[10] For ease of derivation the Bernoulli I is written a continuous random variable with very small measure off 0 and 1, and very large (and equal) measure at those points. This saves me using a composite random variable with an integral and summation sign.

$$\pi_B = r_l L - r_d D - r_l K - nT$$
$$= (r_l - r_d)D - nT \quad (1.8)$$

It is obvious from (1.8) that the optimal *n* from the bank's point of view is zero, but the government sets *n* taking into account the need to search for financial flaws. In the event of a crisis, the government will have to bail out the banks but it will take any profits of the banks before it does so. The government maximizes the expected value of profits net of costs, and we allow it to be risk averse so that *E(U(bailout))=E(bailout)-Ω V(bailout)*. We note in what follows that *E(-C)= -E(C)* and *V(-C)=V(C)*.

$$\pi_G = \pi_B - C \quad (1.9)$$
$$\pi_G = (r_l - r_d)D - nT - C = \kappa - nT - C \quad \text{where } \kappa = (r_l - r_d)D \quad (1.10)$$

$$\begin{aligned} Welfare &= E(\pi_G) - \Omega \; V(\pi_G) \\ &= \kappa - nT - E(C) - \Omega \; V(C) \quad \{= \kappa - nT + E[Utility(-C)]\} \\ &\approx \kappa - nT - P\mu L - \Omega P\{\mu^2 + \sigma^2\}L^2 \\ &= \kappa - \underbrace{nT}_{\text{Costs}} \underbrace{- P[\mu L + \Omega\{\mu^2 + \sigma^2\}L^2]}_{\text{E[Utility(-C)]}} \end{aligned} \quad (1.11)$$

The costs of regulation are per-dimension, with a marginal cost of *T*. The marginal benefits of regulation consist of reducing the negative term (expected utility of the crisis) at the end of (1.11) by reducing *P*. The key insight of IDRs, mirroring the intuition of quality control and filters, is that *in the neighbourhood of optimal n, reducing n may result in a very rapid decline in welfare.* We explore this possibility in (1.11) by first deriving the marginal benefit.

$$E[Utility(-C)] = -P[\mu L + \Omega\{\mu^2 + \sigma^2\}L^2] = -\Phi(n) \quad (1.12)$$
$$MB = \frac{dBenefit}{dn} = -\Phi' = -P'[\mu L + \Omega\{\mu^2 + \sigma^2\}L^2] \quad (1.13)$$

Assuming κ is fixed, the optimal *n* is obtained from equating *T* to (1.13), which implies that T/Φ' = -1 at the optimum. The slope of (1.13) at the optimum, where (1.13) is equal to T, is then given by

$$\frac{d^2B}{dn^2} = -\Phi'' = \frac{T\Phi''}{\Phi'} = T\frac{P''[\mu L + \Omega\{\mu^2 + \sigma^2\}L^2]}{P'[\mu L + \Omega\{\mu^2 + \sigma^2\}L^2]} = \frac{TP''}{P'} \quad (1.14)$$

We now return to our two environments where IDRs might be plausible.

Taking regulation as inference first, when $P=[1-\theta]/n+\theta$, a truly independent dimension of regulation would have $\theta=0$, but it is easy to do the analysis for non-zero θ, and so we shall. The most interesting case is when *T* is high – the status of red tape is scarcely interesting if regulation is cheap. If that is so, then the slope of the marginal benefit curve at the optimum, *TP''/P'= - 2T/n* could easily be a large number. We will return to the implications of this presently.

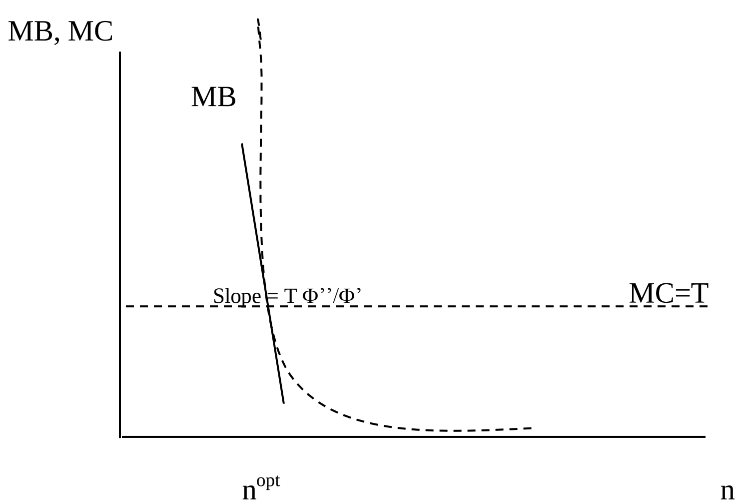
Taking regulation as the control of multiplicative processes, so that $P=p^n$, we have *TP''/P'=T ln(p).* There is a stronger presumption in this case that the slope of the marginal benefit curve will be steep, since it does not depend on the number of dimensions. The pronumeral *p* refers to the scaling down of bad outcomes that regulation achieves, and so if this is a fairly small fraction its log will be a large negative number. As in the previous case, regulation is most interesting as a policy question if *T* is large, and this too increases the slope of the marginal benefit curve (MB) at the optimum.

I 4 The Significance of Steep MB Curves

The significance of a steep marginal benefit curve is seen in Figure 1 where we plot the marginal cost (MC) of regulation *T* against the marginal benefit. If MB is steeply negative when it cuts the MC curve, it implies that MB is increasing rapidly as *n* drops. Coupled with the flat marginal cost curve, a steep MB curve implies that the net benefit (benefits minus cost – not drawn) curve falls away very steeply as the number of dimensions drops below the optimum.

We have thus shown that *if regulation is independent and optimal, it is very costly to remove*. The key model feature here is the steepness of the MB curve. To reiterate the argument above, it will be steep for regulation as control of a multiplicative process (and where expertise is independent). In the case as regulation as inference, it is certainly possible that the MB curve will be steep, but it depends on some other auxiliary assumptions, such as how many dimensions are already in place.

Figure 1: Optimal Regulatory Dimensions



To the right of the optimum MB-MC is capped at approximately *T* and so making a mistake in this region (regulating too much) is less dangerous. In the real world, subject as it is to Knightian uncertainty at least with respect to the shape of any new financial crisis, one knows very little of the structure of this model. How then should regulation proceed? If undershooting the optimal amount of regulation is far more costly than overshooting the optimal amount of regulation it follows that *if regulation is independent but its optimality is unknown, it is risky to remove*.

In making this argument in terms of IDRs we are aware that many individual regulations are not independent. We earlier spoke of independent equivalent dimensions of regulation (in the discussion under 1.1), whereby a cluster of several dependent regulations had an effect on variance equivalent to one independent regulation. Under these circumstances, our reasoning suggests caution about removing any such a cluster.

II. Macro-economic Effects of Reducing Red Tape

II 1 Background

We visualize red-tape reduction in the Australian financial system as primary-factor-saving technical change (reduction in capital and labour requirements per unit of output) in the sector.[11] We define the sector as the industries

Banking (IOPC code 7301),

Non-bank finance (IOPC code 7302), and

Services to finance etc (IOPC code 7501)

in input-output tables prepared by the Productivity Commission.

On this definition, the sector generates 5.1 per cent of GDP, that is the sector's ratio of valued added plus taxes to GDP is 5.1 per cent.

We conduct simulations with the Victoria University National model (the VU-Nat model) to calculate the effects of primary-factor-saving technical change in the sector. VU-Nat is a dynamic computable general equilibrium (CGE) model of the Australian economy. It identifies 106 industries and has evolved from the MONASH model (Dixon and Rimmer, 2002).

As for MONASH, a VU-Nat simulation consists of two runs of the model: a baseline run and a policy run. The baseline run is intended to be a realistic forecast of where the economy is going in the absence of the policy of interest. The policy run imposes the policy (in this case primary-factor-saving technical changes in the financial sector) on the baseline, and the effects of the policy are deduced as the differences between outcomes in the two runs. In the current project, we used the central baseline described in Dixon *et al.* (2014).

Specifically, we calculated the effects of a *one* per cent primary-factor-saving technical change in the financial sector, applied in each of the component industries in 2013. The effects of other small primary-factor-saving technical changes (say up to 10 per cent) could be calculated with reasonable accuracy by scaling the results presented in Charts 1 to7 for the one per cent case.

As can be seen from the charts, we present results for two simulations, one marked ABS conventions (adopted in the Productivity Commission's tables) and the other marked Adjusted conventions. Under ABS conventions the services of the financial sector are sold almost entirely to household consumption and to industries as inputs to current production. There are no sales to investment. This treatment misses an important role of the financial sector, the facilitation of investment. After conducting a simulation with the VU-N's database set up to reflect ABS conventions, we conducted an alternative simulation in which a quarter of the financial sector's sales to households under ABS conventions was transferred to sales to investment in the Ownership of dwellings industry while half of the financial sector's intermediate sales to each industry was transferred to investment in that industry. In switching away from the ABS conventions we increased the share of financial sector sales that are to investment activities from 0 to 35 per cent.

[11] Since prudential regulation is the major way that the system is protected, another way to model a relaxation of the regulatory impost would be to grant banks more balance-sheet freedom. However, the CGE models available to date emphasis the finance sectors role in providing inputs to the economy, and they do not have well-developed balance sheets. Nevertheless, this is an area of active research so that in the near future an exercise of this kind should become more feasible.

We now describe the results in Charts 1 to 7 in a way that we hope brings out the important assumptions in VU-Nat without requiring the reader to have any knowledge of the model.

II 2 Results

Chart 1 shows that a one per cent primary-factor-saving technical change in the financial sector translates into a multi-factor-productivity gain for the economy of about 0.05 per cent. This is one per cent of the financial sector's share in GDP. The slight difference between the results in Chart 1 for the two simulations is caused by our rebalancing of the input-output data after changing the distribution of financial sector sales towards investment. This rebalancing caused the financial sector to have slightly higher value added than in the original data compiled under ABS conventions.

Chart 2 shows the effects on aggregate employment of the one per cent primary-factor-saving technical change in the financial sector. In both simulations these effects are positive in the short run and fade away in the long run.

These and other results from a CGE model such as VU-Nat can often be understood in terms of equations describing a single-sector neo-classical model. For explaining the results in Chart 2, useful equations are :

$$W = P_g * A * F_\ell(K/L) \qquad (2.1)$$

or equivalently,

$$\frac{W}{P_c} = \frac{P_g}{P_c} * A * F_\ell(K/L) \qquad (2.2)$$

and

$$\frac{(W/P_c)(\text{policy}, t)}{(W/P_c)(\text{base}, t)} - 1 = \frac{(W/P_c)(\text{policy}, t-1)}{(W/P_c)(\text{base}, t-1)} - 1 + \alpha\left[\frac{L(\text{policy}, t)}{L(\text{base}, t)} - 1\right] \qquad (2.3)$$

In these equations

W is the wage rate;

P_g and P_c are the price deflators for GDP and consumption;

K and L are aggregate capital and labour;

A is multi-factor productivity;

F_ℓ is the derivative of F with respect to L in the production function GDP = A*F(K,L), that is $A * F_\ell$ is the marginal product of labour;

(policy, t) and (base, t) indicate values for variables in policy and base runs in year t; and

α is a positive parameter.

Equations (2.1) and (2.2) are stylized versions of the CGE assumption that wages in each industry are equal to the value of the industry's marginal product of labour. Equation (2.3) introduces the wage-adjustment assumption used in VU-Nat. It implies that a policy which causes employment in year t to be above its baseline value will cause the policy-induced deviation in real wages in year t to be larger than that in year t-1. With α values typical of those in VU-Nat, policies that are initially good for employment generate only small initial increases in real wages: in other words real wage adjustment is sticky. But wages continue to rise while employment is above its baseline path, eventually driving employment back to its baseline path. Thus, favourable policies have a short-run employment benefit that morphs into a long-run wage benefit. In most VU-Nat simulations this process takes about 5 years.

Now consider the variables in equation (2.2). Because P_c is a major component of P_g the movements in P_g/P_c caused by productivity gains in the financial sector are relatively damped. In terms of our stylized equations the major effect is an increase in A. With a sticky short-run response in W/P_c, equation (2.3) implies that $F_\ell(K/L)$ must fall, requiring a reduction in K/L. K also adjusts slowly. Thus employment rises.

The short-run increase in L shown in Chart 2 is particularly pronounced in the simulation conducted under ABS conventions (in which financial services are heavily used in consumption). This is explained as follows. Productivity increases in the financial sector lower the cost of financial services and under ABS conventions this lowers the cost of consumption relative to the general price level (or equivalently raises P_g/P_c, Chart 3). This reinforces the effect of the A movement in the determination of the short-run employment response. Under the Adjusted conventions (in which 35 per cent of sales of financial services go to investment activity) the reduction in the cost of financial services reduces the price of investment goods relative to the price of consumption goods. Because P_g is approximately a weighted average of the price of investment and the price of consumption, this leaves us with a decrease in P_g/P_c (Chart 3). Thus, the P_g/P_c movement under Adjusted conventions acts against the A movement in the determination of the short-run employment response. The contrasting P_g/P_c movements explain the difference in the short-run employment response between the two simulations.

In both simulations, the long-run employment deviation is approximately zero. Consistent with equation (2.3), real wage increases eliminate the short-run employment gains.

The effects on aggregate investment and capital of productivity improvements in the financial sector are given in Charts 4 and 5. A useful equation for understanding investment and capital effects is

$$\frac{Q}{P_i} = \frac{P_g}{P_i} * A * F_k(K/L) \qquad (2.4)$$

where

Q is the rental rate on capital;

P_i is the price deflator for investment;

F_k is the derivative of F with respect to K in the production function; and

the remaining notation has already been defined.

Equation (2.4) is a stylized version of the CGE assumption that rental rates in each industry are equal to the value of the industry's marginal product of capital.

Q/P_i on the LHS of (2.4) is a stylized version of the rate of return on capital. Other things being equal, an increase in A (such as that arising from an improvement in financial sector productivity) generates an increase in Q/P_i, leading to an increase in investment. What about the other two terms on the RHS of (2.4)? We know that F_k increases in the short run (K/L falls), reinforcing the effect on rates of return of the increase in A. Under Adjusted conventions P_g/P_i rises, further reinforcing the A effect. Under ABS conventions P_g/P_i falls, damping the increase in Q/P_i. These opposite effects on P_g/P_i explain why investment in Chart 4 shows larger deviations in the simulation conducted under Adjusted conventions than in the simulation conducted under ABS conventions.

With higher investment we would expect the paths in Chart 5 for aggregate capital stock to show positive deviations in both simulations: investment adds to the quantity of capital. But for the simulation conducted under ABS conventions the deviations in capital stock are barely positive for most years and even slightly negative in a couple of years, despite positive deviations in investment, Chart 4. The explanation is that the policy (the productivity increase in the financial sector) happens to cause a reallocation of the aggregate capital stock towards low-rate-of- return industries (industries with low rentals compared with the value of their capital). In measuring movements in aggregate capital we weight capital movements in each industry by the industry's share in economy-wide rentals, not by its share in the economy-wide quantity or value of capital. Thus reallocation of capital towards low-rate-of-return industries has a negative effect on measured aggregate capital. This effect is small in both simulations. However, in the simulation under ABS conventions it is sufficient to overcome the positive effect on measured aggregate capital of the relatively small increases in investment for that simulation.

Chart 6 shows the deviation paths in the two simulations for GDP. These paths closely follow the equation

$$gdp = a + S_\ell * \ell + S_k * k \qquad (2.5)$$

where

gdp is the policy-induced percentage deviation in real GDP (Chart 6);

a is the policy-induced percentage deviation in multi-factor productivity (Chart 1);

ℓ is the policy-induced percentage deviation in aggregate employment (Chart 2);

k is the policy-induced percentage deviation in aggregate capital (Chart 5); and

S_ℓ and S_k are the shares of labour and capital in GDP (adjusted to add to one).

Under ABS conventions, the short-run GDP response is stronger than that under Adjusted conventions. This reflects the relative short-run employment responses (explained earlier in the discussion of Chart 2). In the long run, the stronger capital response under Adjusted conventions (Chart 5) elevates the GDP path for that simulation above that for the simulation under ABS conventions.

In public discussions, GDP effects are often used as a measure of the benefits of a microeconomic reform (e.g. reduction in red tape). However, GDP is a measure of production. A better measure of benefits is consumption. The consumption effects in our two simulations of a one per cent primary-factor saving technical change in the financial sector are shown in Chart 7.

An obvious difference between the consumption deviation paths in Chart 7 and the GDP deviation paths in Chart 6 is scale: to a close approximation, the consumption deviations are the same as the GDP deviations expanded by the factor 1/0.535. For example, under ABS conventions the GDP deviation in 2020 is 0058 per cent while the consumption deviation is 0.108 (=0.058/0.535). Under Adjusted conventions, the GDP deviation in 2020 is 0.072 per cent while the consumption deviation is 0.127 per cent. On our factor rule we would have predicted the consumption deviation under Adjusted conventions to be 0.136 per cent (= 0.072/0.535). Why does the factor rule work perfectly under ABS conventions but lead to a slight overestimate of the consumption deviation under Adjusted conventions?

The consumption share in baseline GDP in 2020 is 0.535. We assume that the policy (productivity improvement in the financial sector) has no effect on real national saving or on public expenditure. To a first approximation these assumptions imply that policy-induced GDP increases are absorbed by private consumption, giving the rule that the percentage deviation in consumption is the percentage deviation in GDP divided by the consumption share in GDP. However VU-Nat recognizes foreign ownership of capital. With real national savings fixed on its baseline path, increases in capital mean increased foreign owned capital and consequent increases in income accruing to foreigners. This requires a correction to our simple factor formula: not all of the increase in GDP can accrue to consumption, some of it belongs to foreigners. This explains why the simple factor formula works in the simulation under ABS conventions where there is barely any change in capital but overestimates the consumption deviation in the simulation under Adjusted conventions where there is a noticeable increase in capital.

One final question is raised by the results. If the GDP contribution generated by the policy-induced increase in capital accrues entirely to foreigners, why is the long-run consumption deviation in the simulation under Adjusted conventions higher than in the simulation under ABS conventions? The answer is taxes. Not all of the GDP contribution generated by extra capital accrues to foreigners even if foreigners own all the extra capital. Some of the GDP contribution stays in Australia as taxes.

Chart 1. Economy-wide multi-factor productivity
(% deviations from baseline caused by 1% primary-factor-saving in financial sector)

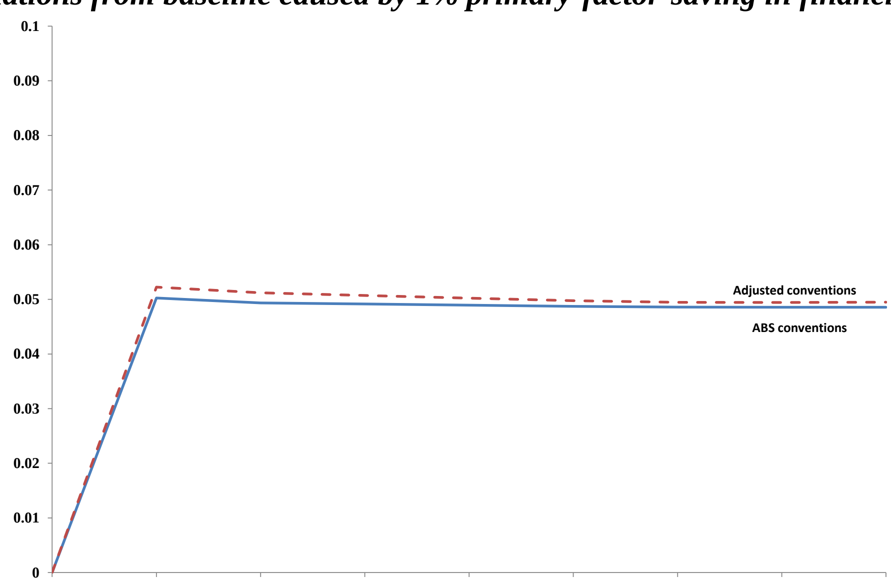


Chart 2. Aggregate employment
(% deviations from baseline caused by 1% primary-factor-saving in financial sector)

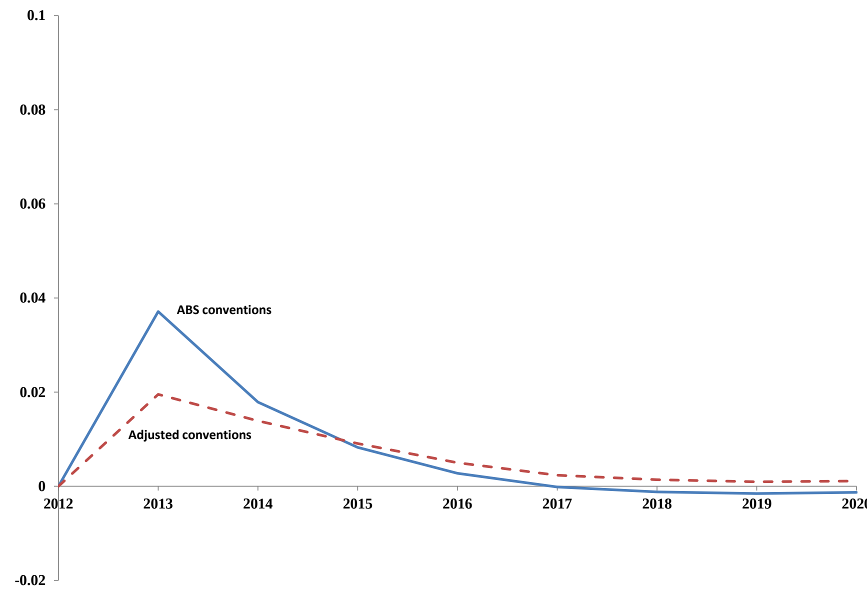


Chart 3. Ratio of the price of GDP to the price of consumption
(% deviations from baseline caused by 1% primary-factor-saving in financial sector)

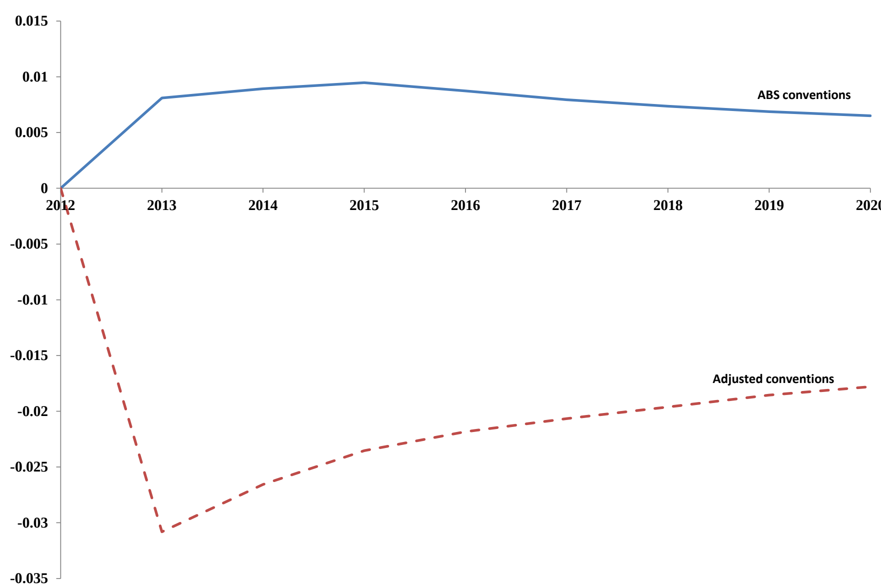


Chart 4. Real investment
(% deviations from baseline caused by 1% primary-factor-saving in financial sector)

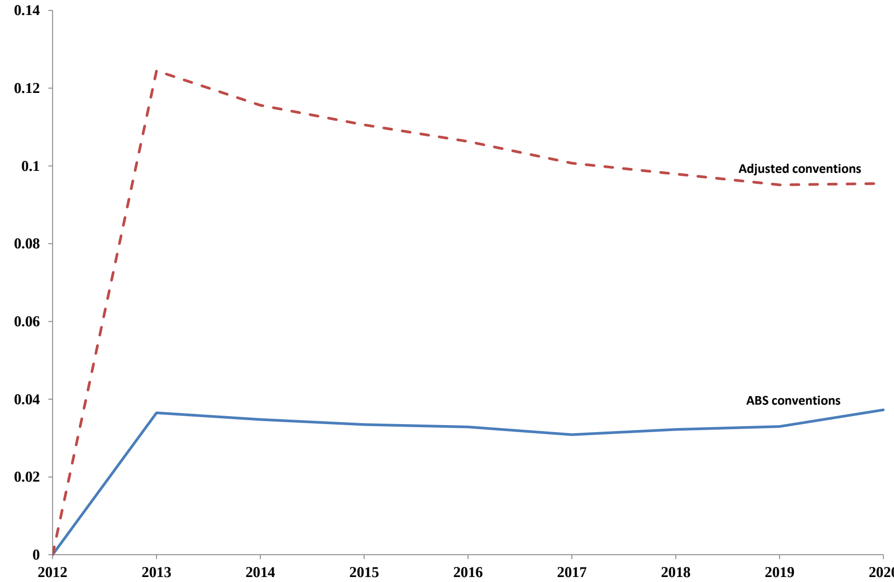


Chart 5. Aggregate capital
(% deviations from baseline caused by 1% primary-factor-saving in financial sector)

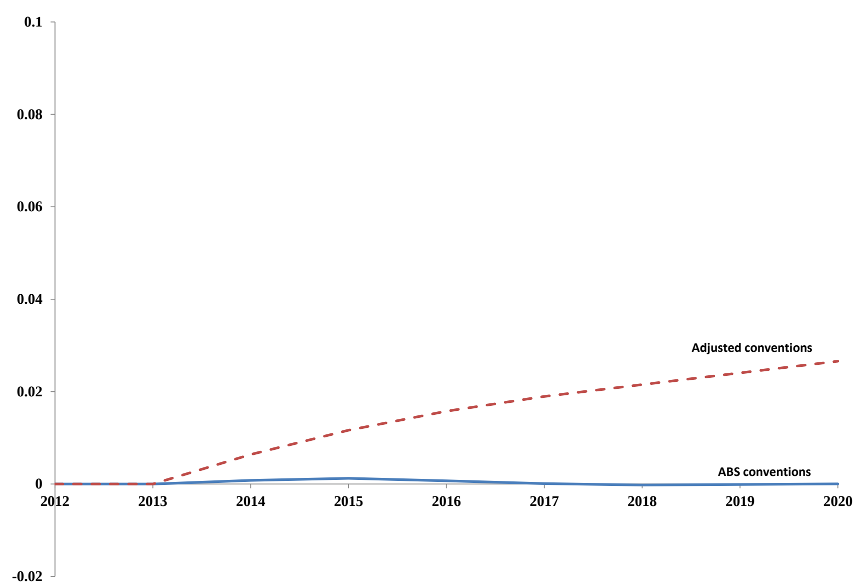


Chart 6. Real GDP
(% deviations from baseline caused by 1% primary-factor-saving in financial sector)

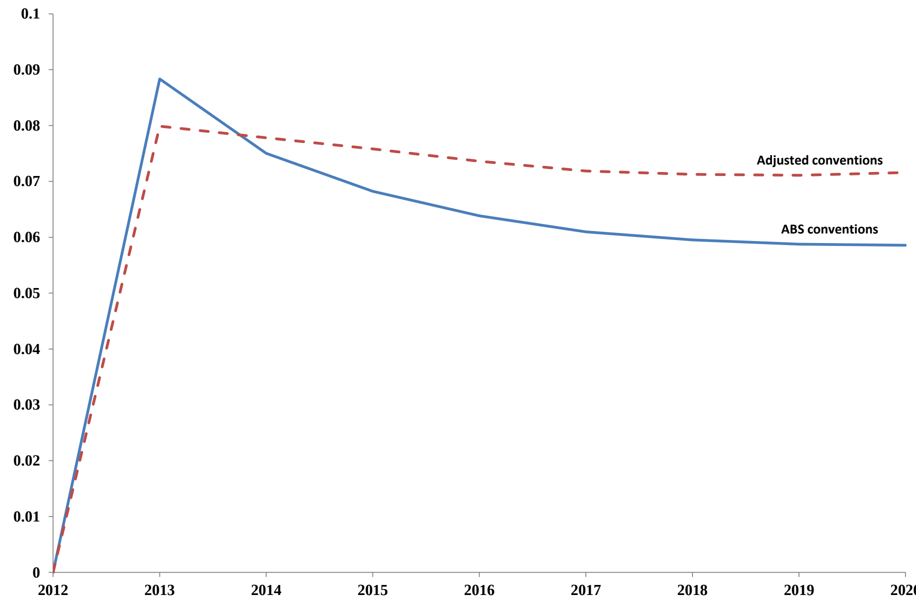
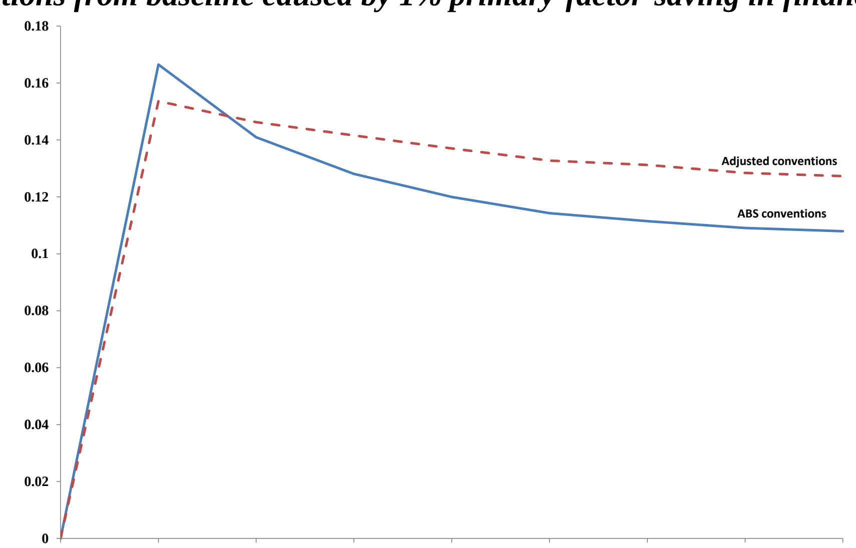


Chart 7. Real private consumption
(% deviations from baseline caused by 1% primary-factor-saving in financial sector)



If the removal of red tape increases the probability of a financial-sector-induced recession too much, it is not good policy. For the given simulations, the removal of red tape becomes worthwhile when the expected loss from a recession, namely Pr(recession)*Loss, goes up enough to counterbalance the (average) 0.065 per cent increase in GDP from the productivity improvement (Chart 6), which translates in a Net Present Value of 1.3 per cent of GDP with a 5 per cent discount rate.

In Table 1, we calculate the ceiling on this probability for a range of productivity improvements and assuming a recession costs 50 per cent of GDP, though we attach a very wide margin of error to this cost. For example, figure 3.8 in IMF (2009) shows the deviations from baseline for a 'typical' recession, one with no financial sector distress, and the other with financial distress. The difference between the output deviations for a non-financial recession and a financial recession is summed over the graphed 3 years (approx. 6½ per cent of GDP) and then assumed to unwind smoothly over the following two years, making a total of around 10 per cent. This compares with BCBS (2010) where a banking crisis is deemed to cost between 20 and 60 per cent of GDP. In Table 1, if the removal of regulations causes the probability of a financial crisis to go up by more than the probabilities in the final column, the removal would fail a cost benefit analysis.

Table 1: Break-Even Increase in Probabilities for Removing Regulation
(50 per cent GDP Recession Assumed)

Productivity increase	**Model GDP Deviations (benefit of removing red tape)**	**Breakeven increase in Pr(recession) due to removal of red tape**
1.0000%	0.0650% = NPV 1.3%	.013/0.5=2.6% pts
2.0000%	0.1300% = NPV 2.6%	.026/0.5= 5.2% pts
3.0000%	0.1950% = NPV 3.9%	0.039/0.5= 7.8% pts

Our figure of the NPV of GDP loss might well prove to be conservative – in favour of removing regulation – both because 50 per cent GDP loss might be low[12] and because we have only been discussing the expected loss from a large recession, not the volatility associated with it. The volatility is huge, and comprises two very different elements.

The sizable margin of error comes partly from difficulties in modelling macro-economic stochastic processes many years hence, a valiant task if ever there was one. But even more fundamentally, it is due to Knightian uncertainty (Knight, 1921) – we simply do not know what the next financial recession will look like. In fact, as we noted in the introduction, the most likely guess we can make about it is that it's entry and mechanisms will differ from the recent Great Recession. In Bird et al. (2010) a CGE model of the US economy is subjected to a crisis precipitated by two years of wasted investment. In the baseline scenario without a financial crisis this leads to a mild recession worth around one third of a per cent of GDP. However, in the event of a financial-crisis capital strike, which lasts three years, five years, or forever, the Net Present Value of GDP loss is 4, 6, and 21 per cent respectively. Clearly, the costs of financial sector recessions are not robust to their duration.[13]

[12] An referee suggested between 50 and 150 per cent, for a developed country like Australia with high wealth and high debt.
[13] Related to this point, most modelling frameworks have the economy returning to an equilibrium, and we acknowledge this is a somewhat arbitrary modelling convention.

Some of the changes in probabilities in the last column of Table 1 look quite large, and so if the productivity improvements are sizable from cutting away regulations, one can understand the appeal of financial liberalization. But knowing the modelling uncertainties as we do, and bearing in mind the Knightian uncertainty concerning future financial recessions, we find the potential gains in GDP, on balance, underwhelming.

III In Praise of (Some) Red Tape

If it is possible to create or find extra IDRs, or make existing regulations more independent, framing the policy choice about low quality regulation ('red tape') solely in terms of 'disband or leave in place' overlooks an important third option. Rather than disbanding or leaving regulation as is, there may be a way to make an existing regulation more independent. We briefly explore a number of possibilities here, and raise some relevant questions, leaving more context-specific recommendations for other research.[14]

If two groups or even two institutions have common goals, and their actions affect each other, then the principles of internalizing externalities and operating at least cost could suggest combining them. But our argument up to this point suggests that the creation of an extra independent round, or the enhancing of the independence of existing rounds, might be very worthwhile if it reduces the probability of a crisis in a non-linear way.

A related question is at what point within, or indeed across, institutions information should be shared, harmonized and all disagreements 'resolved'. Discussions with Australian regulators highlighted the tension between allowing independent and conflicting perspectives to sit alongside each other versus the need to form coherent policy. Firming up a policy stance generally involves both the synthesizing of different perspectives and the communication to the outside stakeholders of that policy.

The definition of regulation in this paper is broad enough to encompass the kinds of corporate governance protocols that financial regulators promote within financial institutions. Where regulation forces an organization to address a question multiple times at different levels, what can be done to make the analysis more independent? For example, if a board has to direct a subcommittee or a consultant to investigate an issue, so they are enabled to make an attestation, could they be required to ask the parties to use original data and not summarized data given to them by the Board?

Where different professionals look at the same aspect of the financial system from different angles (eg. economists, actuaries, accountants) the dimensions are most independent when they are looking at the identical issue with 'different pairs of eyes'. Does this argue for the opposite of compartmentalization and specialization, which minimizes overlap? Should our regulatory environment encourage 'mixed teams' to investigate issues? Perhaps it is good to *maximize* overlap, even though this looks wasteful.

One concern about having multiple agencies direct their attention at the same potential flaw is the possibility that financial institutions might game the agencies. Depending on the institutional design, one of the benefits of different organizations looking after separate dimensions is that it may be harder for the institutions to capture the regulator in an inappropriate way. On the other hand, it might be easier, if the institution has some power to choose the regulator with whom it deals.

[14] This section has benefited from discussions with staff at two Australian regulators, and with a board member of a private company.

A final discussion is in order about how 'special' regulators are. According to the IMF (2014), the task of making existing dimensions of regulation more independent should focus particularly on this last line of defence – the powers and actions of the regulator.

In the Australian context, the regulators stand as the last of what APRA calls six 'lines of defence' to avert a crisis (APRA, 2014b). Should the three internal lines[15] fall, there are three external lines – ratings agencies, equity analysts and, finally, the regulators who can in theory face the Vandals.

Using the tools of our framework, each of APRA's lines of defence should ideally comprise an IDR. Indeed, it is noteworthy that the word 'independent' is used several times in their description of the lines (APRA, 2014b). Yet a dominant CEO might influence all of the first five lines so that they become correlated, which we have shown degrades their usefulness as the number of independent equivalent dimensions shrinks (recalling the discussion following (1.1)). Even without the misadventures of a dominant CEO, the first five lines use more or less the same data, and more or less the same analytic tools. Faced with already high correlation (due to common data and methods) which might be deliberately manipulated by powerful CEOs, the regulator stands out as a potential source of increased independence.

The IMF therefore argues for a paradigm shift in regulation, so that it is more intrusive, sceptical and comprehensive. They suggest that such a shift is not primarily about the rules and frameworks, which were not different enough to account for differential performance during the Global Financial Crisis, but about political will. The regulator needs to face the banks as a lobby group, securing its independence from both the government (operational independence) and from the regulated (independence from regulatory capture). The regulator needs a highly skilled team and, our framework would suggest, independent expertise is valuable in this regard even if it looks 'wasteful'.

In this new debate about supervision the key questions obviously revolve around how the regulator line of defence differs *specifically* from the other five lines of defence in terms of both its independence of information, and of action. We might hope that public authorities in Australia are not at the beck and call of powerful CEOs, but even if this is granted are there other pressures that public officials face which may compromise the independence of this final line of defence? And how different are their data sources and methods of analysis in reality, compared with their private sector counterparts?

All these are interesting questions which deserve to be answered, but not in this paper. Our contribution has been to show that the search for financial flaws can plausibly alter the probabilities of averting a recession in a non-linear fashion, especially if the dimensions of regulation approach independence. The crucial implication of this is that more or less linear cost cutting can lead to nonlinearly expanding dangers. Under these circumstances, and given fairly modest benefits of productivity improvements in Australian financial services outlined in section II, some excess regulation is arguably warranted.

More generally though, our analysis commends a new 'state of mind' approach to regulation in any jurisdiction, where one is always asking questions about independence of action and data collection, particularly for those charged with safeguarding the financial system. Any new environment imbued with this approach would see financial institutions hold other values, alongside classic cost minimization. It will not necessarily be easy to generate such values within institutions that see the world through red-tape glasses.

[15] The three internal lines are; the incentives of the business owners to avoid loss, the supposedly independent operations of the board and the supposedly independent reviews of risk management from time to time.

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