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The value of taking a portfolio approach to climate policy

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Key findings

- Market instruments such as emissions pricing are critically important to supporting New Zealand's low-emissions transition. However, while emissions pricing, such as through the New Zealand Emissions Trading Scheme (NZ ETS), is necessary it is unlikely to be sufficient for a number of reasons.
- There is significant value in pursuing a dynamic portfolio approach to climate policy with emissions pricing at its core, complemented by a number of additional measures that are supported by robust intervention logic and are designed so as not to substitute for or hinder market signals and mechanisms.

Introduction

New Zealand is in the midst of a significant transition to a low-emissions, climate resilient economy. The Government's first Emissions Reduction Plan (Ministry for the Environment, 2022) published this year marks a foundational step towards meeting its long-term climate objectives. However, there is much work yet to be undertaken between now and 2050 to shape the country's transition.

New Zealand has made commitments to domestic and international targets aimed at meaningfully driving emissions down in an effort to curb the worst anticipated impacts of climate change. These include New Zealand's first Nationally Determined Contribution (NDC) under the Paris Agreement – a 50% reduction of net emissions below its gross 2005 emissions level by 2030 – and commitments under the Climate Change Response (Zero Carbon) Amendment Act 2019 – net-zero long-lived gases and a 24% – 47% reduction in gross biogenic methane levels by 2050.

Achieving these targets will not (and cannot) be achieved solely through government action. The key to success will ultimately lie in the investment decisions and behaviour of firms and households. The core role for government is to ensure that policies, market signals and structures are in place to incentivise and support, rather than create barriers to, these actions by firms and households.

In a perfect world, economic theory tells us that we would achieve the socially optimal amount of greenhouse gas emissions since, assuming property rights were perfectly assigned, markets would naturally find their way to this state, taking the most efficient pathway to get there.[1] However, we do not live in a theoretically perfect world - a world that economists often refer to as 'first best'. Markets fail (eg, polluters do not always face the full costs of pollution) and consumers do not always act as perfectly optimising agents (eg, individuals often have limited information and will often make choices that are satisfactory, rather than optimal).

This more realistic world in which we live, which includes market failure and imperfections, is often referred to by economists as 'second-best'.[2] Robust economic policy has the opportunity to pursue the efficiencies of 'first-best' policy outcomes in a 'second-best' world by working to identify and target these market imperfections and gaps where possible. While the imperfections of reality may preclude ever truly achieving first-best outcomes, taking a mindful approach to policy development and portfolio management over time can help move us closer to first-best outcomes than the application of first-best policies in a second-best world on their own.

In a climate policy context, this means taking a *portfolio* approach to policy that leverages the strengths of different, complementary, policy instruments and flexes over time in line with New Zealand's climate transition to support more effective and efficient outcomes overall. In this paper complementary measures are defined by the fact that they inherently support and strengthen, rather than detract from or weaken, core economic policies such as emissions pricing. Importantly, not all complementary measures require government funding. Some of the strongest tools to align incentives and remove barriers can often be non-fiscal, such as robust regulatory policy. A true portfolio approach also means flexing the portfolio approach itself to adjust and update for new information and learning-by-doing as policymakers gain more information about the ease and efficacy of implementing different policies.

There has been a great deal of debate among economists, politicians and amongst commentators more generally about the efficacy of first-best economic policy instruments in achieving climate-related objectives.[3] At the core of this debate is a focus on the role of emissions pricing in driving least-cost emissions reductions across the economy and whether additional 'complementary' measures truly complement, as opposed to substituting for or hindering what emissions pricing is able to achieve on its own. The purpose of this Analytical Note is to contribute to this ongoing conversation.

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[1] See Varian (2010) as an exemplar of an intermediate neoclassical microeconomics textbook for coverage of the theoretical underpinnings of an economic 'first-best' world. For the importance of effective property right assignment, see Coase (1960).

[2] See Bennear and Stavins (2007) for a classic description of 'second-best' theory and the case this makes for the use of multiple policy instruments.

[3] See Hepburn et al (2020) and Hall and McLachlan (2022) as recent academic contributions to this debate.

This paper first provides an overview of the core proposed rationale for taking a portfolio approach to climate policy in New Zealand. It then supports this proposal by first articulating why first-best policy instruments such as emissions pricing are necessary, but unlikely to be sufficient, to drive the broader set of outcomes and objectives associated with New Zealand's climate transition, including but not limited to the existence of several market failures and imperfections. It then highlights specific intervention logic and rationale that create strong opportunities to consider additional policies to complement rather than substitute for or hinder emissions pricing instruments such as the New Zealand Emissions Trading Scheme (NZ ETS). Importantly, not all additional policies can be considered complementary – this paper provides suggestion for how policymakers can consider designing them to ensure that they do not materially hinder the ability of the emissions pricing to play its critical role. Finally, the paper emphasises the benefit of pursuing a dynamic approach over time that suits for information obtained about the ease and returns from implementation of various policies that can support the portfolio to adapt to the intervention logic and policy administrative landscape as it shifts and evolves.

The rationale for a portfolio approach

There are at least three core reasons why emissions pricing is best complemented within a policy portfolio by other complementary measures.

First, emissions pricing is an important economic tool, grounded soundly in economic theory and practice with respect to pricing a significant externality. However, it only addresses one market failure – the externality of greenhouse gas emissions. In reality, there are a number of market failures and barriers that exist across the economy, many of which hinder the efficacy of emissions pricing tools. For example, households or firms may have imperfect information on the emissions intensity of their investments and behaviours. Other barriers, such as lack of necessary infrastructure, may inhibit action. Sufficient cost-effective low-emissions substitutes may also not exist or be readily and widely available on the market.

Secondly, while achieving emissions targets is a critical component of action to address and mitigate further climate change, New Zealand's objectives for its transition are broader than achieving these targets at the least possible economic cost. Emphasis has been placed as much on *how* the transition is achieved, including broader distributional and wellbeing impacts, as achieving the targets. Giving effect to these broader objectives is likely to require policy interventions beyond emissions pricing alone.

Thirdly, the complexity of reality creates significant *ex ante* uncertainty (ie, uncertainty pertaining to the future) about which actions and interventions are likely to have the greatest efficacy. Within the context of climate change, global policy and technology uncertainty also play a critical role. Furthermore, what is required to effectively support a transition to a low-emissions economy will shift over time as the country moves through phases of its transition. Taking a dynamic, diversified portfolio approach grounded in regular updating and adjusting to new information and changing conditions can help increase the efficacy of interventions that support this transition.

Markets are powerful instruments in driving efficiency, but there are many reasons why they may fail to achieve their full potential in practice.

In a first-best economic world, property rights would be perfectly assigned, all costs and benefits would be perfectly perceived and efficiently considered by robustly optimising economic agents, and markets would deliver efficient outcomes on their own. In this world, there would be limited need for additional intervention.

Markets are powerful. They are strong diffusers of information, sending robust signals across large numbers of economic actors (firms and consumers) and play a significant coordination role across the economy. The power of markets has been referred to as an 'invisible hand' by the likes of Adam Smith, a conveyer of key 'time and place' information that supports entrepreneurial discovery and efficiency.[4] When functioning robustly, markets drive the signals and create the incentives that harness the power of firms and consumers to consume and produce at efficient levels. By doing so they help maximise economic output which supports individuals, firms and governments to spend money on the things they most care about. Inefficiency is inherently undesirable because it represents resources that could have been better allocated or generated but were not.

However, the world that we live in is not perfect and there are several reasons why it departs from this first-best ideal. For example, imperfect information, the existence of externalities (ie, where costs or benefits are borne by third-parties as an effect of another party's activities), imperfect allocation of property rights and evidence of market power (eg, monopoly power) are all well-canvassed barriers to why markets, when left alone, may not deliver the efficient outcomes theory suggests they should.[5]

The key to taking a robust economic approach to this problem is to work towards understanding *how* and *why* we have departed from a first-best world and make best efforts to tailor interventions accordingly. This can help support markets to do what they do best in a manner that helps society achieve the most with what it has.

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[4] See Smith (1776) on the 'invisible hand', von Hayek (1937 and 1945) for one economic school of thought's perspective on the importance of 'time and place' information and Kirzner (1997) regarding the role of markets in supporting entrepreneurial discovery.

[5] Academic coverage of highlighted market failures includes imperfect or asymmetric information (eg, Akerlof (1970) and Grossman and Hart (1983)), market power (eg, Cournot (1838) and Bertrand (1883)), ill-defined property rights (eg, Coase (1960)) and externalities (eg, Pigou (1920)).

Emissions pricing is a market instrument with significant potential to help drive an efficient climate transition. Recent amendments to the NZ ETS mean that it is now better placed to support this outcome.

Emissions pricing is an example of a first-best economic instrument that is targeted at addressing a specific market failure (the externality created by greenhouse gas emissions) in order to achieve more efficient market outcomes. A truly first-best emissions price would be one that exactly equalled the size of the externality – in the literature these are referred to as Pigouvian taxes after the economist Arthur Pigou.[6] An alternative to a Pigouvian price instrument is a quantity-based instrument, such as cap-and-trade systems, where the quantity of emissions units under the 'cap' is exactly equal to the true socially optimal quantity of emissions in the economy. Theoretically, under perfect conditions and settings, a price-based instrument or a quantity-based instrument would achieve the same economic outcome from an economic efficiency perspective.[7]

In New Zealand emissions are priced through the NZ ETS which is neither a pure price nor a pure quantity-based instrument. Historically it has shared characteristics with a price instrument through the setting of a 'fixed price option' (FPO) – an amount at which emitters with an obligation to surrender emissions units could pay for their emissions at the end of a reporting year at a given price. It has also shared characteristics with a quantity-based instrument through the issuance of tradeable permits (New Zealand Units, or NZUs). However, until recently there was no cap on the quantity of units issued.[8]

The NZ ETS was established in 2008 and since then it has covered approximately 50% of domestic emissions, with the notable exception-to-date of the agriculture sector.[9] From its inception the NZ ETS has created a functional market for trading emissions units, but little incentive for domestic emissions reductions. Historically this has been due to settings that have dampened the price signal, such as a relatively low FPO, an unlimited supply of units and a relatively thin market with limited incentives for trading. All these settings created limitations for the market to discover an emissions price that reflected the cost of the relevant emissions externality.[10]

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6 See Pigou (1920).

7 For a theoretical discussion on how this theoretical equivalence may be influenced by uncertainty, refer Weitzman (1974).

8 See Motu's guides to the New Zealand Emissions Trading Scheme for an excellent explainer of the NZ ETS, including recent changes (Leining and Kerr (2018) and Leining (2022)).

9 While agricultural emissions do not currently face a price, work is underway to support pricing agricultural emissions by 2025. The Government is expected to take decisions on pricing agricultural emissions by the end of 2022, to enable implementation by 2025. In taking these decisions, the Government will assess recommendations provided by the He Waka Eke Noa Partnership against the legislated backstop option of bringing agriculture into the NZ ETS at the processor-level.

10 Refer Leining et al (2019) for an overview of the effectiveness of the NZ ETS before the 2020 regulatory amendments.

Other well-known historic limitations of the NZ ETS have included its relative thinness and constrained liquidity. In other words, unlike the markets in economics textbooks, the NZ ETS has a much smaller number of participants making a lesser number of trades therefore causing many units to sit in privately held NZ ETS registers for long periods of time rather than make their way around the market driven by the relative supply and demand of market participants.

Recent amendments to the scheme made through the Climate Change Response (Emissions Trading Reform) Amendment Act 2020 have increased the NZ ETS's ability to send more robust price signals to the market in line with other international cap and trade schemes. Most notably, these amendments have included the introduction of a unit cap, the introduction of auctions and the removal of the FPO. These amendments have been critical steps in bringing the NZ ETS closer to a true economic instrument and therefore increasing its ability to send a robust price signal to the market. However, relative thinness and illiquidity compared to other markets remain limitations of the scheme.

It is too soon to make robust judgements on the impacts of the 2020 amendments to the efficacy of the scheme, but even in the short-term it has been clear that prices have started responding more strongly to market forces.[11] Pricing agricultural emissions will bring the coverage of pricing New Zealand's domestic emissions up to 100%. This full coverage is a critical component of more fully supporting whole-of-economy trade-offs and net emissions reductions. Regardless of how these emissions are priced, the operation and efficacy of any future agricultural pricing mechanism is likely to have implications for the future workings of the NZ ETS.

As a (now stronger) economic instrument, the NZ ETS incentivises domestic marginal least-cost abatement first, followed by more expensive abatement as the emissions price rises. By driving investment in this manner, abatement is obtained efficiently and resources are available to use in other areas.

However, there are other important outcomes in addition to economic efficiency.

In addition to legislating emissions reduction targets, domestic legislation emphasises the importance of pursuing a just and equitable transition. This emphasis on equity was echoed by the Climate Change Commission's advice to Government on setting its first emissions budgets and developing its first emissions reduction plan (He Pou a Rangi Climate Change Commission, 2021). Equity considerations forms a core pillar of the Government's approach to achieving the emissions budgets as reflected in the first Emissions Reduction Plan (Ministry for the Environment, 2022). Internationally the Paris Agreement also notes the importance of taking equity into account in the global response to climate change.

[11] For reference, in 2019 and early 2020, before the 2020 amendments were made, the price of New Zealand Units (NZUs) on the secondary market hovered around $25 (this was also the Fixed Price Option at that point in time). From the announcement of the amendments to the scheme and the introduction of auctioning the NZU price more than tripled in two years. At the time of writing the NZU spot price on the secondary market is $85.50.

Even if the market failures and other barriers that cause us to be in a second-best world were resolved, standard economic theory is clear that efficient outcomes may not necessarily be universally considered equitable.[12][13] Emissions pricing instruments, for example, explicitly target the market failure presented by the externality of greenhouse gas emissions to the economy. They are not inherently targeted at achieving outcomes that would universally be deemed equitable and in many cases are likely to have distributional impacts through the increases they are likely to drive in the prices for core goods (such as electricity, transport and fuel).[14]

Rather than hinder or distort the ability of an emissions pricing instrument to drive efficient outcomes, there is a stronger economic rationale to *complement* the emissions pricing instrument with policies that are explicitly focused on supporting equitable outcomes. In addition to equity considerations, taking a broader wellbeing approach to policy means considering impacts across wellbeing domains and aspects of wealth – natural environment, financial and physical capital, social cohesion and human capability.[15] Pursuing a diversified, portfolio approach to climate policy can help support greater achievement of these broader objectives alongside traditional economic efficiency goals.

A portfolio approach to climate policy can support markets to do what they do best, while helping to mitigate the instances in which they don't perform as strongly.

Interventions that address additional objectives, including addressing other market failures, are referred to as 'complementary' measures due to their intention to complement, rather than substitute for or hinder, emissions pricing instruments such as the NZ ETS. The ongoing public debate about the role of emissions pricing and complementary measures, in New Zealand and globally, is as much focused on whether emissions pricing is sufficient on its own as it is about which measures are truly 'complementary'.[16]

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[12] This paper takes a *utilitarian approach* to efficiency – this is in line with the standard economic approach to defining the economy's objective function as maximising total welfare. Importantly, this is not the only approach to considerations of efficiency – alternate approaches include 'minimax', 'maximin' and 'Rawlsian' utility functions.

[13] For a classic reference to the equity-efficiency trade-off refer to Okun (1975). However, it is noted that this tension does not mean that efficiency and equity objectives cannot be pursued alongside one another.

[14] For recent work undertaken by the Treasury on the distributional implications of emissions price increases, see the supplementary documents for the Climate Change Commission's 2022 advice on NZ ETS unit limits and price control settings (ZIP file).

[15] The Treasury's *Living Standards Framework* provides an overview of these domains and capitals (The Treasury (2021)).

[16] For a classic text on the potential for optimal carbon taxation refer Nordhaus (1993). Grubb, Hourcade and Neuhoff (2014) cite emissions pricing as one of three policy pillars and Fankhauser, Hepburn and Park (2011) speak to both the benefits and the risks of leveraging multiple policy instruments.

The idea that emissions pricing alone is sufficient to drive optimal outcomes is only robustly defensible in an economic first-best world with no other market failures and perfectly optimising consumers. Given that we do not live in such a world the focus, therefore, becomes on the discussion around what policy measures, additional to emissions pricing, can truly be complementary and not unnecessarily substitute for or hinder the ability of emissions pricing schemes to support more efficient outcomes. Importantly, despite intentions, not all additional measures are guaranteed to be complementary. This paper suggests that the intervention logic for complementary measures is the strongest where the proposed policy serves at least one of the following purposes.

Addressing additional market failures

The strongest economic rationale for introducing additional measures complementary to emissions pricing is to address broader market failures. As described above, this intervention logic is grounded in the fact that we live in a second-best, rather than first-best, world.

The interaction of market failures is often complex. This can create difficulties in developing and applying specific targeted policies for each one, especially since many overlap. However, leveraging established policies or mechanisms, such as emissions pricing, to achieve objectives broader than the core purpose of the policy creates policy efficacy risk. Where possible, addressing market failures separately with well-constructed, targeted complementary policies can help support greater achievement of desirable outcomes.

Market failures relevant to climate include, but are not limited to, imperfect information, information asymmetries, principal-agent problems, behavioural considerations, coordination failures and other externalities – both positive and negative. Some of these failures, such as imperfect information and principal-agent problems, may hinder individuals, households and firms from fully incorporating emissions price signals from the NZ ETS into investment and consumption decisions.

A common example of principal-agent problems in this context is the barriers created to investments in energy efficiency through tenant-landlord dynamics. In this example, the tenant (principal) often directly faces the signal from the NZ ETS (eg, through rising electricity or fuel prices), but relies on the landlord (the agent) to invest in household heating, cooking or other appliances. Given the investment cost of a new energy efficient appliance would fall to the landlord, but the incentive to make this investment and the immediate benefits would accrue to the tenant, the principal-agent relationship in this context can mean efficient investment that would have otherwise been incentivised is not undertaken.

The characteristics of low-emissions technologies and behaviours that are considered public goods can also be give rise to market failures in other markets. This creates barriers to emissions pricing signals driving efficient investment in abatement. Roading infrastructure and publicly funded research and development are important public goods to consider in this context. These public goods are ‘non-excludable’ (ie, the owner of the good cannot explicitly prevent anyone from consuming the good) and ‘non-rivalrous’ (ie, the consumption of the good by one individual does not decrease the ability of others to also consume the good). Public goods with these characteristics give rise to what is referred to as ‘free-riding’ where users of a good can access the good without directly paying for it. In this way, individual firms or households may not be significantly incentivised to act in response to emissions pricing signals, given others are likely to benefit from their investments without contributing to the cost.

In addition to these barriers, there is also evidence that even with robust pricing signals in place, firms and households do not always act in an economically optimal manner, often not undertaking investments of behaviours for which the benefits may substantively exceed the costs. A well-canvassed example of this is the energy efficiency paradox where substantive action and investment in energy efficiency that economics suggests should be incentivised given current prices is not being taken up.[17] The reference to this being a 'paradox' comes from many of these actions or investments having negative cost to consumers, reflecting financial benefits that may far exceed the cost of undertaking the action or investment. There have been many attempts to explain the energy efficiency paradox including reference to market failures such as incomplete or asymmetric information, the cost of 'effort' in learning about energy efficiency actions and principal-agent problems. In reality it is likely that all of these problems may contribute to why market signals are not always driving efficient outcomes in this space. Developing complementary measures that address these failures therefore holds significant potential to support price signals in driving more efficient outcomes through market mechanisms.

In considering the development and implementation of such complementary measures, the greatest value is likely to be where they can be developed in a way that most closely targets relevant market failures to address the underlying barriers. Developing a deeper understanding of the nature of these market failures and behavioural considerations by leveraging behavioural and other economic sciences can also help support the efficacy of additional policies.

Driving additional overall abatement in areas or sectors that do not currently face an emissions pricing signal

There is also strong intervention logic for complementary measures to address emissions that are not currently covered under the NZ ETS. At present the most notable example of this is the agriculture sector, which does not currently face any price for its emissions inside or outside of the NZ ETS. A first-best economic solution would be to price these emissions alongside other sectors through the NZ ETS. However, economics is only one component of decision-making and how these emissions are ultimately priced remains subject to future policy decisions. In the interim, while these emissions remain unpriced, there is a rationale for complementary policies that help incentivise reduction of these emissions. However, it is important that any such additional intervention does not distort or hinder supply, demand, or price within the NZ ETS market.

Importantly, interventions that address emissions not covered by the NZ ETS, but that support the uptake (or not) of mitigation technologies that are sought by participants within the NZ ETS may still risk distorting the NZ ETS's price signal. Options for mitigating this risk include developing such policies (eg, subsidies for a given low-emissions technology) to be effectively targeted or time-limited where possible. This can reduce the risk of the policy creating an enduring substitute for the incentives created by the NZ ETS.

[17] Refer to Jaffe and Stavins (1994) and Gillingham and Palmer (2014) for excellent overviews of the energy-efficiency gap and a variety of possible explanations for why it exists.

Acting as a policy 'bridge' by addressing design limitations of the NZ ETS and directly mitigating risks and barriers including those presented by investment cycles and technology and infrastructure 'lock-in'

In its current form, the NZ ETS has some structural characteristics that dampen the resulting price signal (for example, industrial allocation[18]) and, in some cases, mean that the price signal from the scheme (even if robust) may be less effective in driving change. This means that even if the NZ ETS cap were to be tightened, the salience of the resulting price signal may not be sufficient to drive the desired levels of mitigation. Importantly, even with improvements to the scheme, there is still likely to be a lag in the response of the market to the price signal. This lag, in addition to the investment cycles of low-emissions technologies, creates a risk that certain emissions-intensive investments may be 'locked-in'.

More generally, activities that involve infrastructure lock-in, such as road transport networks, can also create frictions within the market that prevent firms and households from effectively responding to the marginal price signals driven by the NZ ETS. Examples of this include household vehicle investment choices potentially lagging behind marginal price increases to emissions-intensive fuel, due to current transport networks and platforms having been developed and optimised to support petrol and diesel, rather than electric or hydrogen, vehicles. Lock-in around road and public transport systems is also likely to create frictions for day-to-day decisions on mode shift.

Barriers to accessing capital can also serve to drive greater lock-in, if firms and households cannot fund or finance the upfront investment needed to transition to a lower-emissions behaviour. These and other barriers to the low-emissions transition (including market failures as discussed above) are expanded upon in Hall and McLachlan's recent paper on why emissions pricing 'can't do it alone' (Hall and McLachlan, 2022).

Further improvements to the NZ ETS and addressing underlying barriers such as infrastructure lock-in and other barriers to the efficacy of the NZ ETS's price signal will take time. To meet shorter-term emissions objectives and goals (such as the first emissions budget), there can be a greater rationale for complementary measures to help drive emissions reductions sooner. These initiatives can bridge the mitigation gap between the present and the future where price signals from the NZ ETS are likely to be stronger and some of the underlying barriers to the efficacy of this signal lessened or removed. In addition to acting as a 'bridge', complementary measures can also play an enduring role in addressing the risks of technology 'lock-in' by helping bring investment in lower-emissions technology forwards in capital asset management cycles.

[18] Industrial allocation is an allocation of units which is given to businesses carrying out an activity which is recognised as being impacted by the NZ ETS. In particular, these businesses are considered to be emissions-intensive and trade-exposed. The purpose of industrial allocation is to help support these firms to compete on the international market with other firms who may not face the same costs associated with the emissions-intensity of their production. For more on industrial allocation refer to the EPA's explainer: https://www.epa.govt.nz/industry-areas/emissions-trading-scheme/industrial-allocations/

However, complementary measures justified by this intervention logic carry risks of substituting for or hindering a robustly functioning NZ ETS to drive cost-efficient mitigation, if not targeted effectively. To be truly complementary these policies are most valuable as temporary 'bridges', rather than enduring forms of support so that similar investment in mitigation technologies is driven more directly by emissions prices in the future (eg, by leaving room for private finance to flow into an area) rather than by additional government policies and supports. Given the focus on capital asset and investment lifecycles, these policies also carry greater risk of governments 'picking winners' with respect to low-emissions technologies. Supporting these types of policies to be well-targeted, time-limited and potentially with requirements for a return on government investment or co-investment with the private sector can help mitigate these risks.

Complementary policies to directly address the barriers of capital constraints or infrastructure lock-in can also help remove the need for enduring support over time. Policies to remove and address these barriers also have the significant benefit of increasing the efficacy of the NZ ETS to drive efficient outcomes in the market. For example, policies that help support the development of supporting networks for low-emissions technologies, such as charging networks for electric vehicles (EV's), can help remove barriers to investment in EV technology and incentivise more firms and households to make the switch from internal combustion engine vehicles.

Supporting broader wellbeing considerations, including perspectives on equity and distributional impacts.

Finally, the fact that New Zealand's climate objectives are broader than achieving its targets at least possible cost creates an additional rationale for complementary policies, even where emissions pricing succeeds at driving least-cost abatement. For example, there are political economy concerns that efficient emissions pricing signals may drive prices of key goods to firms and households higher than is considered acceptable. Additionally, high prices on important inputs to production and consumer goods are not costless to the economy. Increasing costs of production creates a drag on productivity in the short-run while inputs to production are fixed. Upward pressure on living costs, without sufficient availability of affordable alternatives, carry greater risk of driving 'pain points' in the economy rather than incentivising accelerated emissions reduction.

It may be appropriate in these situations to use complementary measures to shift the cost of meeting emissions targets from certain firms and consumers onto others, or, more generally onto society (for example through rates or general government expenditure). However, these types of measures also carry a significant amount of risk since in many instances they are likely to undermine the strength of the emissions pricing signal in driving low-emissions investments and behaviours. For example, blanket subsidies for essential goods that are likely to increase in price due to increases in NZ ETS prices (eg, fuel or electricity) can benefit at-risk populations, but dampening the NZ ETS price signal across the entire population means that investments in low-emissions technologies the price would have otherwise driven are less likely to occur.

The policies with the greatest potential are therefore those that effectively target at-risk populations facing undue pressure from emissions pricing. When targeted, the inefficiencies of these complementary measures can be outweighed by the distributional, equity-related and broader wellbeing benefits.

As with intervention logic for complementary measures that act as a 'bridge', as described above, there is significant benefit for policies aimed at alleviating distributional impacts to be similarly time-limited or adjust over time. The availability of technologies is expected to increase over time and their costs to fall. In the long run, therefore, it is expected that affordable low-emissions investments and decisions will be an option for a greater proportion of the population. It is also anticipated that both firms and households will shift production and consumption behaviour over time as inputs to production cease to be "sticky" and preferences and consumption bundles have opportunities to change. In this way, distributional issues are also inherently dynamic.

Complementary policies that are truly additional to emissions pricing mechanisms can also internalise *positive* externalities across our economy and achieve a number of co-benefits. For example, policies that incentivise investment in biodiversity alongside policies that incentivise investment in emissions reductions and removals can help support the achievement of multiple wellbeing objectives. However, in constructing these policies it is important to be careful that the pursuit of the co-benefit does not reduce the efficacy of the emissions pricing instrument, given its central role in the climate policy portfolio.

The optimal makeup of this policy portfolio will change over time

As with most policies, *dynamic* considerations are key to supporting effective intervention over time. Emissions pricing and market mechanisms are enduring pillars around which strong policy portfolios can be built. Both now and in the future emissions pricing is anticipated to play a critical role in supporting the transition to a resilient low-emissions economy. The most optimal policy portfolio is one that adjusts *dynamically* as the underlying rationale for the intervention logic supporting the portfolio mix shifts over time. Over time it is expected that new technologies will be developed, existing technologies will come down in cost, behaviours and preferences will shift, inputs to production will become less sticky and political economy and broader socio-economic conditions will continue to shift.

Taking a portfolio approach to climate policy is not a 'set it and forget it' exercise. The complexities associated with the second-best world in which we live will continue to drive the importance of considering and re-considering how we support and intervene in markets over time. Given the complexities and wide-reaching implications of climate change and climate policy, taking a dynamic approach is all the more important.

There is also significant value in observing and learning from the returns achieved from various policy instruments in the portfolio and using this information to update the portfolio over time. Policies that yield high returns in the short-term are not guaranteed to be the same policies that yield high returns in the longer-term. As with other long-term policy goals, effective climate policy action is best undertaken through an informed, adaptive management approach. Such an approach also applies to policy design and implementation. As policymakers 'learn-by-doing', designing increasingly effective policies at lower administrative cost will become increasingly achievable. This will drive the overall efficacy of the policy portfolio as a whole.

Conclusion

Emissions pricing is a powerful first-principles economic instrument that holds significant promise in supporting New Zealand, and countries around the world, to efficiently drive low-emissions investment and behaviour decisions from firms and households.
When functioning effectively its strength lies in the benefits of leveraging a flexible market mechanism to coordinate and drive efficient behaviour and investment in a manner that maximises the amount of total resource in the economy in a socially optimal manner.
This resource can then be utilised to achieve a broad set of objectives.

As New Zealand's core emissions pricing mechanism, the NZ ETS plays an important role in achieving these outcomes. The recent amendments to the scheme that bring it closer to a first-best economic instrument and the opportunity for further amendments in the future build upon these foundations to support enduring incentives for efficient emissions reductions into the future.

However, despite all that the NZ ETS and emissions pricing more generally can achieve, there are many reasons why it is unlikely to achieve its theoretical potential. In addition, even if perfect efficiency was achieved the entirety of the market failures in and across the economy were addressed, there is no guarantee that broader equity and wellbeing objectives would be met.

Taking a portfolio approach to climate policy with emissions pricing at its core, supported by a number of well-considered complementary measures is the most economically efficient and effective approach to climate policy one can take in a second-best world. These complementary measures can not only support more effective achievement of specific objectives, they can also help adjust and optimise the overarching climate response in a way that aligned with New Zealand's broader wellbeing objectives, many of which are not presently considered directly by any market mechanism.

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