Beyond Market Failures
shaping and creating markets

Mariana Mazzucato

October 2014

University of Sussex
SPRU – Science Policy Research Unit

About the Author

Mariana Mazzucato (PhD) holds the prestigious RM Phillips chair in the Economics of Innovation at SPRU in the University of Sussex. Previously she has held academic positions at the University of Denver, London Business School, Open University, and Bocconi University. Her research focuses on the relationship between financial markets, innovation, and economic growth - at the company, industry and national level. Between 2009-2012 she directed a large 3 year European Commission FP7 funded project on Finance and Innovation (FINNOV); her current project on Financing Innovation is funded by the Institute for New Economic Thinking (INET); and her project on Finance and Mission Oriented Investments is funded by the Ford Foundation's Reforming Global Financial Governance initiative. Her new book The Entrepreneurial State: debunking private vs. public sector myths (Anthem, 2013) - winner of the New Statesman SPERI Prize in Political Economy, and on the 2013 Books of the Year list of the Financial Times, Forbes and the Huffington Post - focuses on the need to develop new frameworks to understand the role of the state in economic growth and how to enable rewards from innovation to be just as 'social' as the risks taken. In 2013 the New Republic called her one of the '3 most important thinkers about innovation'. She advises the UK government and the EC on innovation-led growth. Her research outputs, media engagement, and talks (including her TED Global talk), can be found on her website http://marianamazzucato.com .

This paper reflects the view of the author, and does not necessarily reflect the position of SPRU. Any errors or omissions are those of the author.

Beyond Market Failures: *shaping and creating markets*

Mariana Mazzucato

October 2014

Introduction

Countries around the world are seeking 'smart' innovation led growth. And hoping that this growth is also more inclusive and sustainable than in the past. This paper argues that such a feat requires re-thinking the role of government and public policy in the economy—funding not only the 'rate' of innovation, but also envisioning its 'direction'. It requires a new justification of government intervention that goes beyond the usual one of 'fixing market failures'. It requires the ability and confidence to shape and create markets. And to render such growth more 'inclusive' it requires attention to the ensuing distribution of 'risks *and* rewards'.

The context: modern capitalism faces a number of great *societal challenges*, including climate change, youth unemployment, obesity, ageing, and rising inequality. These challenges have created a new agenda for innovation and growth policy that requires policymakers to 'think big' about what kind of technologies and socio-economic policies can fulfil visionary ambitions to make growth more smart, inclusive and sustainable (see the European Commission's 'Europe 2020' strategy).

Although such challenges are not strictly technological (as they also require behavioural and systemic changes), they have much to learn from those 'mission-oriented' feats (Foray *et al.*, 2012) that led to putting a man on the moon, or to those that led to the emergence of new general-purpose technologies, ranging from the Internet to biotechnology and nanotechnology.

Achieving such missions required companies that were willing and able to invest in long-run areas, and a confident 'entrepreneurial state' willing and able to take on the early, capital intensive high risk areas which the private sector tends to fear (Mazzucato, 2013a). A state is entrepreneurial when it is able and willing to invest in areas of extreme uncertainty, courageously envisioning the *direction* of change across public agencies and departments. An entrepreneurial state must welcome, rather than fear, the high risk and uncertainty across the entire innovation chain (from basic research to commercialization) and the experimentation processes required for organisational learning along the way (Hirschman, 1967; Rodrik, 2013). Most importantly, an entrepreneurial state must 'think big' (Mazzucato, 2013a).

Finding a way for government to 'think big' is not just about throwing public money at different activities. It requires a new economic framework that can justify the role of the public sector in 'directing' change, forming the right institutional structures that can foster and adapt to change in a dynamic way. It requires a framework that justifies the catalytic role of government, its ability to transform landscapes, create and shape markets, not just fix them. It requires new indicators through which to evaluate public investments, which captures the 'transformational' catalytic impact that Keynes (1926) suggested should be the objective ('*doing those things which at present are not done at all').* It requires different insights on the organisation of government, and on the distribution of risks and rewards that emerge from the collective effort towards 'smart' innovation led growth.

Beyond market failures

Market failure theory (MFT) justifies public intervention in the economy only if it is geared towards fixing situations in which markets fail to efficiently allocate resources (Arrow, 1951). The market failure approach suggests that governments intervene to 'fix' markets by investing in areas with

'public goods' characteristics (such as basic research, or drugs with little market potential) and by devising market mechanisms to internalise external costs (such as pollution) or external benefits (such as herd immunity).

While market failure theory provides interesting insights, it is at best useful for describing a *steady state* scenario in which public policy aims to put patches on existing trajectories provided by markets. It is less useful when policy is needed to dynamically create and shape new markets—'transformation'. This means it is problematic for addressing innovation and societal challenges because it cannot explain the kinds of transformative, catalytic, mission-oriented public investments that in the past created new technologies and sectors which did not exist before (the Internet, nanotech, biotech, cleantech), and which the private sector feared. It was such mission-oriented investments that coordinated public and private initiatives, built new networks, and drove the entire techno-economic process, which resulted in the creation of new markets.

Four opportunities for changing the innovation policy discourse

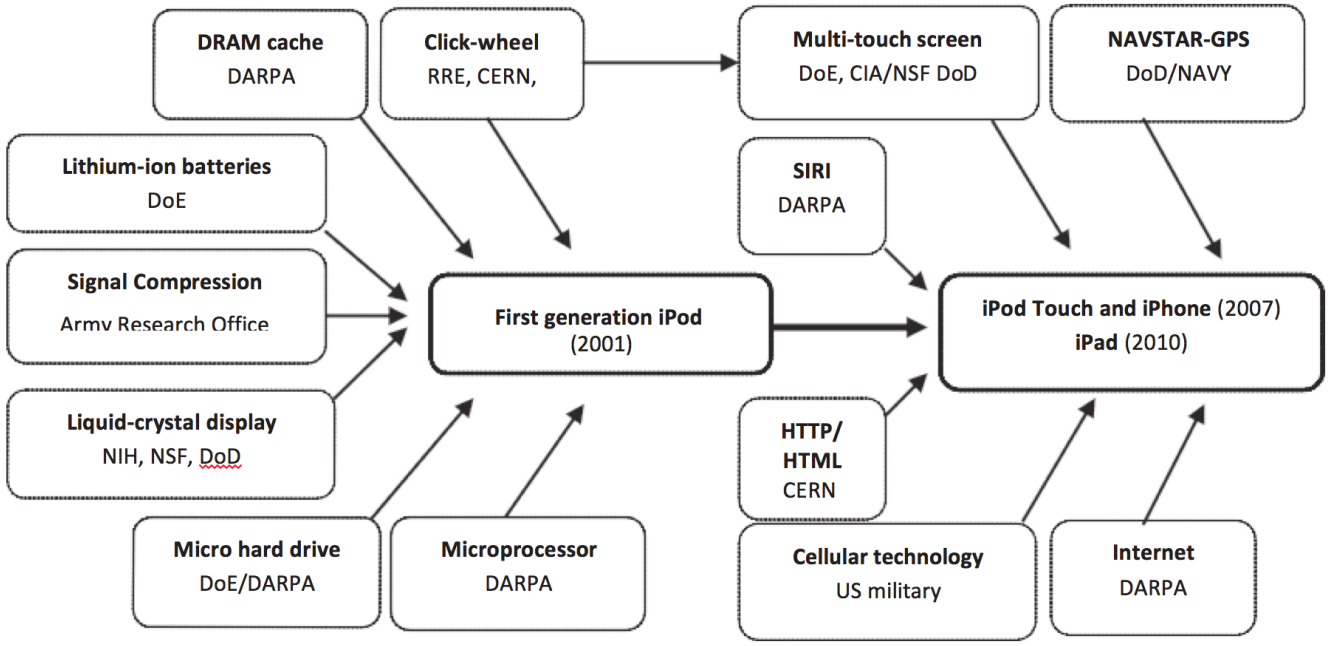
There are four key limitations in MFT, which continues to guide policy making today: its insights for the ability of the state to set the direction of change; to form indicators through which to evaluate its transformational impact; to set up organisations in the public sector that are willing and able to welcome rather than fear failure; and the ability to earn some return from the upside to fund the many inevitable failures that are part and parcel of the innovation process. These limitations are discussed below:

***Directionality**: envisioning and 'picking' strategically.* Innovation has not only a rate but also a direction (Stirling, 2009). In the ambition to achieve innovation led growth, debates about directionality are however often neglected. Shale gas, which was fully funded by the US government (Shellenberger et al., 2012) is a case in point, considering the negative impact that the technology (fracking) required to produce it has on natural environments. Therefore, public investments to address societal challenges must give particular consideration to the types of vision and directionality they embody. It is also important to consider the involvement of civil society in the debate about such 'directions' (Schot and Geels, 2007).

The importance of such a debate is absent in traditional economic policies, which aim to correct markets and assume that once the sources of the failure have been addressed, market forces will efficiently direct the economy to a path of growth and development. Yet, markets are 'blind' (Nelson and Winter, 1982) and the direction of change provided by markets often represents suboptimal outcomes from a societal point of view. This is why, in addressing *societal challenges,* states have had to lead the process and provide the direction towards new 'techno-economic paradigms' (Perez, 2002), which do not come about spontaneously out of market forces. In the mass production revolution and the IT revolution, governments made direct 'mission-oriented' investments in the technologies that enabled these revolutions to emerge, and formulated bold policies that allowed them to be fully deployed throughout the economy (Foray et al., 2012; Block and Keller, 2011). As I show in my recent book (Mazzucato, 2013a), every technology that makes the iPhone 'smart' (Internet, GPS, touch-screen display, and SIRI) was directly publicly funded (Figure 1). And even the deployment of most 'general purpose technologies' (from electricity to IT) was an outcome of public policy (Mazzucato and Perez, 2014). Furthermore, in the IT revolution, and even in the emerging clean-tech revolution, government not only funded the actual technologies (such as mainframes, the Internet, wind and solar power, and fuel cells), but also created a network of decentralized public and private actors (a 'developmental network state') (Block and Keller, 2011), provided early-stage funding to companies that risk-averse private finance would not, and devised special tax credits that favoured some

activities more than others (Mazzucato, 2013a, 2013b). These facts seem to point to a different analytical problem facing policy makers: not whether the right role is that to intervene or stand back, but understanding *how* particular 'directions' and routes can be chosen, and determining how to mobilise and manage activities that can lead to the achievement of dynamic social and technological challenges.

Figure 1: State investments funded all of the key technologies behind the iPhone



Source: Mazzucato (2013a, p. 109)

***Evaluation**: static vs. dynamic metrics.* MFT has developed concrete indicators and methods to evaluate government investments, which stem from the framework itself, usually through a cost-benefit analysis that estimates whether the benefits of public intervention compensate for the costs associated both with the market failure and the implementation of the policy (including 'government failures'). However, there is a mismatch between the intrinsically dynamic character of economic development and the static tools used to evaluate policy. The diagnostic tools and evaluation approach based on MFT involves identifying the sources of market failure and targeting policy interventions on their correction. This entails *ex-ante* considerations about administrative and fiscal requirements and the political-economic consequences of intervention. Such an exercise usually consists of the following steps:

- An *ex-ante* cost-benefit analysis that weighs up the costs of the failure, the (private and social) benefits from addressing it, and the costs and risks of government failure.
- An *ex-ante* identification of sources of market failures and of second-best policy tools to address them.
- An *ex-ante* diagnostic of the best principal–agent structure that avoids governmental capture by private interests (insulation/autonomy) and that forces private agents to do what the principal (government) wants.
- An *ex-post* evaluation of the outcomes of the intervention vis-à-vis the *ex-ante* quantifiable prediction of the likely outcomes of the intervention.

Yet this is a limited toolbox for evaluating public policies and investments that aim to address societal challenges, because doing so represents a static exercise of evaluation of an intrinsically dynamic process.

By not allowing for the possibility that government can transform and create new landscapes that did not exist before, the ability to measure such impact has been affected, with economists often resorting to an analysis of the public sector as an inefficient private one (Mazzucato, 2013a). This is evident not only in the area of innovation, but also for public services. This then leads to accusations of government 'crowding out' businesses, which implies that those areas that government moves into could have been areas for business investment. Such accusations are at best defended through a 'crowding in' argument, which rests on showing how government investments create a larger pie of national output that can be shared (the savings) between private and public investors. However, this defence does not capture the fact that the goal of public investments should be to not only 'kickstart' the economy but to choose directions that "*do those things which at present are not done at all"* (Keynes, 1926). By not having *indicators* for such transformative action, the toolbox affects the government's ability to know when it is simply operating in existing spaces or making new things happen that would not have happened anyway (its 'additionality'). This often leads to investments that are too narrow or directed within the confines of the boundaries set by business practices of the prevailing techno-economic paradigm.

Organisation*: learning, experimentation and self-discovery.* If brought to its extreme, as advocated by critics from Public Choice, MFT calls for the state to intervene as little as possible in the economy, in a way that minimises the risk of 'government failure' (e.g. 'crowding out', cronyism and corruption). This view requires a *structure* that *insulates* the public sector from the private sector (to avoid issues such as agency capture) and has resulted in a trend of 'outsourcing' that often rids government of the knowledge capacities and capabilities (for example, around IT) that are necessary for managing change. Studies have examined the influence of outsourcing on the ability of public institutions to attract top-level talent with the relevant knowledge and skills to manage transformative mission-oriented policies. Without such talent and expertise it will difficult for the state to coordinate and provide direction to private actors when formulating and implementing policies that address societal challenges. Indeed, there seems to be a self-fulfilling prophecy whereby the less 'big thinking' occurs in government, the less talent/expertise the public sector is able to attract, the less well it performs, the less 'big thinking' it is allowed to do. In order to promote transformation of the economy, by shaping and creating technologies, sectors and markets, the state must organise itself so that it has the 'intelligence' (policy capacity) to think big and formulate bold policies. This does not mean it will always succeed, indeed the underlying uncertainty in the innovation process means that the state will often fail (Nelson and Winter, 1982; Hirschman, 1967). If the emphasis is on the *process of policy making* (Rodrik, 2013) that can allow the public sector to envision and manage transformational change, then understanding the appropriate structures of public organisations and their 'absorptive capacity' (Cohen and Levinthal, 1990) is essential.

Risks and Rewards*: towards symbiotic private–public partnerships.* MFT says little about cases in which the state is the *lead investor and risk taker* in capitalist economies through 'mission-oriented' investments and policies (Foray et al., 2012). Having a vision of which way to drive an economy requires direct and indirect investment in particular areas, not just 'creating the conditions' for change. This requires crucial choices to be made, the fruits of which will create some winners, but also many losers. Indeed, precisely because venture capital has become increasingly short-termist, with emphasis on an exit in 3 years (while innovation takes 15-20 years!), publicly funded early stage seed finance has become increasingly important (such as SBIR funds in the USA). As have also guaranteed loans for innovative high risk projects. For example, the Obama administration in the US recently provided large guaranteed loans to two green-tech companies, Solyndra ($500 million) and Tesla Motors ($465 million). While the latter is often glorified as a success story, the former failed miserably and became the latest example, used widely by both economists

and the more popular treatment in the media, of government being unable to 'pick winners'. Indeed, the taxpayer picked up the bill, and complained.

This highlights the need to build a theoretical framework that can help the public sector understand (a) its 'portfolio' choices (Rodrik, 2013) and (b) how to socialise not only the risks of those investments but also the rewards. In building a portfolio, it is crucial to make sure that the assumptions regarding the distribution of returns, as well as their measurement, are driven by a real understanding of the fundamental uncertainty that drives the innovation process, and the broad nature of 'social returns'. The risk-reward question comes down to whether in a MFT framework the government deserves to retain a direct share of the profits generated from the growth that it fosters. Is it right that US tax payers shouldered the Solyndra loss, yet made nothing from the Tesla profits? Or put another way, are taxes currently bringing back enough returns to government budgets to fund high-risk investments that will probably fail? It is well known that companies that benefit greatly from government investments have been successful in avoiding tax: Google, whose algorithm was funded by the NSF, has been criticised for such avoidance, as have also Apple and Amazon and a host of 'new economy' companies. But even if they were not dodging tax, tax *rates*, such as that on capital gains, have been falling due to the narrative that it is a narrow set of agents who are the real innovators, wealth creators, and risk takers[1]. It is indeed this same narrative that has justified the increasing financialization of the private sector, with many large companies in IT, energy and pharmaceuticals spending more of their returns on share buybacks than on R&D (Lazonick and Mazzucato, 2013). Only when this limited and biased 'wealth creation' narrative is debunked, can we begin to build more 'symbiotic' innovation eco-systems that can ensure future funding by both public and private actors.

Conclusion: a new framework requires new questions

The solutions derived from Market Failure Theory (downsizing the state apparatus, promoting market-based mechanisms to counter market failures, insulating public agencies from the private sector, etc.) might hold for steady state situations, but not for the situations in which public policy is required for *transformation,* such as those witnessed through the technological and socio-economic missions of the past. Such missions required an emphasis not on fixing market failures or minimising *government failures* but on *maximising the transformative impact of policy that can shape and create markets.*

Considering the need for government policy to 'transform', be catalytic, create and shape markets not just fix them, helps reframe the key questions of economic policy from static ones that worry about crowding out and picking winners to more dynamic ones that are constructive in forming the types of public–private interactions that can create new innovation and industrial landscapes. In this perspective, it is key for government to not just pick different technologies or sectors but ask what it wants from those sectors. In the same way that putting a man on the moon required many sectors to interact, the 'green' direction being debated today also requires all sectors to change. Green is not only about wind, solar and biofuels but also about new engines, new maintenance systems, and new ways of thinking about product obsolescence (Mazzucato and Perez, 2014). This is not about prescribing specific technologies, but providing directions of change which bottom up solutions can then experiment around. As Stirling (2014) has recently put it: '*The more demanding the innovation challenges like poverty, ill health or environmental damage, the greater becomes the importance of effective policy. This is not a question of "picking winners"—an uncertainty-shrouded dilemma which is anyhow equally shared between public, private and*

[1] It was the National Venture Capital Association that in the late 1970s lobbied for capital gains tax to fall from 39.6% to 20% in 5 years (Lazonick and Mazzucato, 2013). Warren Buffett has admitted that such tax changes did not affect investment, only inequality.

third sectors. Instead, it is about engaging widely across society, in order to build the most fruitful conditions for deciding what "winning" even means'.

Government would benefit from adopting a portfolio approach to public investments in innovations, nurturing the explorative, plural, and trial and error aspect of change. This requires thinking not only about technological change in a new way but also organizational change. Building and empowering the public agencies of the future with creative, adaptive and explorative capacity.

References

Arrow, K. (1951). *An extension of the basic theorems of classical welfare economics.* Paper presented at the Second Berkeley Symposium on Mathematical Statistics and Probability, Berkeley.

Block, F., & Keller, M. (2011). *State of innovation: the U.S. government's role in technology development*. Boulder: Paradigm.

European Commission. (2010). 'Europe 2020: A European strategy for smart, sustainable and inclusive growth'. Available at http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf (accessed 16/7/2014).

Foray, D., Mowery, D., & Nelson, R.R. (2012). Public R&D and social challenges: What lessons from mission R&D programs? *Research Policy, 41*(10), 1697-1902.

Friedman, B.M. (1979). 'Crowding out or crowding in? The economic consequences of financing government deficits'. *Brookings Papers on Economic Activity, 3*, 593-654.

Hirschman, A.O. (1967). *Development Projects Observed*: Brookings Institution Press.

Keynes, J.M. (1926). *The end of laissez-faire*. London: Prometheus Books.

Lazonick, W., & Mazzucato, M. (2013). 'The Risk-Reward Nexus in the Innovation-Inequality Relationship: Who Takes the Risks? Who Gets the Rewards?' *Industrial and Corporate Change,* 22(4), 1093-1128.

Mazzucato, M. (2013a). *The Entrepreneurial State: Debunking the Public vs. Private Sector Myths*. London: Anthem.

_____. (2013b). Financing innovation: Creative destruction vs. destructive creation. *Industrial and Corporate Change, 22*(4), 851-867.

Mazzucato, M., & Perez, C. (2014), "Innovation as Growth Policy: The challenge for Europe" SPRU Working Paper Series, 2014-13

Mazzucato, M., & Perez, C. (2014), "Innovation as Growth Policy," in *The Triple Challenge: Europe in a New Age*. J. Fagerberg, S. Laestadius, and B. Martin (eds.) Oxford University Press: Oxford, forthcoming.

Nelson, R.R., & Winter, S.G. (1982). *An Evolutionary Theory of Economic Change*. Cambridge (MA): Belknap Press.

Perez, C. (2002). *Technological revolutions and financial capital: the dynamics of bubbles and golden ages*. Cheltenham, UK ; Northampton, MA, USA: E. Elgar Pub.

Rodrik, D. (2013). *Green Industrial Policy*: Princeton University Working Paper.

Schot, J., & Geels, F. (2007) Typology of Sociotechnical Transition Pathways. *Research Policy,* 36 (3), 399-417.

Shellenberger, M., Nordhaus, T., Jenkins, J. & Trembath, A. (2012). 'US Government Role in Shale Gas Fracking History: An Overview and Response to Our Critics'. The Breakthrough, March 2. Available at http://thebreakthrough.org/archive/shale_gas_fracking_history_and (accessed 13/7/2014).

Stirling, A. (2009) Direction, Distribution and Diversity! Pluralising Progress in Innovation, Sustainability and Development. *STEPS Working Paper: Vol. 32*.

Stirling, A. (2014). Making choices in the face of uncertainty. *Themed Annual Report of the Government Chief Scientific Adviser*, Chapter 2 (June). Draft mimeo.

Connect with SPRU
www.sussex.ac.uk/spru
@SPRU

SPRU
University of Sussex
Jubilee Building
Falmer
Brighton
BN1 9SL
United Kingdon

University of Sussex
SPRU – Science Policy Research Unit