DURHAM ECONOMIC JOURNAL

DUES

Michaelmas Issue 2025

Durham University Economics Society

CONTENT

DUES

WORDS FROM THE PRESIDENT

What an incredible start to the 2025/26 academic year! It's fantastic to see Durham University's Economic Society truly back on its feet. In just the first week of our relaunch, we welcomed over 180 new paid members, with an impressive 60% opting for lifetime membership. This momentum reflects the renewed energy across the society.

Our social calendar also launched with fantastic momentum. Our initial bar crawl attracted a tremendous 70+ attendees, fostering an immediate sense of community and excitement. Off the back of this, more than 40 participants took part in our CV workshop. It was an event made possible by the generosity and expertise of our panellists. A huge thank-you to them for delivering such insightful and practical guidance.

We've also launched the term with a strengthened editorial team. Our new Co-Chief Editors, Finn and Eben, have already made a remarkable impact. Their dedication is evident in the fresh wave of blog posts, the revitalised website design, and the onboarding of a dynamic team of writers. Their work is setting a new standard for the quality and visibility of our academic content.

Alongside this, the Executive Committee, together with our Sponsorship Officers, Becca and Ben, have been working tirelessly to secure new partnerships. Their efforts in sourcing sponsors will play a crucial role in expanding our activities, enhancing the professional opportunities we can offer members.

With such a strong foundation laid in just the first week, we are incredibly excited for what we will bring in the Epiphany Term. DUES is not only back, but it's moving forward with renewed ambition.

Grace Li
President 25/26

WORDS FROM THE EDITORS

It is our pleasure to present this issue of the Durham Economic Journal following a six year dormancy. This edition brings together a wide-ranging collection of work, both in subject matter and institutional reach, of consistently exceptional standard.

One of our accomplishments we are particularly proud to highlight is our success in attracting submissions from universities beyond Durham. With contributions from scholars at University College London and Royal Holloway, this issue reflects the Journal's vast potential as a forum for original economic research across institutions.

We begin with Louis Zhu (UCL), whose article presents an innovative framework for evaluating the policy relevance of neuroeconomic evidence. Zhu challenges readers to think critically about when neuroscientific data can genuinely enhance welfare analysis and when its use may outpace what the evidence can responsibly support. His work stands at the frontier of interdisciplinary inquiry, and it sets a fittingly reflective tone for this issue.

Next, Mihir Joshi (Royal Holloway) contributes an analysis which illuminates how key macroeconomic variables shape electoral dynamics within one of the world's largest democracies. By tracing patterns across a decade of political change, he offers a nuanced view of the economy–politics nexus and its implications for voter behaviour.

Emily Hatwell (Durham) delves into the broader social impact of entrepreneurial success. Through a blend of theoretical inquiry and evaluative argument, she revisits long-standing assumptions about wealth creation and public benefit, offering an accessible yet thought-provoking contribution to a debate that continues to shape economic discourse.

Turning to domestic policy questions, Daniel Ajala (Durham) examines the potential economic consequences of a highly contentious issue. Ajala's exploration of a regulated organ market raises important questions about incentives, market design, social costs, and ethical boundaries, inviting readers to consider how economic reasoning can inform debates that are often discussed only in moral terms.

We close the issue with an article by Ana-Alexandra Carlig (Durham). Carlig traces technological revolutions across centuries and situates today's digital transformation within that historical lineage. Her piece highlights how past waves of innovation can help us better understand the economic, social, and ethical challenges posed by rapid technological change today.

Together, these articles showcase the diversity of contemporary economic scholarship and the success in resurrecting Durham's Economic Journal. We welcome submissions from scholars and undergraduates across the UK that transcends disciplinary boundaries, advances novel data and methods, and engages thoughtfully with pressing social, political, and economic questions.

We are delighted to present this issue to you and hope that its discussions, analyses, and reflections spark curiosity, conversation, and further research.

Eben Macdonald
Editor-In-Chief 2025/26

Finn Regan
Editor-In-Chief 2025/26

POLICY USES OF NEUROECONOMICS: WHEN SHOULD NEURAL DATA INFORM WELFARE?

A Model-Based Approach to Integrating Neuroeconomics into Regulatory Decision-Making

Neuroeconomics promises to ground welfare analysis in neural and computational evidence about how people value outcomes, learn from experience and exercise self-control. At the same time, policy and commercial actors increasingly invoke neural data to justify paternalistic regulation, "brain-based" interventions and new welfare measures.

This paper asks under what conditions neural data can legitimately inform welfare judgements for policy rather than merely describing behaviour. I develop a non-empirical, model-based framework that links three levels: neural signals, computational decision models and normative welfare criteria. Within an actor–critic reinforcement-learning model, I formalise the inference path from neural activity to latent values and prediction errors and then to welfare claims. I show that neural evidence constrains welfare judgements only when the neural–computational mapping is well validated, the decision model identifies "true" interests versus context-dependent mistakes, and the welfare criterion is explicitly specified and defended.

Applying the framework to addiction, neuromarketing and environmental policy, I derive a Neuroeconomic Welfare Inference Checklist for regulators and for designers of NeuroAI systems. The analysis treats brains and artificial agents as value-learning systems while showing that internal reward signals, whether biological or artificial, are computational quantities and cannot be treated as welfare measures without an explicit normative model.

1 | Introduction

Neuroeconomics is commonly defined as the study of the neurobiological and computational basis of value-based decision-making.

It aims to provide a biologically grounded account of behaviour that can be applied in both the natural and social sciences. Early work on dopaminergic reward-prediction errors and cortical value representations suggested new ways to think about intertemporal choice, risk and self-control.

At the same time, welfare economics and public policy have begun to draw on these findings. Behavioural public economics asks how to do welfare analysis when preferences are inconsistent or context-dependent. Neuroeconomics appears to offer mechanistic evidence about which choices reflect "true" interests and which reflect mistakes or cue-triggered lapses. Applications now range from consumer protection and retirement saving to health and environmental policy, alongside a growing commercial ecosystem in neuromarketing and consumer neuroscience.

This expansion raises a central problem. Neural data are noisy, paradigm-dependent and theory-laden, where welfare is a normative construct. It encodes judgements about when a person

is better or worse off. The mere fact that a choice correlates with activation in certain brain regions does not tell us whether that choice advances the person's welfare. Without a careful framework, the authority of brain images risks being used to re-label contested welfare judgements as scientific facts.

The thesis of this paper is that neural data can inform welfare only via a clearly specified computational model and a clearly defended normative standard. Brains implement algorithms. Neuroeconomics allows us to infer aspects of those algorithms from neural data and behaviour. Welfare analysis requires an additional step: deciding which outputs of those algorithms count as welfare-relevant in which contexts.

The argument proceeds in three steps:
1) Formalise the link between neural activity and computational quantities in value-based decision-making.
2) Combine this with behavioural-welfare frameworks that distinguish welfare from observed choice.
3) Derive conditions under which neural evidence can legitimately support those distinctions, illustrated in three policy domains: addiction, neuromarketing, and environmental policy.

This paper makes three contributions. First, it integrates reinforcement-learning-based neuroeconomic models with behavioural welfare economics by providing a unified, three-level framework that links neural signals, computational decision processes, and normative welfare criteria. Second, it derives a set of necessary conditions under which neural data can genuinely constrain welfare judgements and expresses them as an operational checklist for applied work. Third, it extends these ideas to human-inspired AI by treating actor–critic architectures and dopaminergic prediction errors as templates for artificial value-learning agents, and by showing why their internal reward and value signals cannot be equated with welfare without an explicit normative model.

Throughout, I connect to NeuroAI. Reinforcement learning and distributional reinforcement learning have become shared formalisms for modelling both dopamine systems and artificial agents. Both brains and artificial systems can be treated as value-learning processes, but welfare remains a separate, normative layer. Conceptually, the paper distinguishes three levels: neural data (spikes, BOLD), computational models (values, prediction errors, policies) and welfare judgements (better/worse for the person or society). Neural evidence can constrain welfare analysis only by way of a computational model, and welfare claims always require an additional normative step. This three-level structure is made concrete in Sections 3–4 using an actor–critic reinforcement-learning architecture and its neural implementation (Figures 1–3).

2 | Neuroeconomics, welfare and NeuroAI

2.1 | Neuroeconomics as value-based decision science

Rangel, Camerer and Montague propose that value-based decisions can be decomposed into five processes: (1) representing the decision problem; (2) valuing candidate options; (3) selecting an action; (4) evaluating the outcome; and (5) learning to update value representations.

Empirically, orbitofrontal and ventromedial prefrontal cortex encode subjective values of options, often in a "common currency" across reward modalities, while ventral striatum and midbrain dopamine neurons exhibit activity patterns consistent with reward-prediction errors. Dorsolateral prefrontal cortex and anterior cingulate cortex contribute to executive control, conflict monitoring and exploration. A key implication is that these neural variables track subjective evaluations, contingent on expectations, reference points and affective states. High striatal activation is not a direct readout of welfare; it reflects context-dependent value signals.

Neural signals track how we value options, reflecting context and expectations, but they do not directly measure welfare.

2.2 | Welfare economics and behavioural public economics

Standard welfare economics identifies welfare with the satisfaction of coherent, stable preferences revealed in choice. When preferences are complete, transitive and context-independent, a utility function can represent them and serve as a welfare criterion. Behavioural economics documents systematic violations: present bias, framing effects, loss aversion, limited attention and self-control problems. Behavioural public economics therefore develops alternative welfare notions that can accommodate such phenomena.

One influential strand distinguishes welfare-relevant from mistake-driven choices. For example, an "as-judged-by-themselves" criterion seeks to recover the preferences individuals would endorse under better conditions, free of errors and self-control failures. Neuroeconomics is attractive here because it appears to offer mechanistic evidence about which choices are genuine expressions of underlying goals and which reflect cue-triggered or pathological processes. Addiction is a central case.

Neuroeconomics can help identify which decisions reflect true goals and which are caused by mistakes or external triggers, such as in addiction or self-control failures.

2.3 | NeuroAI, human-inspired AI and value-learning systems

Reinforcement learning (RL) offers a natural bridge between neuroeconomics and AI. Temporal-difference (TD) learning updates value estimates using prediction errors, a formalism closely matching dopamine neuron activity in conditioning and choice tasks. Dabney et al. show that dopamine populations in mice encode a distributional value signal, with different neurons tuned to different reward quantiles, mirroring distributional RL algorithms in machine learning. Sadeh and Clopath describe this two-way traffic as the core of "NeuroAI": AI tools accelerate neuroscience, while neural principles inform new AI architectures.

For present purposes, the crucial point is conceptual. Both brains and artificial agents can be treated as value-learning systems: they maintain value functions, policies and learning rules. Welfare questions arise when we ask which values these systems ought to learn, and which policies are better for the agents and for others. NeuroAI can therefore sharpen our understanding of mechanisms and algorithms, but it does not, by itself, answer welfare questions. It supplies richer models of how agents update and act; welfare analysis must decide how to evaluate those behaviours.

From a human-inspired AI perspective, actor–critic TD learning, distributional value codes and neuromodulatory teaching signals are not just descriptive models of the brain but also templates for AI architectures. Many contemporary RL agents are deliberately designed to mirror these mechanisms. The framework developed in this paper therefore applies symmetrically to neural and artificial systems: it treats both as value-learning processes with internal reward and value representations, and asks under what conditions those internal quantities can justifiably be used for welfare-relevant purposes. This is directly relevant to current practice in reinforcement learning, where agents are often trained with human-derived feedback or rewards and their internal reward signals are routinely used as proxies for user welfare; the framework explains why that identification requires additional normative argument rather than being guaranteed by the biological inspiration alone.

3 | A formal mapping from neural signals to welfare claims

This section sets out a compact formal framework that makes explicit the steps from neural data to welfare-relevant judgements. The point is not to provide a full empirical model, but to show where normative assumptions enter.

3.1 | Decision and learning model

Consider a sequential decision problem with discrete time t. The individual faces states $s_t \in S$, chooses actions $a_t \in A$, receives rewards r_t and transitions to new states s_{t+1}. A standard reinforcement-earning description posits a value function $V^{\theta}(s)$

or an action-value function $Q^{\theta}(s, a)$, a policy $\pi^{\theta}(a \mid s)$ and a learning rule that updates θ on the basis of prediction errors.

Figure 1 | Actor-critic temporal difference architecture

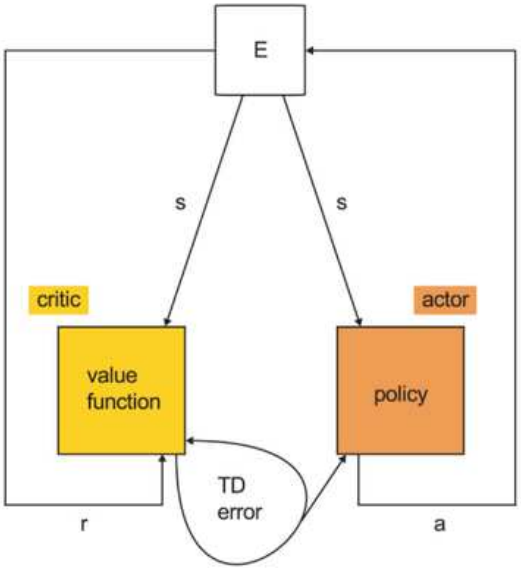

Figure 1 shows the classic actor–critic temporal-difference architecture. The environment E supplies the current state s_t and reward r_t to the critic (value-function module) and the current state s_t to the actor (policy module). The critic computes a temporal-difference (TD) error and uses it to update both the value function and the policy; the actor samples an action a_t from the current policy, which is fed back to the environment.

$\delta_t = r_t + \gamma V_\theta(s_{t+1}) - V_\theta(s_t)$ write a TD-style update

$\theta_{t+1} = \theta_t + \alpha\, \delta_t\, \nabla_\theta V_\theta(s_t),$

where γ is a discount factor and α is a learning rate.

$$\pi_\phi(a \mid s_t) = \frac{\exp(\beta\, Q_\theta(s_t, a))}{\sum_{a'} \exp(\beta\; Q_\theta(s_t, a'))},$$ policy:

where β is an inverse-temperature parameter controlling sensitivity to value differences. his actor–critic scheme is implemented both in artificial agents and in biologically plausible network models, providing a natural bridge to neuroeconomics and NeuroAI.

3.2 Neural signals as noisy encodings of computational quantities

Let n_t denote neural measurements at time t (for example, firing rates or BOLD activity). In the simplest case, we can treat these as noisy encodings of latent computational variables:

$$n_t = f(\delta_t) + \varepsilon_t \text{or} n_t^{\text{vmPFC}} = g(V_\theta(s_t)) + \eta_t,$$

where f and g are monotone link functions and ε_t, η_t are noise terms. In the first case n_t tracks a temporal-difference prediction error δ_t; in the second, n_t^{vmPfc} tracks a state value $V_\theta(s_t)$.

Figure 2 | Neuronal actor–critical architecture generating and exploiting a dopaminergic TD error signal

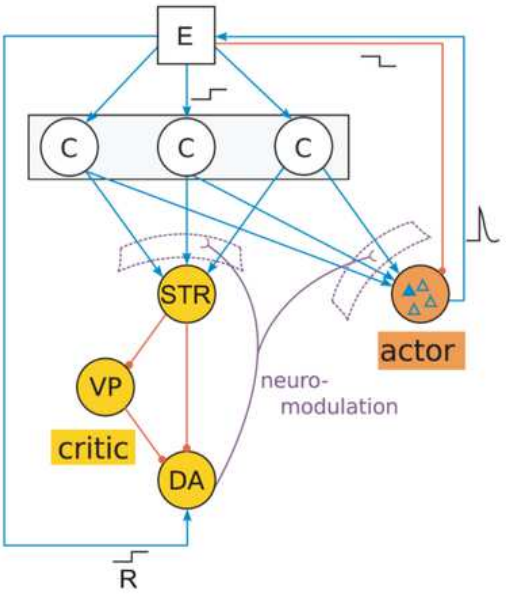

Figure 2 extends the abstract actor–critic of Figure 1 to a neuronal actor–critic architecture. Cortical populations (C) encode state information and provide state-dependent input to the critic—implemented in striatal (STR), ventral pallidal (VP), and dopaminergic (DA) neurons—and to a pool of action-selective actor neurons. STR and VP project to DA neurons with different delays. The environment (E) drives state-coding cortical neurons and interprets the first-spiking actor neuron as the chosen action, while reward (R) is encoded as a DC input to DA neurons. DA neurons broadcast a neuromodulatory signal that globally modulates plasticity at cortico-striatal and cortico-actor synapses, playing the role of a TD-error-like teaching signal. Red lines indicate inhibitory connections, blue lines excitatory connections, and purple lines dopaminergic neuromodulation.

Empirically, phasic dopamine activity does resemble a TD prediction error in classic conditioning tasks. Before learning, unpredicted rewards elicit brief dopaminergic bursts; after learning, the burst shifts to the predictive cue and disappears at reward time; omission of an expected reward produces a dip below baseline.

Figure 3 | Phasic dopamine signals resembling a temporal-difference prediction error:

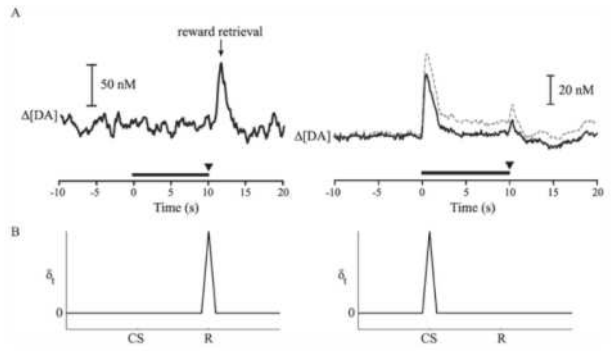

Figure 3 illustrates phasic dopamine signals resembling a temporal-difference prediction error. Before learning, an unpredicted reward elicits a phasic increase in dopamine; after learning, the dopamine burst shifts to the predictive cue and the predicted reward elicits little or no response, while omission of an expected reward produces a dip below baseline (panel A). A temporal-difference (TD) model of reinforcement learning produces an error signal δ_t with the same qualitative pattern—positive at unpredicted rewards, shifting to cues with learning, and negative at omitted rewards (panel B). This tight qualitative correspondence underpins the interpretation of dopamine as a TD-like prediction-error signal, justifying, in this paradigm class, modelling dopaminergic activity as $\eta \approx f(\delta_t)$.

In our framework, neural signals therefore provide noisy constraints on the latent variables of an RL model: dopamine gives evidence about δ_t; vmPFC and ventral striatum about V_θ; prefrontal regions about control signals that govern π_Φ. Whether and how those constrained models inform welfare analysis is the topic of Section 4.

Welfare criteria and "true interests"

Suppose we want to evaluate whether a policy p that changes the decision Behavioural-welfare frameworks typically distinguish between the implemented decision process and a welfare criterion.

Let U(s, a) denote a welfare-relevant utility function. Let $V_\theta(s)$ and π_φ describe the actual value function and policy implemented by the person. These need not coincide. In particular, there may be states in which π_φ selects actions that reduce U. A dual-self self-control model makes this explicit. Let $u^L(a)$ be a long-run utility and $u^s(a)$ a short-run utility. The implemented instant utility might be:

$$U^{\text{impl}}(a) = \lambda\, u^L(a) + (1-\lambda)\, u^S(a),$$

with $\lambda \in [0,1]$ reflecting the influence of long-run considerations. In addiction, cue exposure may transiently reduce λ, shifting weight toward the short-run self.

A welfare criterion might take u(as normative and treat episodes dominated by u) under certain cue conditions as mistakes. The important point is that welfare is defined in terms of U, not directly in terms of V or n_t. Neural and behavioural data tell us about V, π and the environments in which they are distorted; they do not determine U.

4 | When do neural data legitimately inform welfare?

Within this framework, neural data can constrain welfare analysis only under several conditions.

4.1 | Measurement and representational validity

The actor–critic architecture in Figures 1–2, together with the empirical mapping between dopamine and TD error in Figure 3, motivates treating neural data as evidence about δ_t, V_θ and π_φ. For such evidence to bear on welfare, however, we need further conditions. First, neural signals must be valid measures of specified computational variables.

Task-level validation. There should be convergent evidence that n_t tracks δ_t or V_θ across tasks of the relevant class, not just in a single paradigm. Reward-prediction-error interpretations of dopamine are supported by conditioning, decision and movement studies.

Representational specificity. The mapping

$$n_t = f(\delta_t) + \varepsilon_t$$

should be specific enough that alternative computational models do not explain the data equally well. Otherwise, neural data do not favour any particular welfare analysis that depends on one model over another.

Robustness across individuals and contexts. Encoding must be robust, or systematic variations must be understood and modelled (for example, stress- or mood-dependent modulation of value signals). Without these, neural data cannot be straightforwardly treated as measures of value or prediction error and thus have limited welfare relevance.

4.2 | Model identifiability

Even with a plausible encoding, there is often a model identifiability problem. Multiple decision and learning models can reproduce the same pattern of behaviour and neural responses.

Formally, suppose two models M and M' with parameters (θ, φ) and (θ',φ') generate the same joint distribution of actions and neural data in the observed environment:

$$P(a_t, n_t \mid M, \theta, \phi) = P(a_t, n_t \mid M', \theta', \phi')$$

for all observed t. If the welfare analysis associated with M and M' differs because they embed different welfare criteria or mistake classifications, neural data do not discriminate between those welfare judgements.

A second condition, then, is: Model identification condition: in the domain of application, the model class is sufficiently constrained, and alternative models with distinct welfare implications are either empirically ruled out or explicitly acknowledged.

4.3 | Normative transparency

A third condition concerns the normative move from computational variables to welfare. When authors claim that one neural pattern reflects a “true” valuation and another a “biased” valuation, they rely on implicit assumptions about which brain state is authentic or welfare-relevant. In the notation above, they are selecting a welfare function U and classifying some states as mistake states. The neuroscientific contribution lies in mapping states to mechanisms and correlations; the welfare judgement is a separate, normative step. Normative transparency condition: any paper or policy that draws welfare conclusions from neural data should explicitly state the welfare criterion, justify it, and explain how neural and behavioural data identify contexts in which welfare and implemented choice diverge.

4.4 Policy relevance and institutional context

Finally, translating individual-level neural evidence into policy involves further steps. Policies operate at scale, under constraints of fairness, privacy and feasibility. Using neural data to justify, for example, targeted mandates or tax treatment of particular groups raises distributional and political concerns.

While neural data can inform understanding of individual behaviour, turning it into policy requires respect for fairness, privacy, and feasibility.

Policy context condition: any proposed use of neural evidence in welfare analysis should specify how such evidence would be operationalised in practice, whether classification based on neural traits is legitimate, and how uncertainty and heterogeneity will be handled.

These four conditions form the core of the Neuroeconomic Welfare Inference Checklist (Section 6).

5 | Case domains

To make the framework concrete, I sketch three domains where neural data have been proposed as inputs to welfare analysis.

5.1 | Addiction and self-control

Neuroscience has transformed theories of addiction. Drug exposure alters dopaminergic signalling, cue reactivity and plasticity; drug-related cues acquire strong motivational salience; and many studies report reduced prefrontal control in addicted individuals.

A standard normative argument runs as follows: at least some consumption episodes reflect cue-triggered mistakes rather than genuine preferences; therefore, paternalistic policies such as sin taxes, mandatory cooling-off periods or access to commitment devices, can be justified as tools to restore an individual's own long-run interests.

In the formal framework, addiction can be represented as a regime in which, in "cue" states scue, the effective value function and policy are distorted:

$$V_\theta^{\text{cue}}(s,a) = V_\theta^{\text{base}}(s,a) + \kappa\, C(s,a),$$

where C(s, a) captures learned cue reactivity and κ is large in cue states, while λ in the dual-self utility shrinks. Neural evidence in favour of this picture includes enhanced striatal and amygdala responses to drug cues and attenuated dorsolateral prefrontal activation during drug-seeking.

Within the checklist:
• Measurement validity: imaging and electrophysiology support distinct cue-driven and baseline regimes.
• Model identifiability: alternative interpretations (for example, adaptive re-valuation given changed internal states) must be considered.
• Normative transparency: privileging baseline valuations (higher λ, lower κ) as welfare-relevant is a normative choice.

Neural data can strengthen the case that some episodes are mistakes in the sense of Bernheim and Rangel's cue-triggered model, but they do not by themselves determine whether, for example, abstinence is universally welfare-superior to managed use. Those conclusions require ethical and economic argument.

Neural data can indicate when decisions may be errors, but determining what is truly best for welfare requires ethical and economic reasoning beyond data.

5.2 | Neuromarketing and behavioural public policy

Neuroeconomics and behavioural insights now inform both public policy ("nudges") and commercial practice (neuromarketing, personalised advertising).

Public-sector applications include using fMRI and EEG to identify message framings that better engage brain networks linked to self-control or pro-social motivation, for example in retirement saving or health campaigns. Private-sector applications include optimising adverts to maximise reward-related activation and approach tendencies.

In welfare terms, there is an asymmetry. The same neural insights that support welfare-enhancing nudges can be used to exploit biases. Recommendation algorithms that maximise click-through or engagement effectively reshape the reward landscape in which human neural RL systems operate. Over time, they may lead to over-consumption of immediately rewarding but harmful content, potentially narrowing preferences and weakening self-regulation.

In the formal vocabulary, platforms choose the reward function r and state-to-cue mappings; AI systems learn policies that maximise platform objectives; human value functions V adapt. Neural evidence, for example that a given design induces heightened ventral striatal activation and more habitual responding, shows that the platform is effectively tuning the human learning system.

Neural data support welfare claims when combined with:
• an explicit welfare criterion (e.g. long-run financial security, mental health);
• a model of how design changes shift behaviour away from that criterion; and
• normative transparency about which neural responses are taken as welfare-relevant.

Without this, there is a risk that high reward-system activation is mis-interpreted as high welfare.

5.3 | Environmental and energy policy is another emerging domain for "environmental neuroeconomics"

Neuroimaging studies examine how people respond to different framings of climate risks or energy savings messages, with the aim of designing communications that close the energy-efficiency gap. Neural responses, for example, strong activation in regions

linked to affective value or social cognition when viewing climate impacts, are sometimes interpreted as evidence of latent concern that is under-expressed in choices. Policy advocates may argue that such findings justify stronger environmental protection than stated preferences alone would suggest.

The framework suggests caution:
• Neural data can show that certain messages more strongly engage circuits associated with valuation, social norm processing or moral concern.
• They can reveal heterogeneity: some individuals show little neural engagement even when they express pro-environmental attitudes, or vice versa.

But moving from "people show neural responses to environmental loss" to "policies should weight environmental quality more heavily than current choices imply" requires a normative step. The welfare criterion must treat certain neural responses, e.g. guilt, awe, moral outrage, as part of what makes outcomes better or worse for individuals. Again, the checklist applies: task validity (do the lab stimuli correspond to real policy trade-offs), model identification (are alternative explanations for neural activity considered) and normative transparency (why are those responses taken as welfare relevant).

6 | A Neuroeconomic Welfare Inference Checklist and implications for NeuroAI

Drawing the argument together, Table 1 below summarises a practical checklist for using neural data in welfare analysis. For NeuroAI, the checklist has two main implications. First, it supports modelling both brains and artificial agents as value-learning systems whose internal variables can be compared. When AI systems are designed to assist human decision-makers, designers can adopt an explicit welfare criterion U and treat human neural and behavioural data as evidence about V and π. The checklist disciplines how that evidence is used.

Second, it guards against conflating optimisation of neural activation with optimisation of welfare. An AI system that maximises expected striatal activation might push users toward behaviours with high short-run reward but low long-run welfare. Welfare-aligned NeuroAI should instead optimise a defensible U, with neural data serving only as one class of inputs and constraints.

For human-inspired AI, the checklist can be read as a set of design principles for brain-inspired value-learning agents. Architectures that borrow from dopaminergic TD learning or cortical–striatal actor–critic loops (Figures 1–2) should treat their internal reward signals and value functions as computational variables, not welfare criteria. A designer who wants such an agent to act in the interests of a human user must specify and defend a separate welfare model U and justify how the agent's learning objective approximates it. The checklist then governs how neural data (for example, user-specific prediction-error patterns) may or may not be used to adapt that objective. In this way, the paper

1	Define the welfare criterion U	Specify whether welfare is identified with long-run preferences, experienced utility, or another standard. Justify this choice in the policy context.
2	Specify the computational model	State the decision and learning model (for example, reinforcement learning with parameters θ,φ). Explain which behavioural patterns it captures.
3	Validate neural encodings	Provide evidence that neural variables encode specific computational quantities (for example, δ!, V$), and assess the robustness and specificity of these encodings across tasks and individuals.
4	Assess model identifiability	Consider alternative models that fit the same behavioural and neural data. Discuss how, if at all, neural evidence distinguishes between these models and their associated welfare analyses.
5	Locate welfare-relevant divergences	Identify states or contexts where implemented choice (given V$ and policy π%) diverges from U. Use neural evidence to characterise mechanisms behind such divergences, not to define U itself.
6	Analyse policy implementation	Explain how neural-based classifications or interventions would be implemented in practice. Address fairness, privacy, legal and broader political constraints on using neural data in policy.

contributes not only to welfare analysis of human behaviour but also to the conceptual foundations of human-inspired, welfare-aware AI, bridging brain-inspired RL architectures and welfare-aware AI design and filling a gap between technical work on value learning and the normative questions that arise when such systems are deployed in policy-relevant domains.

7 | Conclusion

Neuroeconomics is sometimes presented as if it could directly deliver welfare-relevant quantities by "reading" the brain. This paper argues that such expectations are misplaced. Neural data are valuable, but they inform welfare only through computational and normative lenses.

By formalising the path from neural signals, through reinforcement-learning and dual-self models, to welfare criteria, I have derived conditions under which neural data can legitimately inform policy. These conditions emphasise representational validity, model identification, normative transparency and institutional context. Case sketches in addiction, neuromarketing and environmental policy show both the promise and limits of current practice.

The alignment with NeuroAI is natural: RL, prediction-error coding and distributional value representation provide a shared language for brains and machines. Yet welfare remains a separate layer that requires philosophical and economic argument. NeuroAI systems that increasingly shape human decision environments should incorporate explicit welfare models and adhere to something like the Neuroeconomic Welfare Inference Checklist, rather than treating neural correlates of reward as welfare endpoints.

Neural data can refine our models of how people choose and illuminate mechanisms behind departures from rationality. Embedded in transparent welfare frameworks, such models can support more precise and humane policy design. What neural data cannot do is relieve us of the need to argue about what counts as a good life, and whose judgement should prevail when brain signals and choices diverge, that is, whether the decision-maker is a human or a human-inspired AI system trained on those signals.

Future work can proceed in three directions. Empirically, the checklist can be used to audit concrete policy uses of neural evidence in domains such as addiction treatment, personalised advertising or climate communication, testing which of the conditions are actually met. Methodologically, the formal framework can be extended to richer value learning models, including inverse reinforcement learning and multi agent settings, to analyse how welfare claims arise when AI systems infer or influence human reward functions. Normatively, the account can be integrated with broader debates in political philosophy and AI ethics about legitimacy and authority in welfare judgements, especially when human decisions are mediated by human inspired AI systems.

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ECONOMIC VOTING IN INDIAN STATE ASSEMBLY ELECTIONS (2013-2023)

Evidence from Constituency-Level Data on Growth, Inflation, and Unemployment

This paper examines economic voting in India using constituency-level data from 30 state assembly elections across 15 states between 2013 and 2023. It tests whether per capita GDP growth, inflation, and unemployment affect the re-election probability of incumbent party candidates, and how these effects vary across high, medium, and low-income states. Logistic panel models with random effects and rich non-economic controls—drawing on CSDS survey evidence—are estimated separately for each income group. The results show that economic voting exists: voters punish incumbents for higher inflation and unemployment across all state categories. However, the impact of SGDP growth is heterogeneous. Voters in high-income states reward per capita income growth, those in middle-income states are largely unresponsive to it, while voters in low-income states puzzlingly punish higher growth. These findings underscore the need for a fresh, disaggregated and grounded approach to examining voter behaviour in developing economies and polities.

1 | Introduction

From Karl Marx's prophecy of an inevitable communist revolution to Bill Clinton's campaign theme, "It's the economy, stupid," scholars and strategists alike have long argued how economic conditions shape political outcomes. In advanced Western democracies, economic, conditions shape political outcomes. In advanced Western democracies, economic voting behaviour has become well-established (Lewis-Beck and Stegmaier, 2018).

Despite India's status as the fastest growing major economy and the most populous democracy, the study of economic voting in India remains surprisingly weak. Three limitations dominate the literature. First, most work is focused on national elections, when states are the primary centres of economic policymaking and political accountability (Panagariya and Gupta, 2014). Second, analyses rarely disaggregate across income groups, even though per capita incomes and other well-being indicators sharply vary across states. Third, existing scholarship omits non-economic variables that capture India's political, cultural and regional divisions, thus potentially masking significant omitted variable bias. As a result, a clear verdict on Indian economic voting is missing.

This paper aims to fill these gaps by analysing economic voting in 30 state assembly elections between 2013 and 2023, examining whether changes in per capita GDP growth, inflation, and unemployment affect the re-election prospects of ruling party candidates, and crucially, whether these effects differ across high-, middle-, and low-income states. Logistic panel

regression models are estimated separately for each income category, incorporating robust non-economic controls—including caste dynamics, anti-incumbency tendencies, and regional party competitiveness. Coupled with survey evidence from the Centre for the Study of Developing Societies (CSDS), this approach isolates the economic component of voter behaviour.

The results yield three main insights. First, economic voting exists in India: macroeconomic conditions significantly shape electoral outcomes, demonstrating that voters hold governments accountable for its economic stewardship. Second, inflation and unemployment uniformly erode incumbent support across all state income groups, mirroring global patterns. Third—and most unexpected—per capita income growth produces sharply divergent effects across states. Voters in high- and middle-income states reward growth, but voters in low-income states punish it: higher growth actually reduces the likelihood of incumbent re-election, something widely observed in the high-incumbency rates of poor governments.

These findings suggest that in India's poorest states, growth may not be translating into tangible living standard gains due to myriad factors such as 'exclusive' institutions, patronage and clientalism, or dominance of caste and community identities, which create perverse incentives. These findings complicate assumed notions about development-led democratic mandates and raise new questions for scholars and policymakers alike.

The paper is organised as follows. Section 2 presents a thorough literature review, presenting theoretical and empirical debates on economic voting, with particular attention to developing democracies. Section 3 introduces the dataset, election sample, economic indicators, and control variables, and substantiates the econometric methodology. Section 4 presents and discusses the results across the three income categories, whereas Section 5 concludes the study by offering policy suggestions.

Economic conditions shape voting in India: inflation and unemployment hurt incumbents everywhere, while income growth helps richer states but can backfire in poorer ones due to weak institutions and local politics.

2 | Literature Review

The Economic Voting Hypothesis, also called the 'reward-punishment' hypothesis, posits that voters reward or punish incumbent governments for their stewardship of the economy (Lewis-Beck and Stegmaier, 2018). It is underpinned by Key's (1966) Responsibility Hypothesis, where, in a democratic system with an attributable distribution of power, voters can clearly identify who is responsible for economic performance. The clearest responsibility often lies with the incumbent government, whose stewardship can be evaluated by voters; from this insight, Key (1966) coined the paradigm of retrospective voting, which is widely followed.

Early regression-based aggregate studies pioneered by Kramer (1971) in the US and Goodhart and Bhansali (1970) in the UK identified that GDP growth increased incumbent vote shares while inflation and unemployment reduced them, as is rationally expected. However, these studies suffered from ecological fallacy and omitted variable bias by excluding political and contextual controls (Stewart and Clarke, 2017).

To overcome these deficiencies, a new class of

studies emerged which were underpinned by rigorous survey data to study voter behaviour at a granular level (Lewis-Beck and Stegmaier, 2018). Fiorina (1981) empirically corroborated Key's retrospective voting hypothesis using American National Election Survey data (ANES), demonstrating that voters indeed vote retrospectively. Kinder and Kiewiet (1981) established sociotropic voting—voters prioritizing national economic conditions over personal finances—as the dominant pattern; however, notable exceptions have been found bucking this pattern. On the whole, economic voting behaviour has proved robust across Western democracies (Lewis-Beck and Stegmaier, 2018), with GDP per capita growth, inflation, and unemployment emerging as key determinants of electoral success.

Economic voting is robust in Western democracies: often prioritising national over personal conditions.

2.1 | The Indian Context: Development, Heterogeneity, and Nascent Evidence

The main quantitative economic voting studies in India are limited to Viramani (2004), Panagariya and Gupta (2014) and Vaishnav (2015). These studies however face serious drawbacks. Firstly, they are entirely focused on national elections, where non-economic issues such as security, personalities, geopolitics, corruption etc. have significant impact; meanwhile, state elections are more focused on day-to-day governance issues, and have been called by Panagariya and Gupta (2014) as the main arena of economic voting. This issue emerges due to India's federal structure and division of power between the Centre and the States. Secondly, these studies have focused on a single election, while most exemplary western studies are based on multiple election cycles to account for variation and heterogeneity. Consequently, whereas most Indian studies are cross-sectional in nature, Western studies employ myriad panel data models. Thirdly, existing Indian studies employ a 'one-size fits all' approach to study economic voting, ignoring the tremendous economic variation across Indian states that potentially affects voter priorities.

Whereas India's tech and pharma dominated states in the South have per capita incomes upwards of $4000, the per capita income of the poorest state is $830, comparable to the poorest Sub-Saharan African states (OGD Platform India, 2025). Lastly, and crucially, existing studies omit political and non-economic variables that significantly affect voting patterns, which have been well-studied and identified across field studies, sparking concerns of significant omitted variable bias (Sardesai, 2014, 2019; Sharma, 2019).

2.2 | Aims of this study

This study aims to add to the corpus of Indian economic voting literature by overcoming some of the methodological shortcomings mentioned previously. While the specific variable and modelling choices will be addressed in the forthcoming chapter, this study employs state election level data for 30 elections in the form of a panel, and incorporates salient non-economic variables as control variables to isolate economic voting behaviour. Moreover, this analysis is disaggregated based on the level of economic development of Indian states; 15 states are categorised into three categories based on their per-capita income, with the aim of understanding the granularities of economic voting behaviour.

3 | Data and Methodology

This study analyses 30 state assembly elections held between 2013 and 2023 across 15 Indian states, yielding 6,087 assembly constituency-level observations.

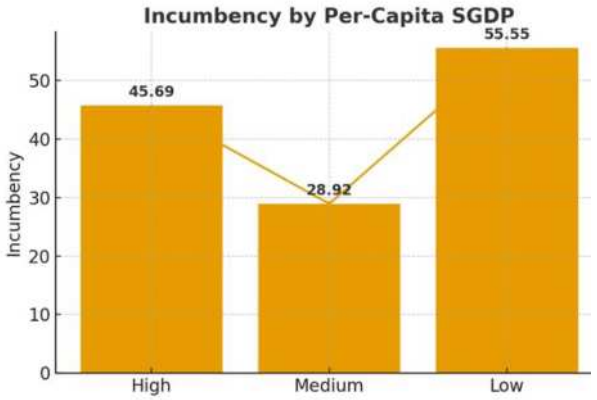
While the chosen states are spread across India's geography, states bordering Pakistan and China were excluded to isolate economic voting behaviour from complex security dynamics.

To inform on the disaggregated approach of categorising states, preliminary exploratory analysis was performed, which revealed significant heterogeneity in incumbent re-election rates: high-income states (45.7% re-election rate), medium-income states (28.9%), and low-income states (55.5%), exhibiting a U-shaped pattern. This finding justifies categorising the 15 states into three categories based on per capita income: high-income above ₹300,000 (Karnataka, Gujarat, Tamil Nadu, Haryana, Telangana; n=1,709), medium-income ₹170,000-₹300,000 (Maharashtra, Andhra Pradesh, Rajasthan, Punjab, Kerala; n=1,846), and low-income below ₹170,000 (Bihar, Uttar Pradesh, Madhya Pradesh, Chhattisgarh, West Bengal; n=2,532). This stratification aligns with development economics convention where per capita income proxies institutional quality, development levels, and governance capacity (Barro, 1999; Acemoglu et al., 2001)

Election data was sourced from the Election Commission of India and Ashoka University's Trivedi Centre for Political Data. Economic variables were sourced from the Reserve Bank of India's Handbook of Statistics on Indian States and NITI Aayog. Political controls were constructed from CSDS pre-poll surveys, representing a methodological innovation of combining aggregate macroeconomic data with voter survey based insights to construct and validate hypotheses.

States were grouped by per capita income to capture development differences: high- and low-income states showed higher incumbent re-election rates than middle-income states.

Figure 3.1 | Results of the Preliminary Data Analysis showing state categories vs incumbency ratios



3.1 | Variables

The dependent variable is binary: 1 if the incumbent party's candidate (not necessarily the same individual) wins re-election at the assembly constituency level, and 0 otherwise. It is defined by party and not candidate, reflecting Indian parties' practice of frequently switching candidates across elections or candidates changing parties (Sardesai, 2019).

Three economic variables are measured retrospectively with a one-year lag, following retrospective voting theory (Fiorina, 1981). Their choice follows the convention of exemplary internal studies (e.g., Lewis-Beck and Stegmaier, 2018). SGDP per capita growth rate captures increase in income per person in the state. Inflation rate at the state level was proxied by national CPI due to limited state-level data, justified by recent inflation convergence across states (Patnaik and Sharma, 2024). Unemployment, as a variable, was constructed from CSDS pre-poll surveys with a binary form (1 if voters identified it as their top issue), circumventing the well-documented reliability problems in India's official unemployment statistics (Bhalla, 2019).

The Multidimensional Poverty Index (MPI) —percentage of population experiencing deprivation across health, education, and living standards—serves as the primary

economic control, preferred over simple poverty rates for its holistic measurement, and widespread usage by the NITI Aayog, the apex public policy body of India.

Non-economic controls include: anti-incumbency (years in power), vote margin, political turncoat status, Modi Factor (BJP presence without Chief Minister), Central Government spillover, entrenchment (prior political experience), multipolar contests, new state status, and COVID-19 timing. These isolate economic effects from India's complex political landscape and social dynamics and are identified from CSDS surveys and political science literature.

A critical data limitation of this study is the imposition of state-level economic variables uniformly across all constituencies, masking intra-state heterogeneity between urban and rural areas—an unavoidable constraint given data availability.

3.2 | Empirical Strategy

This study employs logistic panel regression with random effects, estimated separately for each income category. The logistic framework captures the binary nature of the dependent variable, whereas the panel data structure accounts for variation across states and election years. For each category, three model specifications—one for each economic variable independently— are run to avoid multicollinearity given their theoretical interrelatedness; the choice of variables to incorporate in each model were further determined by correlation matrices:

$$P(\text{Re-election} = 1) = \text{Logit}(\alpha + \beta_1 \text{Economic Variable} + \beta_2 \text{MPI} + \Sigma\gamma \square \text{Controls} + \mu_i + \varepsilon_i \square \square)$$

where i = constituency, s = state, t = election year.

Random effects capture time-independent constituency characteristics (local caste dynamics, candidate attributes) while allowing both within-constituency and between-constituency variation (Bell et al., 2018). Estimating nine separate models (three income categories × three economic variables) allows economic coefficients to vary freely across development levels, allowing for granular insights into economic voting behaviour. Clustered robust standard errors at the state level address within-state correlation to ensure the robust interpretation of coefficient significance (Cameron and Miller, 2015). Hausman tests confirmed random effects appropriateness ($p > 0.05$), while Variance Inflation Factors (VIF) remained below 5. Goodness of fit is assessed using McFadden's Pseudo-R2:

H0 — No Economic voting behaviour is observed across high, medium and low states.
H1 — The coefficient on SGDP growth per capita is positive in all the three state categories.
H2— The coefficient on Inflation is negative in all the three state categories.
H3— The coefficient on Unemployment is negative in all three state categories.

Random effects capture constituency traits while coefficients vary by income level, with robust errors, Hausman tests, and VIFs ensuring reliability.

4 | Results and Discussion

This section presents regression estimates for all three state income categories, presenting the effects of SGDP per capita growth, inflation, and unemployment on incumbent re-election probability. For each state category, three model specifications are estimated—one for each economic variable—with salient non-economic controls included throughout. Results are presented with clustered robust standard errors; significance levels and model diagnostics are included for all estimates. For expositional purposes, all three economic variables have been put into a single column, whereas the analysis estimated each main economic variable independently.

4.1 | High Per Capita Income States

Table 4.1 | Regression Output for high income states

Variable	Coefficient (SE)
SGDP per capita growth	6.188 *** (1.958)
MPI	–0.196 (0.223)
Inflation	–0.909 *** (0.098)
Unemployment	–5.145 *** (0.443)
Entrenchment	0.360 * (0.205)
Modi Factor	1.017 *** (0.413)
Central Government Spillover	1.490 *** (0.252)
Multipolar Contest	0.742 ** (0.543)
Covid-19	1.725 ** (0.585)
Constant	2.357 *** (0.205)
Pseudo-R^2	7.5–8.0%
Significance	* 10%, ** 5%, *** 1%, **** <1%

Results:
In high-income states (Karnataka, Gujarat, Tamil Nadu, Haryana, Telangana; n=1,709), economic voting results align with the predictions of standard Western models. The coefficient on SGDP growth is estimated at 6.188 and highly significant ($p<0.01$), indicating that per capita income growth substantially increases incumbent re-election probability. Conversely, inflation exhibits a coefficient of -0.909 ($p<0.01$), and unemployment shows -5.145 ($p<0.01$), highlighting that voters punish incumbents for rising prices and unemployment. All three economic coefficients are statistically significant at 1% and directionally consistent with Key's (1966) reward-punishment paradigm.

Discussion:
These findings align with exemplar international literature (Lewis-Beck and Stegmaier, 2018), confirming the existence of economic voting in India's wealthiest states. The significant positive effect of growth and negative effects of inflation and unemployment corroborate theoretical predictions and CSDS poll findings that voters reward growth and punish inflation and joblessness. This finding represents the first empirical confirmation of inflation and unemployment as 'punishment variables' in the Indian context.

These results can be interpreted in terms of the respective states' institutional frameworks. High-income states are characterised by stronger political and economic institutions, higher human development indices, better infrastructure, and more robust rule of law, which are able to translate aggregate improvements into on-the-ground living standard increases (Panagariya, 2008; Vaishnav, 2017). Consequently, voters in these states have clear expectations of good governance, welfare delivery, and public goods provision from their state governments. CSDS post-poll surveys for Karnataka (2023), Gujarat (2022), and Tamil Nadu (2021) confirm that voters in these states evaluate ncumbents primarily on governance quality, infrastructure delivery, and economic management rather than purely casteist or religion-based appeals. On the policy front, these findings

represent a well-functioning political system where voters have clear expectations from the state and its capacity to deliver economic gains – and are willing to punish incumbents for failing to do so.

4.2 | Medium Per Capita Income States

Table 4.2 | Regression Output for medium income states

Variable	Coefficient (SE)
SGDP per capita growth	1.885 (7.90)
MPI	0.008 (0.278)
Inflation	–6.211 *** (0.152)
Unemployment	–1.974 *** (0.219)
Political Turncoat	0.248 (0.494)
Entrenchment	0.555 *** (0.161)
Modi Factor	2.258 *** (0.7625)
2× Incumbency	4.328 *** (0.873)
Central Govt. Spillover	1.749 *** (0.329)
Multipolar Contest	5.812 *** (1.342)
Covid-19	0.577 ** (0.582)
Constant	–11.085 *** (2.526)
Pseudo-R^2	8.4–8.9%
Significance	* 10%, ** 5%, *** 1%, **** <1%

Results:
In medium-income states (Maharashtra, Andhra Pradesh, Rajasthan, Punjab, Kerala; n=1,846), a puzzling trend emerges. The coefficient on SGDP growth is estimated at 1.885 but statistically insignificant ($p>0.10$), indicating a very weak relationship between per capita income growth and re-election probability. However, inflation (-6.211, $p<0.01$) and unemployment (-1.974, $p<0.01$) remain highly significant punishment variables, aligning with high-income states and international evidence. Notably, medium-income states exhibit the lowest incumbent re-election rate (28.9%) across all three categories, as was found in the preliminary data analysis.

Discussion:
The positive yet statistically insignificant growth coefficient suggests structural differences in voter behaviour and socioeconomic profiles of medium-income states relative to high-income ones. Unlike Karnataka or Gujarat, most of these states lack major metropolitan hubs such as Chennai or Bengaluru and instead consist primarily of tier-2 and tier-3 cities (e.g., Jaipur, Bhopal, Indore). These urban centres are only recently undergoing rapid urbanisation and do not host large, private job-creating industries—such as technology, pharmaceuticals, or hospitality which pull in capital and labour from the respective states (Sadashivam and Tabassu, 2018). Consequently, aggregate SGDP growth may fail to translate into visible improvements for the median voter in these states, for them to reward it.

This dynamic also reflects voter expectations: many residents associate better employment opportunities with India's established metropolitan economies rather than their own state capitals, as suggested by persistent migration patterns (Peter, Sanghavi and Narendran, 2020). Supporting this, CSDS evidence from Madhya Pradesh (2023) and Kerala (2021) indicates that voters in medium-income states prioritise welfare delivery, direct benefit transfers, and employment generation over headline economic growth—factors not captured by state-level GDP measures.

Curiously, like their compatriots in high-income states, voters identify "development" as their primary electoral concern. However, "development" appears to carry a different meaning: access to public services, welfare benefits, and state-facilitated employment rather than aggregate macroeconomic expansion.

A key point to note is that unlike GDP growth, welfare delivery, inflation and joblessness are felt at the household level, allowing voters to form clear judgments of these issues, aligning with Key's (1966) responsibility hypothesis.

4.3 | Low Per Capita Income States

Table 4.3 | Regression Output for high income states

Variable	Coefficient (SE)
SGDP per capita growth	–7.624 *** (0.539)
MPI	–0.529 *** (0.091)
Inflation	–0.416 *** (0.127)
Unemployment	–1.714 *** (0.204)
Entrenchment	0.389 *** (0.123)
Modi Factor	0.185 (0.752)
2× Incumbency	0.589 ** (0.083)
Covid-19	1.265 *** (0.250)
Constant	0.883 (0.715)
Pseudo-R^2	12.2–12.4%
Significance	* 10%, ** 5%, *** 1%, **** <1%

Results:
In low-income states (Bihar, Uttar Pradesh, Madhya Pradesh, Chhattisgarh, West Bengal; n=2,532), the coefficient on SGDP growth is -7.624 and highly significant ($p<0.01$). This counterintuitive result indicates that higher per capita income growth seemingly decreases incumbent re-election probability—a complete reversal of standard economic voting theory. Meanwhile, inflation (-0.416, $p<0.01$) and unemployment (-1.714, $p<0.01$) remain negatively associated with incumbent re-election probabilities, consistent across all income categories.

Discussion:
The negative growth coefficient represents this study's most puzzling and novel finding. Rather than rewarding economic growth, voters in India's poorest states punish incumbents who deliver higher growth; conversely, they continually reward incumbents under whose stewardship growth has flattened (e.g. West Bengal under the Left-Front, and Bihar under the Mandal socialists). This paradox requires careful interpretation within India's political economy context.

Several mechanisms may be used to unpack this puzzle. First, distributional concerns: in states with weak institutions and poor governance, aggregate growth may be highly unequal and concentrated among traditional caste elites, bypassing rural majorities (Virmani, 2004). Sharma (2019) and Gupta (2022) document how service-sector-led growth in poor states remains confined to state capitals while agricultural and informal sectors stagnate, leaving most voters materially unaffected despite rising state GDP.

Contrary to standard theory, growth in India's poorest states reduces incumbent support, while inflation and unemployment consistently hurt incumbents.

Second, patronage and clientelism: political science literature establishes that public welfare in poor states operates through informal networks where votes are exchanged for direct benefits—cash

jobs, contracts, access to officials (Bardhan, 2012; Bussell, 2015; Chandra, 2004). In such systems, aggregate macroeconomic delivery becomes irrelevant; what matters is personalised benefit delivery and distribution of the 'pie' in exchange of favours and votes. High growth may even threaten existing patronage networks by strengthening formal institutions that reduce politicians' discretionary power, incentivising incumbents to resist developmental transitions (Acemoglu and Robinson, 2012). In states like these, caste and community networks operate as 'collective economic bargaining' mechanisms, vying for the same limited 'pie', and vote accordingly (Munshi, 2019). It is well-documented that governments appoint members of their caste bloc into public sector jobs such as the police or teachers (Sardesai, 2014; 2019).
Broadly speaking, these states exhibit weak institutions creating perverse incentives and limited opportunities, as widely studied by the likes of North (1990) and Acemoglu and Robinson (2012).

Crucially, the significant negative coefficients on inflation and unemployment demonstrate that voters in poor states do engage in economic voting—but only for variables with direct, immediate welfare impacts on their pocketbook, which are even more salient among the poorest demographics. This pattern aligns with Key's (1966) punishment dimension but reveals that the "reward" dimension operates through non-traditional channels: welfare schemes, caste solidarity, patronage access—factors beyond this study's measurement but extensively documented in CSDS post-poll analyses of Bihar, Uttar Pradesh, and Madhya Pradesh elections.

5 | Conclusion

This study examined the economic voting hypothesis in the context of Indian state assembly elections, specifically examining the effect of state GDP per capita growth, inflation and unemployment on there-election probability of ruling party candidates. The first study to examine economic voting behaviour in state elections, 15 states were examined over 2 consecutive election cycles between 2013 and 2023, therefore employing a large dataset to obtain consistent and interpretable findings.

In Key's (1966) reward-punishment framework, the main takeaway from this study is that while inflation and unemployment are punished across all three state categories, only in the case of high per capita income states, growth is explicitly rewarded. On the other hand — given the unanimous choice of voters in identifying development as the top issue in CSDS pre-poll surveys— it is very likely that the factors which voters reward in the case of medium and low per capita income states are not captured by SGDP Growth Per Capita, underscoring the impact of nontraditional economic factors which voter behaviour, opening up the avenues for future research.

5.1 | Further Extensions

While this study makes a headway in terms of a disaggregated and granular approach to examining Indian economic voting behaviour, further extensions can throw more light. This involves collating district level economic data rather than state (or in some cases, national) data, which gives a more detailed picture of economic voting since assembly constituencies correspond more accurately with districts. Moreover, this can capture the differing voting patterns across rural and urban areas, where political studies (e.g., Sharma, 2019; Sardesai, 2014, 2019) have found marked differences.

Additionally, following this study's conclusion, a serious study of different states' institutions is necessary, especially their role in converting aggregate growth into tangible living standard increases. This aligns strongly with India's aim of joining the ranks of developed nations by 2047, the centenary of its independence,

which strongly depends on turning around India's weakest states, which are incidentally also the youngest and most populous.

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PROFIT, POWER, AND PUBLIC GOOD: DO BUSINESSPEOPLE TRULY BENEFIT SOCIETY?

How Earnings, Spending, and Policy Shape Economic, Social, and Environmental Outcomes

When considering the benefits of successful businesspeople's earnings and spendings, it is vital to consider the principles of so-called 'trickle-down economics.' Coined by comedian Will Rodgers, 'who mocked President Herbert Hoover's Depression-era recovery efforts', the term was meant as an insult (Keller, 2017). The term today refers to policies where firms and wealthy individuals get tax cuts by governments to fuel consumption and investment, so overall tax revenue could increase from indirect taxes. This was popularised during Reagan's presidency (Foster, 2017). The idea suggests wealthy individuals and firms should not face heavy tax because if they have more disposable income and revenue with which to consume and invest, a multiplier which would then benefit others would be created. This links to free-market policies, which promote 'an unregulated system of economic exchange' (Orlitzky, 2016). Therefore, without tax, free-market policy is promoted with trickle-down economics. Trickle-down economics principles must be applied to evaluate benefits of successful businesspeople making money because that is the best way in which links between money being made and spent by these individuals is clearest.

Consequently, spendings and earnings of successful businesspeople are often tied to whether a government has decided to use free-market and trickle-down policy. If they are heavily taxed, then many would be discouraged from investing within a country because returns could be higher elsewhere. This would not promote economic growth, and therefore would not create benefit. So, the benefit drawn can vary depending on government policy.

Trickle-down economics assumes that wealth concentrated in successful businesspeople eventually benefits the broader economy. However, without government policies encouraging reinvestment and innovation, wealth may stagnate at the top.

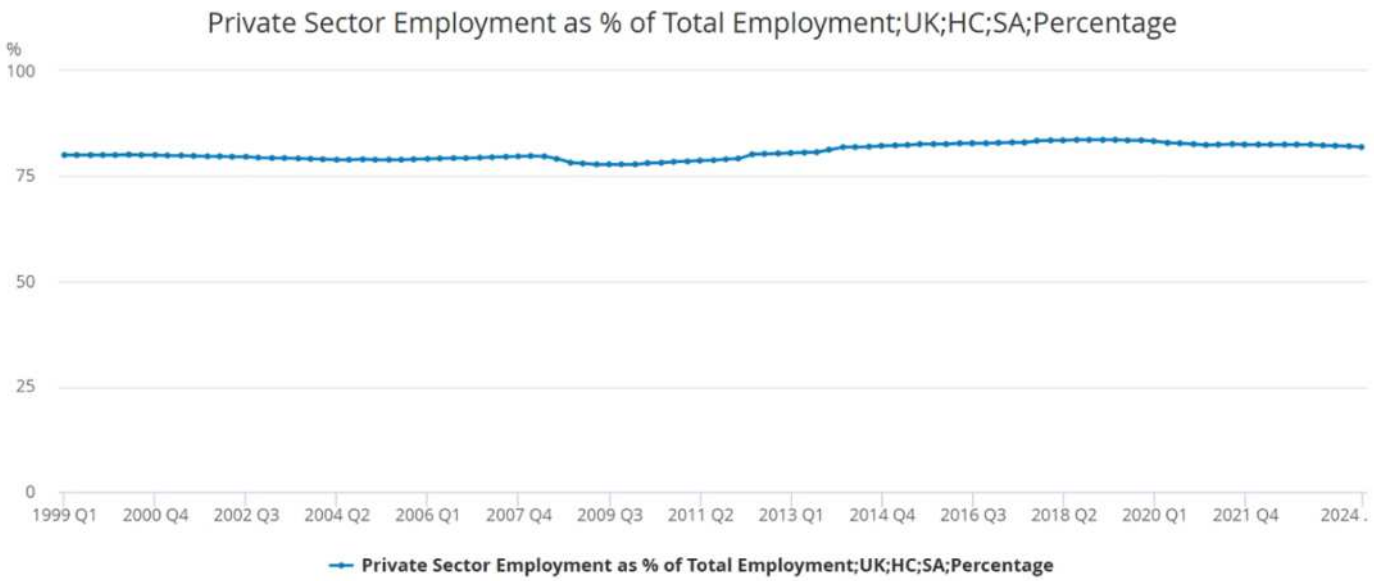

Figure 1 (ONS, 2024).

Since 1999, the private sector has employed over 77% of the workforce in the United Kingdom (see Figure 1). Hence, successful businesspeople are required to run the firms in which most workers earn their living. Otherwise, there would be economic collapse. The wages paid by successful businesspeople, as well as the prices which households pay for goods and services provided by firms maintain the circular flow of income. Furthermore, households no longer have skills to survive in a subsistence or barter society seen pre-Industrial Revolution (Zeidan, 2021). Therefore, selling labour is the only way to provide for themselves; without firms run by successful businesspeople there would be no way in which to do this. Moreover, without this developed labour-selling system (for many countries this came with the Industrial Revolution, with the feudalism's replacement with capitalism) living standards would be lower, as evidenced by lower life expectancies globally pre-Industrial Revolution (Dattani, et al., 2023). Therefore, successful businesspeople provide opportunities which have improved living standards. However, the idea that successful businesspeople create benefits assumes that the main gain is economic growth. Other macroeconomic objectives, like environmental protection or societal equality may be sacrificed by firms, because the main way in which businesses are seen as 'successful' is by having long-term profitability, often without accounting for negative externalities. While life expectancy has increased since the introduction of capitalism in the late 18th century, there has been significant environmental damage.

In the last millennia, global forest cover has decreased by a third; half of which occurred in the last century (Ritchie, Ross, 2024). The market is responsible for 90% of tropical rainforest deforestation (Thomson, Franklin, 2024). This suggests industrial growth and its associated business leaders have had a negative impact globally, which will thus have negative consequences in the future. Without forest cover there would be a loss of biodiversity and human livelihoods. In 2020, forests supported 90% of those living in extreme poverty and are often lands of importance for Indigenous Peoples (FAO, 2020). The result of successful businesspeople making their money since the Industrial Revolution has not created benefits for future generations; a balance should be made between having an efficient market economy that supports improved living standards and environmental protection so a market society that cares only for economic growth is avoided.

Moreover, the benefits of trickle-down economics (which the source is successful businesspeople) are not guaranteed. The key issue with the principles of trickle-down is that it is highly theory-based with large assumptions, namely that the money amongst the richest will be spent and continued to be spent throughout the economy. In the foreword of the 2022 World Inequality Report, it is stated that the "entrepreneurial culture that celebrates the unabashed accumulation of private wealth" brought in with the "Reagan-Thatcher revolution" lead to "a dizzying rise in inequality within countries that continues to this day" (Banerjee, Duflo, 2022), suggesting the promotion of successful businesspeople under the policies of Reagan and Thatcher lead to inequality and not a trickle-down effect, because there was no incentive to do so, and every incentive to save the money with low tax rates. Therefore, the actions of successful businesspeople (whether spending or making money) are implied to be negative.

On the other hand, it was suggested that one of the best ways to attempt to solve inequality would be to direct money grants straight to households in need as they tend to spend money on necessary merit goods – like food – that will aid their quality of life (Orkin, 2020). Consequently, allowing tax breaks for the wealthy because they provide benefits through trickle-down economics is not the most efficient way to reduce inequality. Even though these businesses could have a positive effect, it does not mean they are the only or best forces in an economy that can.

Another consideration is how the successful businessperson earned their money. Money made from the finance industry may not create many benefits because growth in the finance industry is correlated with declines in productivity (Kharroubi, 2015).

Additionally, speculation and its associated industries can cause price bubbles, particularly with housing, seen with the 2008 Global Financial Crisis. This makes housing unaffordable (Gao, et al., 2019), detracting necessary resources from those in need. Lawrence described speculation as an "economic parasite" because it "divert[s] resources away from production" (Lawrence, 2014). Likewise, speculation does not create any good or service, tending to be a method for the wealthy to further increase their earnings (Pazzanese, 2016).

Money earned through speculative finance often fails to boost real productivity, inflates asset bubbles, and benefits only the wealthy.

Alternatively, creative industries not only contribute to culture, they also have positive effects like improving healthcare (Fancourt, Finn, 2019). Hence, the way in which a successful businessperson makes their money can influence how it creates benefits for the economy. A question then rises: are ethical ways to make money utilised? Cuadros uses the context of Trump's nomination as the Republican candidate for the 2016 US election to describe the appeal of billionaires opposed to Trump. However, Cuadros argues that meritocracy is "a myth" and that the idea of "better billionaires" will not help to solve contemporary issues (Cuadros, 2016). In a later article, Cuadros furthered this argument by using jailed Brazilian billionaire Eike Batista as an example. The fact that a developing country like Brazil was jailing a billionaire who had pitched themselves as "a new kind of businessman" (Cuadros, 2017) was seen as a marked sign that no matter their public image, many wealthy businesspeople make their money through corruption, even if they claimed to make it ethically. This suggests that avenues of ethical business are largely unfulfilled.

Alongside wealth inequality, the concept of a link between wealth and power must be explored when considering successful businesspeople's benefits.

In the USA, citizens (excluding convicted felons, anyone serving time in prison regardless of their offence, or some with mental disabilities) over the age of eighteen that meet their state's residency requirements can vote (USA Gov., 2024). This means one vote per eligible person under the American democratic system. Yet, with the inequalities found with the Electoral College vote distribution (Durran, 2017) and the discontent many Americans feel towards government policy (Pew Research Center, 2023) it is suggested that the majority are not being represented.

Conversely, those with money often have greater influence over politics and therefore government policy, in large part because of lobbying and campaign financing (Saaida, 2023). This was exemplified in 1954, when the USA backed the coup d'etat in Guatemala – partly on the behest of the United Fruit Company – to oust the democratically elected Árbenz to prevent unused UFC land from being nationalised (Gatchell, 2015). This spending of money made by successful businesspeople can undermine democracy on an international level, particularly affecting developing nations, such as Guatemala.

Wealth can amplify political power: while most citizens have one vote, rich businesspeople influence policy through lobbying and spending.

However, there are some benefits. Political parties require funding from donors. By providing them with funding, successful businesses allow parties to campaign so that households can access their political message. Before the spread of business practice in the 19th century, people received less political freedom to elect whom they wished, and those without wealth and privilege had difficulty breaking into the political sphere (Clinton, 2015). Consequently, the evolution of capitalism helped bring the benefits of democracy even if there wer some flaws.

The avenue in which money is spent has a large impact on its effects on the economy.

Money spent altruistically on philanthropy has many positive impacts. The Gates Foundation has donated $4 billion to Gavi since its inception in 2000, and the charity is now "the key player in distributing Covid vaccines in developing countries" (BBC, 2021). There are many forms of ethical leadership; Liu and Baker outline that many philanthropists are seen to lead by example by the media (Liu, Baker, 2014) which could suggest that philanthropy from successful businesspeople incentivises others to act charitably, an undeniable positive outcome for the economy.

However, philanthropy is partially promoted by governments. Charitable donations qualify for tax deduction in many countries like the USA (Reich, 2013), incentivising many to donate. Hence, government policy like this helps to promote benefits like philanthropy. Without this, it can be inferred that individuals and firms would be less incentivised to be philanthropic. Therefore, the idea that successful businesspeople would solely create economic benefit is diminished, linking back to the idea that governments are also influential in creating societal benefits.

Cuadro also argues that using philanthropy to identify a virtuous billionaire is "misguided", as many wealthy individuals like Bill Gates, Warren Buffet, and Andrew Carnegie – all known for charitable work – used it as a shield for protection against criticism for poor

business practices (Cuadro, 2016). Therefore, while philanthropy can create benefits, if it is to mask the damaging aspects of their business, the net gain is little, if anything.

The final consideration to be made is how successful businesspeople could be incentivised to create a net positive. Despite being one of the wealthiest countries globally, the USA suffers from some of the highest inequality (Horowitz, et al., 2020), which suggests that a complete free market could exacerbate issues. However, by attempting to alleviate inequality with "closed-system reasoning" as well as faith in "allocative efficiency" and "public choice theory", as seen towards the end of the Soviet Union and in current British neo-liberal policies is argued by Innes in Late Soviet Britain to also be ineffective because it disincentivises innovation by establishing inefficient monopolies (Innes, 2023). Consequently, government policy would have to be engineered so that the extremities of the free market are avoided while still incentivising firms. For example, there should be transparency with government contracts and privatisation of public services should be avoided.

Overall, whether successful businesspeople provide benefits when they spend or make their money is subjective. These individuals and firms may provide benefits, like the evolution of democracy and higher living standards displayed by longer life expectancies. However, these benefits need to be evaluated against their costs. Economic growth needs to be checked against other measures like environmental damage and wealth inequality for a comprehensive plan for development, as outlined in Doughnut Economics (Raworth, 2018). Moreover, government policy is just as key in determining the benefits drawn; too much intervention may cause innovation to leave an economy, while too little may not provide sufficient incentive to provide wider benefits to the economy. Therefore, while successful businesspeople can and do provide benefits to the economy with their money, they are not the only or most effective economic agent.

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THE ECONOMICS OF THE HUMAN ORGANS TRADE: COULD LEGALISATION BOOST THE UK'S GDP?

Assessing the Impact of Legalising Human Organ Trade on GDP, Public Health, and Societal Welfare

This essay investigates whether legalising a regulated human organ trade in the United Kingdom could generate measurable positive impacts on national GDP. It examines the historical development of organ markets, including cases in Pakistan and India, highlighting both increased transplant availability and severe ethical concerns such as exploitation of vulnerable populations. The study evaluates potential economic benefits for the modern UK, particularly in the aftermath of COVID-19, where slow GDP growth and rising NHS costs have intensified interest in alternative economic stimuli. Using evidence on the high cost-effectiveness of kidney transplantation compared to dialysis, the research explores how financial incentives might expand organ supply, reduce NHS expenditure, and increase overall economic activity. It then analyses proposed regulatory frameworks—especially monopsony-style systems under a central public authority—and models based on redistributive taxation that aim to ensure fair access while preventing exploitation. The study concludes that while a domestic kidney market would likely have minimal impact on GDP due to limited domestic demand, operating within an international market under strict regulation could generate far greater economic gains, though significant moral and social risks remain. The findings suggest that economic potential exists but must be weighed against ethical constraints and feasibility.

1 | The History Of Human Organ Trade And Transplantation

Human Organ Trade is the business of exchanging organs, usually for monetary benefit, for transplantation purposes. It usually involves organs, primarily the kidney, but can also include tissues and other bodily products. It is split into 2 components, “Organ Trafficking” and “Trafficking in Persons for Organ Removal” (Whitney, 2023). The former refers to the ‘illegal handling of organs’ while the latter ‘is when a person of vulnerability is exploited, deceived, coerced, or abused for the illicit use of their organ.’ (Whitney, 2023).

Human organ trade has continually developed throughout history, with some initial forms of it occurring in Israel and Pakistan. The practice of it was termed 'transplant tourism' where wealthy individuals from affluent, developed countries would purposefully travel to impoverished countries at the time, like India to receive organ transplants from poorer citizens legally. Pakistan's role in the organ trade since the mid-1990s was that of a popular destination for transplant tourism as 'by 2007, some 2000 commercial transplantations were performed annually in Pakistan, the majority of which—approximately 1500—on foreigners, especially from the Middle East.' (Efrat, 2013). Transplant tourism provides some good, however, as 'thousands of patients — from the United States, Israel, Saudi Arabia, and other prosperous nations — get the kidneys they need.' (Ireland, 2008). This meant people who originally would not have the opportunity to receive organ transplants or were on waiting lists for absurd periods with meagre hopes to receive one would receive a new chance at life.

However this process was very targeted, since those of lower social strata were regularly singled out to provide these organs, evident after a 'socioeconomic survey of the kidney vendors was undertaken in the North of Pakistan' (Rizvi et al, 2010) between 1997 and 2007, it highlighted that the 'majority of the vendors (93%) sold kidneys to pay off debts. However, 88% of them had no economic benefits post-vending. Similar findings on vendors have been reported from India.' (Rizvi et al, 2010). This is clear evidence alluding to the exploitation of the lower class by wealthier individuals for their organs, as under financial pressure, they resorted to desperate measures with severe repercussions. The plight of poverty-stricken citizens is sorrowful, as they often have limited information about the forced organ transplants they undergo, yet are subject to its cruelty. Nevertheless, this provides an insight into what factors to consider, in the event of the implementation of a legal human organ market - preventing maltreatment of poorer citizens and ensuring they are properly informed of potential risks and the whole procedure, as they may be blinded by the short-term financial gains while remaining oblivious to the dangers of the procedure.

As George Santayana claimed, 'Those who can not remember the past are condemned to repeat it.' Therefore previous forms of human organ transplantation and its markets must be analysed, to discard negative factors that prevailed previously and ascertain the positives of past systems to maximise both physical and economic welfare. One of these former positives was that organ transplantation, in general, had 'established itself as a first-line treatment for end-stage renal failure, with excellent results' (Noorani, 2008). As the organ market in Pakistan greatly increased the availability of organs due to monetary incentives, it boosted transplantation rates as the influx of organs would allow recipients to be better matched to compatible organs. This would increase the overall number of organ transplants as well as the success rate of each transplantation since the aspect of choice benefits not only the recipient but also the health service, since less money is spent dealing with potential complications as an aftermath of the transplantation due to greater compatibility.

In particular, 'kidney transplantation is highly cost-effective, particularly in relation to NHS spend.' (NHS, 2009). This is because 'the average cost of dialysis is £30,800 per patient per year.' while the cost of a transplant to the NHS was £17,000 and only £5,000 per annum for immuno-suppression. (NHS, 2009). The benefits are clear as 'in 2008-09, 2,497 people received a kidney transplant. These transplants are now saving the NHS £50.3m in dialysis costs each year for every year that the kidney functions.'

(NHS, 2009). Therefore a slight incentive could motivate people to donate and save money for the NHS. Despite this, the ramifications of organ trade cannot simply be ignored, and under the World Health Organisation (WHO), previous forms of organ trade were branded insidious and immoral as they were deemed as exploiting the poor through 'transplant tourism' by the WHO in an official statement in 2004 when it 'urged members 'to take measures to protect the poorest and vulnerable groups from transplant tourism and the sale of tissues and organs'. (Adair and Wigmore, 2011). Organ trade was banned by WHO in 1987 as it was deemed to violate Article 1 of the Universal Declaration of Human Rights since it infringed on the dignity and rights of others.

However, the money generated from current illegal organ trade could be utilised advantageously, as due to 'a shortage of legally sourced organs around the world, it is estimated that the illegal trade of human organs generates about 1.5 billion dollars each year from roughly 12,000 illegal transplants.' (Gonzalez, Garijo & Sanchez, 2020). Such vast amounts of wealth could cause positive impacts on GDP when injected into economies, but the social impact must also be considered, as if a trade ban was placed on the United Kingdom (UK) due to its operation of a legal organ market, then a severe negative impact on GDP is likely due to lack of exports.

While organ trade could generate significant revenue, any economic gains must be weighed against human rights and social impact.

How Could Human Organ Trade Revitalise The Modern UK Economy, And Would It Lead To Any Other Benefits or Disadvantages?

As the perspective switches from the past to a modern-day setting, the trade of human organs begins to look both increasingly viable and necessary, due to economic instability from the Coronavirus pandemic, 'public health measures including social distancing, travel restrictions and closure of non-essential shops drove a 19.8% fall in Gross Domestic Product (GDP) between April and June 2020.' (Office for National Statistics, 2021). Although the UK GDP in Q3 2023 was 1.4% above its pre-pandemic level of Q4 2019 (House of Commons Library, 2024). The strong impact of the pandemic is evident, as it severely limited economic growth to the point where GDP only increased by 1.4% in nearly 4 years.

Such weak economic growth is alarming, especially as the coronavirus is constantly mutating, so it could negatively impact the economy greatly if another global pandemic is caused. (Kloss, 2023). Regardless, there is high economic instability within the UK currently and if employed correctly, human organ trade could be a huge asset in rebuilding the UK's GDP and general economy. In addition, the UK's structure as a mixed economy allows for both capitalist and socialist aspects to shine. (Anon, 2023). This means that organ trade could potentially be left in the hands of the community, as commerce grows GDP, while the government collects taxes to expand the market through subsidies, allowing for continual growth.

On a further note, a market for human organs, or at least financial incentives for organ donation in the UK could greatly increase supply, which would save thousands of lives. This would greatly promote both national and economic welfare, since the lives saved continue to ontribute to the UK as well as the donors

who now have more income, an attestation to rising GDP. Despite this, a for-profit commercial market in human organs is often denounced as inappropriately commodifying the human body.' (Cherry, 2015). Many people struggle to fathom the concept that the human body could be viewed as property capable of purchase and sale. This is due to its pre-established position as a gift rather than a product in society. Hence, there is an instinctual form of rejection and moral repugnance to a for-profit market for human organs.

However, whether altruistic donation is truly morally correct or not isn't clear, as certain factors may subtly push individuals to donate their organs, such as 'psychological, emotional and medical needs, as well as a desire to please others.' (Cherry, 2015). As indicated, altruistic donation could occur due to shrewd coercion, or social pressures, while a for-profit market, albeit slightly callous, would be straightforward as it would simply be an exchange of goods. Many people are also unaware that a commercial market would provide a reasonable benefit to the donor, as since the human body holds such value, how can parts of it simply be gifted away? These transactions would provide a private benefit to both donors and recipients as they receive reasonable compensation for their efforts.

Moreover, the introduction of a market for human organs could potentially revitalise the struggling and debilitated post-COVID UK economy, as a market for organs connotes increased transactions, essentially more 'production of goods' which ultimately contributes to benefiting the UK's GDP. This desired result could be brought to fruition through utilising monetary incentives to increase availability, which could potentially lower the stress on the National Health Service (NHS), as fewer resources would be allocated to elements such as advertising to increase donation rates, or maintaining the data for organ transplant waiting lists as they receive organs due to increased supply, for example. Furthermore, 3.2% of the NHS budget is spent solely on kidney failure services, a market would greatly reduce this as taxing the transaction could financially support the transplant procedure. (Kidney Research UK, 2023).

Along this route, a concept of financial incentives creating savings to the healthcare system was established as data obtained from Chile, a mixed economy like the UK, was used to calculate the most appropriate financial incentive to increase organ provision. This could be achieved whilst simultaneously lowering costs for Chilean Healthcare services as 'the results indicate that a compensation computed at the 95th percentile of the distribution would still generate savings to the health system, even when using conservative values for the cost–benefit analysis.' (Parada-Contzen and Vásquez-Lavín, 2019). The monetary incentives would increase willingness to give up organs, which would save costs spent on long-term dialysis, regular treatment, and being looked after by carers. This saves money for the healthcare system overall, hence why it could revitalise the economy, as the money could instead be spent on factors like improving the structure of the NHS or investing in businesses, which benefits GDP.

Financial incentives for organ donation could cut NHS kidney care costs and boost organ supply, indirectly supporting the UK economy.

Moreover, the exploitation of the poor due to wealthier individuals capitalising on their straits has already been considered, 'as one allows the incentives to vary depending on the individual position on the wage distribution' (Parada-Contzen and Vásquez-Lavín, 2019). These incentives can vary up to the 95th percentile for income and have the additional benefit of convincing wealthier individuals to donate, which restrains the poor being targeted.

Nevertheless, this price variation may cause dissatisfaction among many individuals who could potentially view it as the rich getting richer, and due to variance between the larger UK economy in comparison to the Chilean economy, the 95th percentile may be much wealthier in the UK, which means that greater wealth would be required to persuade them to give up an organ. Thus, rather than rejuvenation of GDP, it could instead lead to further bleeding of the UK's GDP, as government funds would be diverted from maintaining the economy into a fruitless project that would provide nothing but losses, negatively impacting the overall economy and GDP.

Offering financial incentives for organ donation risks exploiting the poor, as wealthier individuals may only participate at high compensation levels.

Additionally, such a system is still likely to target the poor, as a reputed Harvard professor claimed that 'even in a regulated, government-run version of transplant tourism, "unethical realities" lead to exploitation of the poor and the vulnerable' (Ireland, 2008). Those on the wealthier spectrum of society are unlikely to donate unless they run into financial trouble, as in most cases they will prioritise their future health over a sum of money that they don't truly require. This means that indigent citizens would make up the majority of donors in this potential system. Alternatively, rather than trying to safeguard the poor from incentivised organ trade, why not accept that they will undoubtedly be the focus, since this already occurs frequently in society?

The former president of the American Society of Transplant Surgeons, Anthony Monaco, highlighted that 'developed societies have already become comfortable with the use of tangible recognition for personal self-sacrifice that is most likely to flow to the needy'. (Friedman, 2006). This means that governments within developed countries target the poor with the majority of their projects, as all it takes to move them is money.

This is reinforced as Monaco claims 'If military service can be recognised with inducements such as paid education, enlistment bonuses, and financial recovery for injury or mortality, why should the decision to donate an organ be viewed differently?' (Friedman, 2006). As in both cases of organ donation and risky employment, participants take on tasks with evident risk to benefit, with many forms of risky employment being even more dangerous than organ donation yet being perfectly legal with corresponding rewards.

This, therefore, reinforces the concept that targeting the poor for organ trade may not classify as exploiting them, since they receive a benefit suitable to their needs, as a result of self-sacrifice. (Wilkinson, 2016). Moreover, this would provide substantial benefits to GDP as average wealth levels in the UK would rise, also promoting a greater level of commerce as when these initially poor citizens resolve their financial straits, the money flows back into the UK economy.

2 | What System Would It Operate Under?

The specific system that legalised organ trade would operate under is also a point of concern, as this could prove either severely detrimental or advantageous towards the inception of a market for human organ trade, depending on its effectiveness. The particular system chosen should maximise economic benefits while simultaneously providing suitable care and protection to both donors and recipients to ensure their welfare.

An important point to note in this regard is that 'almost all serious advocates of allowing payment for human organs argue not for an unfettered 'free market' but for a regulated one.' (Wilkinson, 2016). This is due to the severe ramifications that could occur upon implementation of a free market, evident from the dire circumstances that befell kidney vendors in Pakistan's former organ market. Although opinions vary on the system that a market for human organs should adopt, three imperative points that are commonly advocated are that the market 'is limited to a particular geopolitical area,' with 'a central public body responsible… for allocating organs fairly in accordance with clinical criteria.' and 'prices are set at a reasonably generous level to attract people voluntarily into the market.' (Wilkinson, 2016).

These three factors remain constant within most proposals of a legal human organ market since they presumably allow for the most amount of rationale to persist as the altruistic notion of organ donation is discarded. The first point aims to limit outbreaks of transplant tourism, while the second seeks to minimise exploitation of the poor, as although it is inevitable, actions can still be taken to lessen its impact.

A central public body would allow people trading their organs to have a sense of security when doing so, fostering increased organ trade and availability due to a rise in confidence levels. The third point also holds weight as the price needs to be suitable for the sacrifice it demands from individuals.

The task of determining the price and manipulating the market for stability would fall upon the central governing body, hence why its role is of vital importance, as the concept of a 'monopsony where only one buyer exists for the products of several sellers,' appears to be the most manageable, as in the UK the National Health Service (NHS) could easily assume control over an organ market without a doubt, due to its status and relevance in the matter of organ trade. (Adair and Wigmore, 2011).

The majority of proposed markets for human organs adhere to these guidelines, and one such study on this theory is a projected model of legalised human organ trade through redistributive taxation within the United States (US) economy. (Wilwerding, 2018). Moreover, as both the UK and the US are large, mixed economies with both capitalist and socialist measures, there will be similarities in the overall economic effects. This study targeted a specific organ - the kidney, since it can be transplanted from living donors, the acceptance rate of its development from an altruistic donation to a compensated donation would be higher.

The model that the study proposed was a form of taxation, specifically a 'redistributive tax regulation' with 'taxation tailored to prevent inequitable access.' It primarily focuses on the kidney as it is one of the transplant procedures with the least risk, and affects the largest quantity of people. (Wilwerding, 2018). The aspect of tailored taxation meant that wealthier recipients would not only pay the full price for a kidney but also an additional sales tax on top of that. The value of the sales tax would be up to the discretion of the central governing body,

but the tax could be directed towards subsidising the cost of kidneys for impoverished citizens, as they are less capable of paying the cost. Recipients would be segmented into divisions based on their income, with poorer recipients having part of the cost subsidised by the NHS using the sales tax, the value of the subsidy varying based on their income with it possible for 100% of the cost to be paid off. Meanwhile, those above a certain income bracket would face an additional sales tax, which would then be used to fund the subsidies for poorer citizens, hence this is why a suitable price must be calculated.

Two important factors to consider about this system are the income brackets that would separate individuals, as well as the value of the subsidies that particular recipients could receive. (Wilwerding, 2018). The income brackets would not only determine whether or not a recipient pays sales tax on the organ they receive but also the value of the sales tax they pay, as those earning a higher income would be subject to a higher sales tax depending on what tax bracket they lay within. Similarly, the subsidy provided would also need to align with income brackets, and the level provided for each segment should be calculated appropriately to minimise the wastage of funds. (Wilwerding, 2018).

Additionally, those in need of a kidney occupy the largest proportion of donor waiting lists in the UK at 5,353. (Stewart, 2019). This means that there is much less risk of the NHS losing money due to factors such as a lack of wealthy recipients to charge a sales tax upon, as a larger population of recipients improves the plausibility of such a system as there will likely be enough affluent citizens contributing towards the sales tax so that poorer citizens could receive subsidies.

Furthermore, the price settled on for the kidney within this system should not only be high enough to increase the supply of organs, but it should also be reasonable such that many recipients are willing and able to pay it so that a satisfactory quota of sales tax could be obtained to assist poorer citizens. Moreover, if an appropriate price is chosen, supply could potentially increase to a greater point than demand, the NHS could then undertake the process of allocating the most compatible organ to a corresponding recipient to reduce the risk of rejection to a minimum (Wilwerding, 2018). This would conserve a lot of costs for the NHS as less money would be required to deal with the aftermath of rejection, as they would be less likely to occur.

Setting the right price is crucial: high enough to encourage donations and generate funds, but reasonable enough that recipients can pay, while minimising organ rejection costs and NHS expenses.

The money saved could then be injected back into the kidney market, as when it expands, the scale of transactions does too, greatly bolstering the UK's GDP due to the emergence of a new and rapidly growing market, as the value and quantity of goods being sold within the UK increases, so does it's GDP. Another point to take note of is the prospect of a surplus in sales tax collected after less affluent citizens have been subsidised, these leftover proceeds could potentially remain with the NHS, which could then utilise this to improve its infrastructure or fund its general processes and perhaps even the cost of the organ transplants themselves. This would allow them to provide more efficient healthcare, and also allow existing

government initiatives dedicated towards the NHS to be diverted elsewhere, improving the economic flexibility of the UK as more funds would be available considering that NHS 'spending in 2022/23 was £181.7 billion.' (The King's Fund, 2023).

However, considering the small population size of those on the UK's kidney waiting list, it may not be viable for a market in kidneys to be put into practice in the UK, as even if extortionately high prices of £100,000 were charged per kidney, it would only amount to approximately £500 million in earnings when considering the scale of the UK's kidney waiting list. (Stewart, 2019). Furthermore, this would all be earnings directed towards donors, whether their later actions would impact the UK's GDP cannot be directly determined. The sales tax collated overall would likely be less than the overall direct earnings toward donors.

A UK kidney market would not be economically feasible, given its small waiting list and unaffordable prices.

Although this would still likely be a vast amount of wealth, considering that the direct earnings that donors would make counts for less than 0.5% of the NHS' yearly budget, the sales tax itself would offer little more than a slight respite to the NHS. Moreover, even this figure is severely optimistic as 'median household disposable income in the UK was £32,300' at the end of 2022. (Office for National Statistics, 2023). Therefore, the majority of those on the kidney waiting list are likely to be incapable of affording such a sky-high price for a kidney, especially when those on the waiting list are likely incapable of working and earning a wage to pay for a kidney. This means that an organ market in the UK would likely be unfeasible using direct transactions, as kidneys, which make up the majority of the organs on the transplant waiting list, would not bring in nearly enough money to impact the UK's GDP.

Although a kidney market in the UK would have a limited impact on GDP, the same could not be said if it were to operate on an international stage. Despite many believing that the market should be limited to a particular geographical area, this would serve to obstruct any reasonable impact on GDP, as the size of the market is restricted.

However, if the UK were to expand the kidney market externally, with the NHS remaining the sole governing body, the earning potential could skyrocket, bolstering the positive impact on GDP.

The US acts as a prime example, as it has 92,000 patients currently waiting for kidneys, at the same base price of £100,000, then direct earnings would be valued at £9.2 billion. Considering that 'US Disposable Personal Income Per Capita is at a current level of 61,242' (Alfred, 2024). Patients in the USA would be much more capable of paying the required quantity due to them having more funds directly available, alongside assistance such as bank loans, hence less money would be required to fund their acquisition of a kidney.

Furthermore 'In 2022, just over 50 percent of Americans had an annual household income that was less than 75,000 U.S. dollars.' (Statista, 2022). This means that if $75,000 per annum was the tax bracket then just under 50% of American patients would be required to pay a sales tax, and as the majority of those earning under $75,000 would not be fully subsidised, there is great potential to earn money for the NHS, meaning that this external market would eventually provide earnings towards a UK organisation, even potentially allowing the

NHS to expand within the UK. This would mean that employment would increase, and due to a potential increase in money at hand salaries within the NHS could rise, which would otherwise be an arduous and laborious process as the NHS currently employs around 1.4 million people. (The King's Fund, 2023).

Moreover, if this same expansion was carried out by the NHS into multiple countries, the estimated revenue would skyrocket and the NHS would have ample money to spend, so increased salaries and employment opportunities would not only be commonplace in the NHS but would also be instrumental towards economic growth as more UK citizens having more disposable income would promote rapid growth of GDP as 'when real GDP is growing strongly, employment is likely to be increasing' and 'people have more money in their pockets.' (Callen, 2023).

On the other hand, the operational and logistical costs of functioning in the US, as well as the UK, would impact how much the NHS would earn from a kidney market, losses could even be made resulting in a harsh impact on GDP as the employment of 1.4 million people is placed in jeopardy as the NHS could go under due to excessive costs.

Moreover, there is no guarantee that the US or other foreign countries would allow a kidney market to operate on their soil regardless of the potential benefits it may bring to the well-being of their citizens, so while there is a chance that the NHS can earn money to bolster their structure and overall the UK's GDP, it may take a turn for the worse due to risk levels.

Generally speaking however, an expansion of a kidney market with a UK organisation as the governing body could greatly boost the UK's GDP, which is currently predicted to grow by 0.7% in 2024 (Clark, 2023), to much greater values, albeit at a much higher risk. Meanwhile, an internal kidney market solely within the UK would bring in much less earnings, but carry much less overall risk in the long term.

Nevertheless, as the introduction of a human organ market is a sensitive topic, the concept with the least estimated risk should be chosen to maximise initial acceptance, but this option, an organ market utilising direct transactions solely within the UK, appears to provide limited benefits towards GDP. However, it allows for increased organ availability towards patients on the waiting list in the UK. An alternative form of an organ market has been proposed, which similarly operates solely within the UK, but focuses less on direct financial incentives, and more on systematic benefits, such as a futures market for the right to human organs, proposed by Schwindt and Vining, it could potentially incorporate health insurance premium reduction plans, where 'health insurance companies would be natural purchasers of future rights to organs' (Hansmann, 1990).

A lower-risk alternative is a futures market for organ rights, where health insurance companies could purchase future rights.

This means that if customers were to die, with their organs remaining in suitable conditions for transplant, the particular company they were insured under would have priority in the matters pertaining to their organs. This would be due to their established expertise in actuarial calculations and risk management that would be involved in determining future rights to organs (Hansmann, 1990).

This format would not only provide a form of remuneration for organ donors but would also greatly increase participation in organ donation, as in hindsight a cheaper insurance plan would be obtained at the expense of ticking a box. This would act as a primary benefit towards the UK GDP, as due to saving on their health insurance, citizens would generally have more money available at hand, which is a clear sign of GDP growth. Moreover, insurance companies would act as intermediaries, reserving the right to sell the ownership of the organ to recipients in need of it (Hansmann, 1990). This would act as a secondary benefit towards GDP, as the corporation tax on the health insurance company would take these sales into account, allowing for greater tax funds towards the UK government, which can then be reinvested into the economy, promoting economic growth in the UK.

Furthermore, while one may be under the impression that due to the NHS, a nationwide public healthcare service, very few people utilise private healthcare in the UK, 22% of UK adults use private healthcare (Expatriate Group, 2023).

This system would incentivise organ donation by linking it to cheaper health insurance, increasing donor participation, and giving citizens more disposable income- a boost to GDP.

This means that the number of people for whom this method would apply is approximately 15 million people. Hence the potential value of the entirety of such a futures market is very high, so its relative impact on the UK's GDP is also likely to be great.

3 | Conclusion

In conclusion, the feasibility of a market for human organs, particularly the kidney, in the UK is quite low. The probability of it being capable of impacting the UK's GDP is even lower. The direct barrier to the implementation of one would be legal restrictions, as the World Health Organisation (WHO) has quite a strong stance on the matter, believing that it exploits the poor as transplant tourism solely benefits wealthy individuals. This belief is validated by previous forms of organ markets that involved the poor, such as Pakistan's kidney market, where kidney donors almost entirely consisted of poorer individuals laden with debt.

However, even if these legal restrictions were to be overcome, there would be significant hurdles to a legal organ market in the UK having a noteworthy impact on its GDP. Due to the occurrence of Coronavirus, the UK's GDP is under immense struggle, so there is valid reasoning for a legal organ market as it could provide vital aid through taxation, for example, to revitalise it. A particular hurdle to the creation of one however is the social implications of doing so, as the transfer of organs is viewed as a noble and altruistic act, to turn that into a commercial trade would likely not sit right with many.

Nevertheless, if an organ that allows the donor to live when transferred is the basis of the market, such as the kidney, then the rate of public acceptance will be greater than otherwise. This means that financial incentives could be used to increase organ availability, with public acceptance likely. These incentives could be offered while also generating savings for the NHS, due to less money spent on long-term dialysis and carers for recipients as the increase in organ availability reduces those on the waiting list. While adjustments could be made to attract richer citizens to donate their organs too, poorer citizens would likely make up the majority of donors,

however many programmes in the UK target the poor due to their pull factor being evident - money, so this system would prove little difference when compared with other programmes such as the monetary benefits awarded to UK soldiers to increase military participation. As for the specific system that it would operate under, many have been proposed, but one of the most viable ones would be one that operated with a central governing body, in the case of the UK the NHS would act as one. It proposed a sales tax on recipients within certain income brackets when they purchase organs from donors, with the sales tax varying based on income and used primarily to help fund the acquisition of organs from donors for poorer citizens who can't afford it in the form of a subsidy, with it also varying based on income.

However, this system was thwarted by its minimal projected earnings due to a lack of recipients, and while an international format was projected to maximise revenue from a kidney market, its successful implementation was deemed near impossible due to likely resistance from target countries of kidney donors.

Ultimately, the system with the lowest risk and greatest chance of impact on the UK's GDP is the futures market, where health insurance companies purchase future rights to organs, this is due to its relatively low risk as it is stationed within the UK, and its great potential for earnings, as since 22% of UK adults use private healthcare, there is a large target market of approximately 15 million people. The introduction of this new market would also provide benefits towards GDP as donors would receive payment for their sacrifice, allowing many UK citizens to have greater disposable income. This increase in wealth would occur frequently all over the UK due to the organ market, promoting GDP to increase due to the average level of wealth across the country. Therefore, while certain systems of organ trade may not be capable of impacting the UK's GDP significantly, others such as Hansmann's projected model would have a much greater probability of doing so along with much less risk, consequently, I think that legalising human organ trade in the UK could impact its GDP, but the level of impact would be dependent on the system utilised.

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THE FOURTH DIGITAL REVOLUTION: AI, AUTOMATION, AND MODERN ECONOMY TRANSFORMATION

Tracing Technological Progress from History to Today's Societal and Economic Impacts

Despite the modern perception of digitalisation, one which elicits a global economy where individuals are completely dependent on intelligence separate from humanity, destigmatising this concept is vital to comprehend how modes of employment would realistically be influenced. The outcomes of this project have been majorly dependent on the connections between the past, present and future, displaying the common patterns between previous revolutions, and how the fourth is currently playing out. This essay provides connections between, for example, how the first industrial revolution involved capital-labour substitutability to the fourth revolution, where computers were designed to replace repetitive and mundane tasks. Though this study does not fully encompass the complications of digitalisation, it provides a comprehensive understanding of the current global economy in comparison to the previous and the extent of similarities between them. I am to display an unbiased perspective on how digitalisation will shape this current economy, ranging from structural unemployment and income inequalities to new job creation and global nterconnection, and the continual behaviours that have been present surrounding this concept.

Artificial intelligence (AI) is the ability of a digital computer to perform tasks, mimicking the intellect of human beings, with an absence of human intervention. Generative AI can be defined as the creation of new data sets or information, given a third party input. Historical context of the previous industrial revolutions is vital in understanding the way they have shaped approaches to everyday life and have therefore stimulated further digital innovation. Without it, comprehension between the behaviour of individuals and how the digital revolution has manifested lacks substance, and a true assessment of what specific adjustments should be implemented to promote adequate welfare of both individuals and economies will only increase in difficulty. The outcomes of this essay have been majorly dependent on the connections between all spheres of society, particularly using assumed general perspectives of individuals and considering these implications to a higher degree. Though this study does not fully encompass the

complications of digitalisation.

Literary references to AI appear as early as the Hellenistic period, with the Talos of Crete offering one of the earliest examples of a robot, with its sole purpose being to circle the island of Crete three times a day to repel invaders (Shashkevich, 2019).

The robot exhibits actions of modern AI technology, particularly through the pursuit of repetitive tasks induced by a secondary source. Contradictions between the depiction of Talos as the Greek God of invention and the idea that its actions could be hindered through the simple mechanism of removing a bolt from its ankle depicts that the preconceived anxiety surrounding the overwhelming and powerful nature of AI is still under human control. Negative human perceptions of AI have therefore remained relatively consistent since the Hellenistic period. This supports the vitality of consideration of previous revolutions to conclude the effect of the current digital age. Hesiod's Theogony can also be inferred to allude to threats of generative AI, with the character Pandora who unleashes "eternal misery on mankind" for the discovery of fire. (Mayor, n.d.). Pandora appears as a "tragically curious young woman" where all the Gods contributed to her creation, implying that holistic individuals brought their own doom upon themselves. Her foolish and simple demeanour insinuated a level of trust and charm within Epimetheus, possibly exhibiting the need of individuals for short term satisfaction through the deceiving nature of relatively foreign concepts, disregarding the need for information of long- term implications. This is particularly since research surrounding the fourth (current) digital revolution is not completely representative of its future capability.

The first industrial revolution was a significant breakthrough in the efficiency of humankind, with the rapid substitutability between labour and capital in a high wage economy like the United Kingdom, where innovation rose in response to the goal of decreasing costs, increasing the level of capital intensity through the discovery of the steam engine and the use of coal as a cheap energy resource (Allen, 2011).

The first industrial revolution illustrates that technological leaps can boost efficiency but disrupt society, a pattern we see repeating today with AI.

This reallocation of input factors was therefore somewhat due to the stage of the business cycle of the economy at the time. The application of science to manufacturing was visible in the 19th century in the second industrial revolution, with Henry Ford enabling specialisation throughout the automobile production process. The third revolution initially foresaw the application of nuclear energy, transitioning into digitalised technologies such as computers as the fourth revolution became prevalent, through the process of deindustrialisation. This occurred due to the application of digitalised technologies within the workplace, increasing the inherent value of labour to more abstract roles, rather than routine tasks. Nevertheless, this could lead to a widening of the inequality gap between individuals, particularly as semi-skilled manufacturing workers were continually displaced, with their current homogenous skill set similarly not being applicable to any other sector of the economy. Bridging this gap in knowledge is essential for governmental organisations to undertake to smoothen the transition to this modern economy (Didier, 2024).

The replication of human intelligence has been continually attempted throughout history, though many economists argue it is essentially impossible due to the unpredictability of human nature and breadth of emotional intelligence. The

Turing test played a pivotal role in determining whether a machine could exhibit different types of behaviour indistinguishable from a human, such as engaging in conversations ranging from Shakespearian plays to martini making in a competition in Boston (Dewdney, 1992). A significant volume of early research like this was susceptible to several limitations, particularly since it could only perform tasks in reference to previously input information and did not necessarily exhibit 'quirky' human mannerisms. Mistakes in grammar were also evident, allowing judges to clearly distinguish between artificial and human intelligence. As the depth of knowledge of AI developed, deep learning algorithms became a common medium, allowing 'artificial neural networks of interconnected nodes to execute complex and abstract tasks', including generating language, led pattern recognition skills to become prompter and more advanced. Continued research led to the discovery of generative AI.

The Turing test was an early benchmark for AI, assessing whether machines could mimic human behaviour.

Notions of a completely digitalised economy are prevalent, though it is argued to simply coexist amongst the traditional economy. Automation can be defined as the removal of human labour and replacing it with machinery and it will, undoubtedly, it will begin to transform and permeate activities of everyday life (Miguelez et al, 2020). Asynchrony between the demand and supply for labour is argued to increase, particularly as the speed at which labour is reproduced is slower than the changes to the production of goods and services, demonstrating a low level of economic growth within the short run as the volume of labourers is too low to support the intensity of production, especially given the rapid growth of globalisation. The labouring class is hindered due to an increased career length due to longer life expectancies, limiting the level of vacancies available. Changes in the production process should therefore be imminent and would include the substitution of labour with capital or a decrease in wages, though this possesses the risk of diminishing marginal returns as a surplus rise. This substitution to capital, which in this case can be classed as AI, could results in more than 40% of jobs disappearing. Nevertheless, Xu et al (2018) state that technologies across different realms from digital to biological will combine to build upon and improve existing industries, creating a new plethora of opportunities.

This includes the reduction of barriers between inventors and market entry through cheaper technologies. Xu et al. provide the example of 3D printing for prototyping, allowing for the creation of smaller start-ups, increasing market saturation.

The growth of digital technology in addition to the shift in focus from the primary to tertiary sector, such as technology and finance, has provided an incentive for innovation, particularly with the creation of new markets. Workers frequently switching jobs can lead to formation of new companies, (Osborne, 2015) and therefore industries. The consequences are mostly evident in America, where the continuous renewal of prominent clusters such as Silicon Valley, a global centre in Northern California and a hub for high technology and innovation, is a result of this concept. Different cities across the country can be examined to illustrate the divergence experienced, from the growth in the tertiary structure in some to evident socioeconomic decline, demonstrating

that the benefits of this shift in occupational structure are not necessarily felt by all subunits of the population, especially those who were previously at a disadvantage.

The extent to which digitalisation will affect individuals and therefore modes of employment is not necessarily exaggerated, promoting an interconnectedness of society, creations of new markets and encouraging further R&D through innovation. Nevertheless, its negative complications could be taken out of proportion to provide a representation of an economy which is completely dependent on technology, though this would limit the functionality and contribution of individuals towards real national output, so must not necessarily hold true. As the main objective of a high proportion of economies is high labour productivity, it can be inferred that this demonstrates a society where profit maximisation is inherently centralised. This fails to encompass welfare, which is arguably primarily vital to promote a sustainable mode of production long term. I believe that this will inevitably lead to the questioning of the extent to which individuals rely on digitalisation rather than utilising their own intelligence. Economies should prioritise implementing new technologies at a level which enhances and assists user experience, rather than only for entertainment purposes. By creating this balance, though assumed to not be perfectly achievable, it ensures that productive efficiency increases beyond the current level of full employment of resources.

Digitalisation creates new markets, fosters innovation, and connects society- but its benefits are uneven, often bypassing disadvantaged groups.

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