The current issue and full text archive of this journal is available on Emerald Insight at:
https://www.emerald.com/insight/1859-0020.htm

Basic income in Australia: an exploration

Son Nghiem
Australian National University, Canberra, Australia, and
Xuan-Binh (Benjamin) Vu
Griffith University, Brisbane, Australia

Received 15 July 2022
Revised 25 August 2022
9 November 2022
Accepted 23 November 2022

Abstract

Purpose – Basic income (BI) is predicted to be the major economic intervention in response to raising income inequality and accelerating technological progress. Financing is often the first question that arises when discussing a BI. A thorough answer to this question will determine the sustainability of any BI program. However, BI experiments implemented worldwide have not answered this question. This paper explores two options for a BI program in Australia: (1) BI and (2) top-up basic income (TBI).

Design/methodology/approach – The authors employ "back-of-the-envelope" calculations with the latest publicly available data on income distribution, the poverty line and the share of income tax in the government revenue to estimate the costs of implementing BI in Australia.

Findings – Even without any change in the current tax regulations, the TBI option, which requires a contribution of 2–3% disposable income from net contributors, will guarantee that no Australian family lives under the current national poverty line. The BI for all options is not financially feasible under the current tax and transfer regulations because it requires an additional tax rate of at least 42% of disposable income from net contributors.

Practical implications – The results of this study can serve as inputs for the design and implementation of BI options in Australia and similar countries.

Originality/value – This is the first paper that examines the macroeconomic effects of BI options in Australia.

Keywords Basic income, Effective marginal tax rate, Clawback, Macroeconomic effects

Paper type Research paper

1. Introduction

The rationale for a basic income (BI) is due to the rapid technological progress, especially the development of robotics and artificial intelligence, which may lead to a large-scale replacement of workers (Straubhaar, 2017). Many jobs currently undertaken by people may be taken over by robots (Hoynes and Rothstein, 2019). Brynjolfsson and McAfee (2014) also argued that human work in the "second age of the machine" would be taken over by robots with artificial intelligence. In addition, the current tax systems relying on labor income might be under pressure as robots neither are taxed nor contribute to social security systems. Furthermore, technological change may further increase inequality and polarization between capital owners and workers, especially lower-skilled workers (Straubhaar, 2017). Therefore, policymakers and the general public are paying attention to the future of employment, the feasibility of social welfare and stable social security systems (Straubhaar, 2017).

BI is the provision of income to all adult individuals without any tests, including means-tested [1] or conditional, to meet their basic needs (Francese and Prady, 2018; Arthur, 2016;

JEL Classification — E64, H53

© Son Nghiem and Xuan-Binh (Benjamin) Vu. Published in the *Journal of Economics and Development*. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) license. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this license may be seen at http://creativecommons.org/licences/by/4.0/legalcode

Journal of Economics and Development
Vol. 25 No. 4, 2023
pp. 365-376
Emerald Publishing Limited
e-ISSN: 2632-5330
p-ISSN: 1859-0020
DOI 10.1108/JED-07-2022-0119

Colombino, 2019; Ghatak and Maniquet, 2019a). It is generally accepted that BI is universal, adequate and unconditional. The provision of BI will require a significant source of revenue and affect an economy substantially in many aspects (Colombino, 2019).

BI has been experimented in Finland, the Netherlands and the Canadian province of Ontario (Ghatak and Maniquet, 2019a). According to Hale (2019), the Greens party of Australia initiated the first ever universal BI experiment with a $55 m package funded by the New South Wales (NSW) government and undertaken on the NSW South Coast. This experiment aims to reduce inequality, provide economic security and share Australia's wealth fairly.

Debates have revolved around the potential effects of BI across European countries, the United States of America (USA), Canada and Australia (Colombino, 2019; Arthur, 2016; Hale, 2019; Hoynes and Rothstein, 2019; Ghatak and Maniquet, 2019a). Colombino (2019) suggested that BI can be an efficient approach to redistributing the benefits from automation and globalization and does not create "welfare traps" or "poverty traps." BI is simple and transparent, with low administrative costs (Francese and Prady, 2018; Colombino, 2019). In addition, BI may have positive impacts on labor supply, responsibility and human capital investment (Francese and Prady, 2018; Colombino, 2019). BI can reach the poor more effectively than means-tested programs (Francese and Prady, 2018). Nikiforos *et al.* (2017) indicated that BI could be a tax-financed or debt-financed program. If BI is financed by increasing taxes on households, Levy's Keynesian model forecasts no impact on the economy. This is because BI provides households with cash assistance which is taken away from high-income households (i.e. households pay higher taxes due to BI policy). When distributional effects are included in the model, the economy grows. This is because households paying more in taxes than receiving in cash assistance have a low propensity to consume, while households receiving more in cash assistance than paying in taxes have a high propensity to consume. Therefore, even if the BI is tax-financed rather than debt-financed, output, employment, prices and wages will increase (Nikiforos *et al.*, 2017). In contrast, Francese and Prady (2018) and Colombino (2019) indicated some shortcomings of BI. For example, the BI may result in higher taxes or lower government expenditures in other sectors such as health, education and investment with efficiency and equality losses or high fiscal costs; decreased effort, motivation and autonomy and benefit to the "undeserving." However, such effects have rarely been estimated in our region. Despite some shortcomings, Yamamori (2016) argued that a BI can be a solution to cover the minimum subsistence level. Further, Straubhaar (2017) suggested that the BI is necessary to change the social system. The minimum subsistence level should be guaranteed to everybody, and people with no income receive net transfers. He argued that the BI is economically efficient, socially fair and financially viable. The BI offers the best social-political prerequisite for "prosperity for all" in the 21st century.

This paper makes two contributions to the existing literature. First, to our knowledge, this is one of the first examinations of possible BI options fully tax-funded and applied across Australia. Second, we estimate the BI's effects on key macroeconomic indicators, including labor supply, capital, investment and wages.

2. Literature review

The idea of a BI was first introduced by Rhys-Williams (1943). Due to the unfair distribution of wealth and the need to address chronic unemployment issues, she proposed a social security subsidy that could cover the minimum basic needs of all citizens. Friedman (1962, 1968) then developed the concept of a negative income tax as a coupling of income tax and social transfers. Tobin (1966) developed the "case for an income guarantee" based on the negative income tax concept. He suggested both structural and distributive strategies. This is because the former helps build up the capacities of the poorest fifth of the population to earn decent incomes, while the latter helps assure every family a decent standard of living

regardless of its earning capacity. Brown (1995) further developed the concept of a BI, which provided a social minimum for economic activity, and founded the European Basic Income Earth Network in 1986.

Colombino (2019) recommended that BI might be a viable alternative or complementary to selective and conditional social assistance policies. BI redistributes the gains from automation and globalization by building an efficient and transparent buffer against global volatility and systemic risks, generating positive incentives and avoiding recurrent risks of falling into poverty. Colombino (2019) pointed out that the experiments' findings show that many BI recipients use the BI transfers to redesign their careers and occupational choices. They use unconditional cash transfers to cover their training in new skills and related costs of changing jobs (Standing, 2011). The administrative cost of a non-means-tested transfer is approximately 1–2% of the total costs of BI in the USA, whereas means-testing boosts the administrative cost to four or five times that amount (Colombino, 2019). In addition, in 2010, the rate of overpayment because of fraud and error in the United Kingdom was at about 1% for non-means-tested benefits and 4% for means-tested ones. Colombino (2019) indicated that the BI experiments with non-means-tested transfers in developing countries show positive results on labor supply and human capital investments such as education, occupation and health.

The literature on the macroeconomic effects of BI is scant, with only a few studies included in the review. Ghatak and Maniquet (2019a), Banerjee *et al.* (2019) and Hoynes and Rothstein (2019) argued that BI may be likely to decrease labor supply in developed countries, at least in the short run, while no evidence of cash transfer programs in developing countries negatively affects labor supply. Ghatak and Maniquet (2019a) indicated that BI might be more appropriate in developing countries to help the poor, but it is not a long-term solution to poverty alleviation. In the USA, Nikiforos *et al.* (2017) proposed three packages of unconditional income transfers: $US500 or $US1,000 per adult per month and $US250 per child under 16 per month; however, there is no evidence showing that the amount of transfers is enough to cover basic needs. Luduvice (2021) applied an overlapping generation model to the US economy and found a moderate impact of BI on labor supply. However, the impact on the consumption tax rate was substantial, with a proposed BI of $1,000. Steenkamp *et al.* (2022) applied a general equilibrium model to the South African economy and found that BI was associated with increased tax and crowding-out effects on consumption and investment.

Although there have been discussions on BI across countries, the analyses of possible BI options and their impacts in Australia are scant. This current study will fill the gap in the literature by proposing BI options and exploring its potential macroeconomic impacts.

3. Methods

The cost of implementing BI in Australia is estimated using "back-of-the-envelope" calculations with the latest publicly available data on income distribution, the poverty line and the share of income tax in government revenue. Although Australia is a wealthy country, 3.2 m people, or 13.6% of its population, live below the national poverty line (Davidson *et al.*, 2020). Our estimates reveal that this level of BI can be funded by additional tax revenue from the top 10% high-income group of the population and benefit the remaining group (90% of the population). An alternative approach is to provide BI as the additional income to the 13% lowest income group of the population using tax revenue evenly applied to the remaining population at the rate of 1% per dollar of equivalised weekly income above $474.

Initial results reveal that the proposed BI program creates a sharp decline in the labor supply. A top-up BI (TBI) positively affects consumption, investment and capital in the short and long term. Labor supply declines and does not return to the base level 10 years after launching the program. More positive, long-term effects are achievable if other sectors' productivity growth rate and tax share increase.

3.1 Assumptions

The estimation of the costs and effects of the BI program in this paper is conducted using the following assumptions.

By definition, a BI should be enough to cover basic necessities. It is assumed that income at the Australian poverty line of $474 [2] equivalised disposable income per week (Melbourne Institute, 2019). For an Australian representative family of two adults and two children under the age of 16 years, which have a total equivalised weight of 2.7 (1 for the first adult, 0.7 for the subsequent adult and 0.5 for each dependent child), this income is $1,280 per week.

(1) The Australian population structure is represented by a family of two adults and two children. This assumption is conservative with the current Australian population structure, with a quarter of the population being children and young people under 19 years of age (ABS, 2022).

(2) The BI is assumed to be funded by a tax increase at the current share of income tax and other sources of government revenue. This assumption is conservative as technological progress is expected to accelerate in the future; tax regulation may change to increase the share of capital and decrease the share of labor in the tax revenue (Straubhaar, 2017).

(3) The BI level and funding options are estimated at an aggregate level using data from the Australian Bureau of Statistics on income distribution in 2019. The midpoint in each income bracket is selected to represent their income level. The only exception is the last group which has a weekly income of $2,000 and above. It is assumed arbitrarily that the average disposable income of this most affluent group is $2,500 per week. The share of the population in each income group is used to estimate the weighted average income for the whole population.

(4) The economy will be able to generate more goods and services as demand increases. This assumption is based on the reasoning that technological progress will continue and affect increases in goods and services produced with the same or fewer requirements on labor and materials. The belief in rapid technological progress in the future is also the main reason for the increased discussion on BI.

(5) The BI will not replace the existing welfare programs. Although this assumption will make the cost of funding a BI larger, it achieves the underlying objectives of protecting vulnerable people alongside a BI. Some segments of the population (e.g. people with disability and single-parent households) may receive a level of welfare support higher than the poverty line income. Thus, by replacing the existing welfare support with a poverty line, the BI will make them worse. When existing welfare benefits are maintained, the BI also encourages the potential long-term unemployed to get jobs without reducing their allowance.

(6) The BI is assumed to be funded by a budget-neutral tax policy, aiming to maintain an effect free on government budget balance in the short run. This assumption is selected to test the economy-wide impacts of the proposed scheme. While a budget-deficit or borrowed funding approach can be used to fund a BI program, these options are difficult to maintain on a long-term basis. Also, the estimated effects of deficit-funding BI are not apparent. Nikiforos *et al.* (2017) found positive short-term effects, while Paulson (2018) predicted an opposite long-term outcome for the same BI program.

(7) The current welfare administrative budget is sufficient to manage a BI scheme. We assumed this because most BI activities electronically redistribute income in the current welfare system.

(8) Lower-income households have a higher marginal propensity to consume (MPC); hence, BI will lead to more demand for goods and services, leading to the growth of outputs (i.e. goods and services). Although we do not explicitly model the household sector with different income brackets like Nikiforos *et al.* (2017), our analysis considers the differences in the MPC values for different income groups based on the MPC values of Nikiforos *et al.* (2017). For example, the MPC is 0.3 for the highest income group and 0.9 for the lowest income group.

(9) Multifactor-productivity growth will be maintained at the 2016–2017 rate of 0.6% per year (ABS, 2018a). One of the main reasons for increasing BI discussion is that the global financial crisis caused a recession, job losses, unemployment and a slowdown in income growth in many developed countries (Arthur, 2016). The second main reason is that the rapid development of new digital technologies may permanently reduce the demand for labor, including both low-skilled workers and high-skilled fellows (Arthur, 2016). Thus, the assumption that productivity growth remains at the same rate as the current period is modest.

3.2 Financing a basic income program

The cost of a BI program depends on the level of benefits it provides. A high-benefit BI will be too costly, while a low-benefit BI may not be enough to provide essential support for its recipients. We choose the level of support at the current poverty line, which is assumed to be enough to cover the costs of basic needs. The average income at the poverty line considered in Australia in the June Quarter of 2019 was $995.14 per week for a representative family of two adults and two children (Melbourne Institute, 2019). According to the Organisation for Economic Co-operation and Development equivalence scale, the full scale of 1 is given to the first adult, a half scale of 0.5 for an additional adult and a fractional scale of 0.3 for each child under 16 years of age. Thus, the equivalised scale for a representative family of two adults and two children is 2.1, and an equivalised disposable income at the current Australian poverty line is approximately $474 per week (i.e. $995.14/2.1).

In the budget period 2017–2018, Australia's total income tax revenue was $312.5 bn, accounting for 59.1% of the total tax revenue of $528.6 bn (ABS, 2019). Although the total Australian government revenue in 2019–2020 was $669 bn, we focus on tax revenue as the source of finance for BI because other sources of government revenue, such as sales of goods and services or investment dividends, are less stable. Assuming the same share of tax sources will be maintained, income tax raises $280 (i.e. $474 × 59.1%) of equivalised income per week. We propose two options to implement a BI at the current Australian poverty line income level. The first option provides unconditional BI at the poverty line level to every citizen, while the second option only provides top-up income for those below the poverty line.

3.3 Estimating macroeconomic effects

The effects of BI on the Australian economy were estimated based on a dynamic stochastic general equilibrium by Smets and Wouters (2003) using parameters collected from the Australian Bureau of Statistics and the recent Australian model by Rees *et al.* (2016). The estimation was conducted in *gEcon* package, which provides comprehensive and convenient tools to construct macroeconomic models (Klima *et al.*, 2015) of the R programming language (R Core Team, 2020).

The model depicts the economy through interactions between three representative agents: the household, the firm and the government. The household aims to maximize the expected lifetime utility with a time-discounted rate of β. The instantaneous utility in each period is obtained from consumption (C) and labor/leisure (L), and the balance is subject to a budget

constraint with wage income and rental return from capital. The household balances the wealth between holding cash for consumption and government bond for capital investment. The firm hires labor and capital from households through the bond market to produce goods and services (Y) to service the household and the government. The government collects taxes (T) from the household and the firm to provide public services and cash transfers, like the BI. The economy is in equilibrium when the supply of goods and services meets the demand for goods and services from the household by the firm. Effects of supply shocks (productivity and labor supply) and demand shocks (changes in consumer preferences, business investment costs and government spending) on the economy are modeled using structural equations. In this paper, the effects of BI are modeled by changes in government spending (i.e. BI increases cash transfer to the household from the government) and consumption of the household. We assume that multi-factor productivity growth is maintained at the 2016–2017 level of 0.6% per year, which is a conservative rate because the long-term trend for multi-factor productivity in the past 30 years was 1% per year (Parliament of the Commonwealth of Australia, 2010). We also use calibrated parameters from Table 1 of a multi-sector model by Rees *et al.* (2016), such as the discount factor β 0.9996, capital depreciation rate of 0.0175 and labor elasticity (with respect to wage) of 1.

4. Results and discussions

4.1 Financing effects

4.1.1 Option 1: Basic income. BI is provided at $474 equivalised disposable income per week. Using the current share of income tax (59.1%) and the weighted average of equivalised weekly disposable income of $995.14, the gross contribution is required from every citizen, resulting in a flat (gross) tax rate of 28.1% of disposable income (i.e. $280/$995.14). After adjusting for clawbacks (i.e. a $474 transfer from the government to every citizen), the net contributors are only the two wealthiest income brackets: those earning $1,700 per week and above (see Table 1). The effective marginal tax rate (EMTR) is 5% for disposable income from $1,700 to $1,999. For those earning $2,000 and above, the EMTR is 27%. The wealthiest group also pays only 5% of the income, from $1,700 to $1,999. No BI tax is required for a weekly disposable income lower than $1,700. The weighted average of BI-adjusted income is $1,214, which is considerably higher than the original $1,020. The average income increases after redistribution because other sources of government revenue contribute 42.4% of the fund required for the BI.

In the unlikely scenario that income tax is the only source of funding for a BI, the gross tax rate is 47.6% (i.e. $474/995.12) (detailed calculations of this unlikely scenario are not presented for brevity). Net contributors will start from those earning a weekly equivalised income of $1,000. The EMTR is 42.7% for the equivalised income bracket $1,000–$1,049 per week and 47.3% for any weekly disposable income from $1,050 and above. Contributing almost half of the income if earning just over $1,000 per week after fulfilling all existing tax obligations is a challenging policy option. It may create a disincentive to work for the middle-class and high-income earners. However, as argued previously, we will not consider this scenario because technological acceleration leads to the increased discussion of BI, which will lead to changing tax regulations toward higher contribution from capital income accordingly.

4.1.2 Option 2. Top-up basic income. This option identifies up front a guaranteed, tax-free income threshold of $474 per week. Under the assumption that the current income tax share of 59.1% in total tax revenue is maintained, an average of $10 per week is required to finance what we call a TBI. The TBI will provide additional income to those earning a disposable income, including income from current welfare programs, below the current poverty line level. A flat tax rate of 1.9% (i.e. $10/$532) to the fraction of equivalised weekly disposable income above $474 per week is sufficient to finance the TBI (see Table 1). In the unlikely

Weekly disposable income	Population ('000)	Average income	BI tax	BI Adjusted income	EMTR (%)	Income >$474	TBI TBI tax	Adjusted income
No income	60.7	0	$0	$474	0	$0	$0	$474
$1–49	126.9	25	$7	$492	0	$0	$0	$474
$50–99	61.8	75	$21	$528	0	$0	$0	$474
$100–149	110.8	125	$34	$565	0	$0	$0	$474
$150–199	117.3	175	$48	$601	0	$0	$0	$474
$200–249	149.5	225	$62	$637	0	$0	$0	$474
$250–299	321.3	275	$76	$673	0	$0	$0	$474
$300–349	335.7	325	$89	$710	0	$0	$0	$474
$350–399	483.6	375	$103	$746	0	$0	$0	$474
$400–449	766.6	425	$117	$782	0	$0	$0	$474
$450–499	1221.2	475	$130	$819	0	$1	$0	$475
$500–549	1077.8	525	$144	$855	0	$51	$1	$524
$550–599	1048.3	575	$158	$891	0	$101	$2	$573
$600–649	997.8	625	$172	$927	0	$151	$3	$622
$650–699	1117.6	675	$185	$964	0	$201	$4	$671
$700–749	1045.6	725	$199	$1,000	0	$251	$5	$720
$750–799	1059.2	775	$213	$1,036	0	$301	$6	$769
$800–849	960.6	825	$227	$1,072	0	$351	$6	$819
$850–899	989.9	875	$240	$1,109	0	$401	$7	$868
$900–949	932.2	925	$254	$1,145	0	$451	$8	$917
$950–999	822.0	975	$268	$1,181	0	$501	$9	$966
$1,000–1,049	867.1	1,025	$282	$1,217	0	$551	$10	$1,015
$1,050–1,099	702.4	1,075	$295	$1,254	0	$601	$11	$1,064
$1,100–1,199	1521.5	1,150	$316	$1,308	0	$676	$12	$1,138
$1,200–1,299	1288.1	1,250	$343	$1,381	0	$776	$14	$1,236
$1,300–1,499	1819.1	1,400	$385	$1,489	0	$926	$17	$1,383
$1,500–1,699	1309.1	1,600	$440	$1,634	0	$1,126	$21	$1,579
$1,700–1,999	1144.6	1,800	$494	$1,780	5	$1,326	$24	$1,776
$2,000 or more	1608.1	2,500	$687	$2,287	27	$2,026	$37	$2,463
Pop-Wgt Avg		$1,020	$280	$1,214	2*	$563	$10	$1,027

Note(s): *Negative tax rates of low-income earners are set to zero for the convenience of applying a progressive EMTR (i.e. rich people do not receive any negative tax rate for the income below the contribution threshold) and to avoid the awkward tax rate (negative infinity) for those having zero income (the first row of Table 1)

Table 1. Equivalised disposable weekly income and BI

scenario that income tax will be wholly responsible for the TBI, a flat tax of 3.3% (i.e. 1.9%/0.576) is required for every dollar of equivalised disposable income above $474 per week.

Implementing BI or TBI will lift approximately three million people (or 13% of the Australian population) with a weekly equivalised disposable income of less than $450 (the first ten rows of Table 1) out of poverty. In the case of the BI, the income redistribution is larger, resulting in improved living standards (proxied by income) for 90% of the population. The order of income brackets did not change after redistribution by BI (see original and BI-adjusted income columns in Table 1). The TBI also maintains the order of income brackets after redistribution except for the poorest 10 income brackets (those earning a disposable income less than $450 per adult equivalent per week), which have the same income at the poverty line level after redistribution. We believe that BI/TBI recipients, especially the TBI that targets people living below the poverty line, will spend most of their adjusted income on necessities. Thus, the BI/TBI will have expansionary effects (i.e. increased demand for goods and services) on the Australian economy. Since the BI injects more money into 90% of the population, we expect its expansionary effects to be larger than those of the TBI. However,

the BI requires a much more significant increase in tax and government transfer; it may create unexpected consequences for the economy.

4.2 Macroeconomic effects

Implementing a BI will increase tax and government spending on transfers by the same amount (budget neutral). We expect an overall increase in household consumption because net recipients (the poor) will spend a higher fraction of their income (i.e. higher propensity to consume) than net contributors (the rich). Labor supply, especially among net recipients of BI, may increase because their benefits will not be phased out until they reach the top 10% of the income brackets when they become net contributors. However, if increasing automation becomes a reality, implementing a BI may not lead to increased labor supply, at least in the traditional way of labor supply (Hahn, 2015). For example, voluntary, domestic or hobby work may increase, while demand for wage-earning workers may decline due to automation.

Although most of the funds for a BI program are redistribution, the government still needs to collect tax at the level of $474 per adult equivalent per week for BI and $17 for the TBI (i.e. the average TBI tax of $10 is shared by 57.6% of income tax. Thus, the total fund needed for the TBI is $10/0.576 = $17). In 2016–2017, the tax revenue as a proportion of the gross domestic product was 27.8% (ABS, 2018b). Thus, the average gross weekly income is $980/(1–0.278) = $1,357 per adult equivalent. The BI tax rate to gross income is 34.9% (i.e. $474/$1,357), and the TBI tax rate is 1.3% (i.e. $17/$1,357). Thus, the amount of tax must increase by 125% from the 2016–2017 level if a BI is implemented (i.e. 34.9/27.8). If TBI is implemented, the tax increase is only 4.6% (i.e. 1.3/27.8). The 125% tax increase to cover a BI at the level of $474 per adult equivalent per week in this paper is similar to the 120% tax increase to fund a BI at the level of $US 1000 per adult per month by Nikiforos *et al.* (2017) for the USA.

Because the BI results in such a significant tax level increase, we propose implementing it in five years. Thus, the BI will be rolled out with an incremental tax increase of one-fifth of the required amount (125%). The increment of one-fifth of the required BI tax does not mean we recommend providing BI at a lower level in the first four years. Instead, we recommend gradually rolling out full BI incrementally for a randomly selected 20% of the population. One advantage of the incremental implementation is that the percentage of tax increase in the following years may be less than planned due to the multiplier effects of BI spending in the previous year. The multiplier effect is the cumulative effect that the expenditure of a person will become the income of the next person. For example, if a person earns one dollar and spends 50 cents (i.e. assume that the MPC is 0.5), this 50 cents will become the income of providers of goods and services, who will, in turn, spend 25 cents to buy goods and services. The cumulative effect is calculated as 1/(1–0.5) = 200%. For convenience, we assume that the multiplier effects of BI fade out in five years but spread evenly through the years.

The multiplier effect of a BI program will depend on the marginal propensity to consume its beneficiaries. Based on the distribution of MPC among income deciles in the USA reported by Nikiforos *et al.* (2017), we assume the following:

(1) The beneficiaries of the proposed BI, consisting of 90% of the population, have an average MPC of 0.75, while net contributors, the 10% most affluent population, have an MPC of 0.35. Thus, the income redistribution under BI will create a 0.4 change in the MPC.

(2) The beneficiary of TBI, which consists of 13% of the poorest population, have an MPC of 0.9, while the net contributor has an MPC of 0.6. Thus, the income redistribution under TBI will create a 0.3 change in the MPC.

The difference in the MPC of net beneficiaries and net contributors will estimate the potential expansionary effects of 57.6% BI/TBI transfer. Effects of the remaining 42.4% transfer will be estimated using only the MPC of the net beneficiary, which is 0.8 for BI and 0.9 for TBI. The TBI requires only a 4.6% tax increase compared with the current period, and thus, there is no need for gradual implementation. The effects of BI/TBI on the economy will be evaluated five years after the program is fully rolled out.

The simulation results show that a BI significantly increases government transfer and shrinks the labor supply substantially. We acknowledge that the model only includes waged labor while BI may change the nature of work and increase nonwage labor (e.g. domestic duties, volunteer and hobby work). Most BI experiment programs (Ghatak and Maniquet, 2019a) show that the labor supply did not reduce, but none of the experiments included a tax increase to fund the BI. In our standard model, households' utility increases with consumption and decreases with work. A sharp rise in cash transfer like the proposed BI collapses the labor supply and makes the economy unstable. Thus, we will not pursue further analysis of the BI and will focus on discussing a more affordable alternative –the TBI.

The TBI only requires a 4.6% tax increase, and we propose full implementation within one year. The results show that consumption (C) and output (Y) grew rapidly in the first few years and slowed down after Year 5, where consumption increased by 7.2% and output increased by 7.4% (see Table 2). This positive result is substantially lower than that of Nikiforos *et al.* (2017) for the USA, which predicted 13% output growth after four years of completing the implementation of a BI of $1,000 per adult per month in the USA. Investment (I) follows a similar pattern but at a smaller scale. By the end of Year 5, investment had only grown at a rate of 2.8%. One possible factor leading to slow growth in investment is the reduction of savings from high-income earners, which have a lower MPC and hence a higher propensity to save. Capital (K) looks almost flat in Figure 1, but it grows at a minuscule rate to reach 0.16% by Year 5. The slow growth of capital and investment will gradually slow down output and hence consumption in the long run. The "biggest loser" is labor (L), which declines sharply after the first three years and gradually recovers, and by Year 10, it is only lower than in Year 1 by 0.96% (see Figure 1). The finding of labor supply reduction is in line with recent findings for the USA by Luduvice (2021) and Scotland by Connolly *et al.* (2022). The rising trend of labor, capital and slowing consumption and investment suggest that the economy is moving toward a higher equilibrium level.

To test the robustness of the results, we estimate Model 2, where multifactor productivity is assumed to grow at the average long-term rate of 1% per year (The Parliament of the Commonwealth of Australia, 2010). The higher growth of multi-factor productivity indeed creates even more positive effects but only in the long term (e.g. 10 years). Consumption and output increased by a respective rate of 6.2 and 7.3% by Year 10. Investment and capital improve slightly to 3.1 and 0.4% growth rates, respectively. However, higher productivity worsens labor outcomes, declining by 1.8% by Year 10.

	Consumption	Output	Capital	Labor	Investment
After five years					
Main model	7.23	7.41	0.15	−3.03	2.78
Productivity = 1%	7.23	7.41	0.15	−3.03	2.78
Change tax share	7.73	7.73	0.16	−3.75	2.97
After ten years					
Main model	5.45	6.66	0.37	−0.96	2.47
Productivity = 1%	6.20	7.33	0.40	−1.77	3.11
Change tax share	6.19	7.37	0.40	−1.04	2.64

Table 2. Summary effects of a TBI (%)

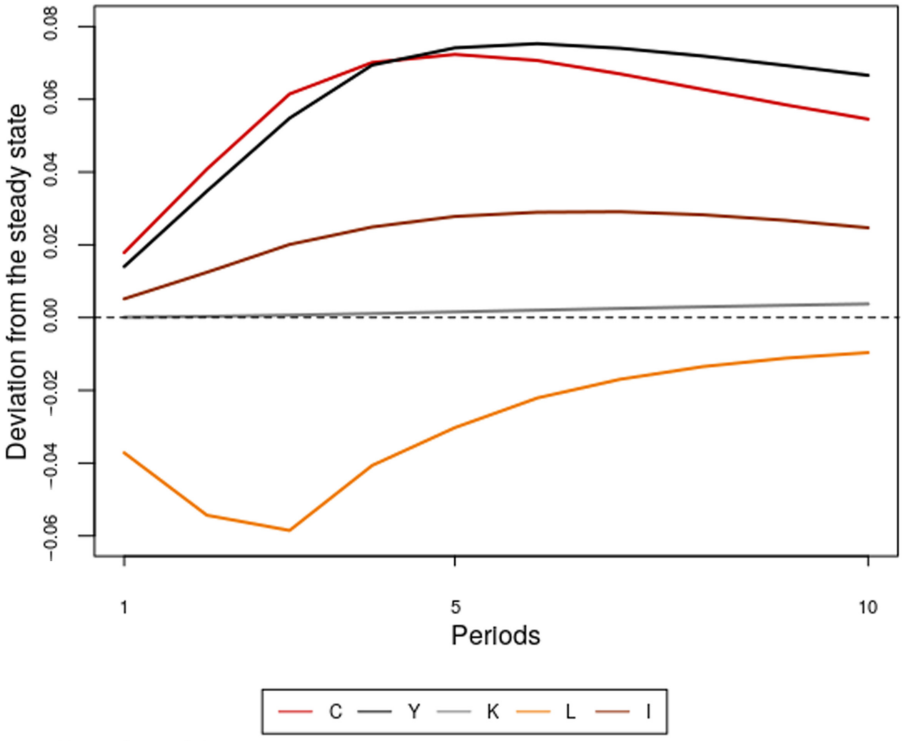

Figure 1.
Effects of a TBI overtime

Note(s): Main model

Changing the tax share toward the higher capital contribution is one way to cope with the expected increasing automation in the future. Thus, we also explore a scenario in that nonincome tax is wholly responsible for financing the TBI. This scenario is expected to create higher expansionary effects because it will result in higher overall consumption. Indeed, this scenario leads to an increase in consumption and output by the same growth rate of 7.7% in Year 5. Investment and capital also improve slightly, while labor supply worsens by 0.7% points compared with the main model.

5. Conclusions

This paper has explored options for BI and its potential effects on the Australian economy. A BI at the level of the current poverty line will require a contribution from the top two highest income earners at the rate of 5% for the equivalised disposable income of $1,700-$1,999 per week and 27% for the fraction income of $2,000 and above. This BI will improve living standards (proxied by income) for 90% of the population. A more affordable option is a basic top-up income, which provides additional support for 13% of the population living below the poverty line. This option requires contributions from the middle class and high-income earners at an average tax rate of about two cents for every dollar of equivalised disposable income above $474 per week.

With the assumption that people gain higher utility by more consumption or less work, the substantial increase in government transfer of BI creates a massive reduction in the labor supply to an unstable level only by the third year. A modification of the model to assume that labor supply will not reduce by BI transfer is the subject of future analysis. The main

limitation of our estimation is that nonwage labor supply, such as voluntary and domestic work, which could be popular with the rise of automation, is not accounted for.

An alternative form of BI, a top-up for low-income earners (TBI), creates expansionary effects. Key macroeconomic indicators, including consumption, output, capital and investment, increase compared with the base period. However, the labor supply declines slightly. In the optimistic scenario that multifactor productivity grows at 1% per year, the TBI's effects are higher in the long run, but the labor supply worsens. Long-term effects are also improved if other tax sources (e.g. capital) are wholly responsible for funding the TBI. Overall, the positive long-term effects of a modest BI are feasible if robots take our jobs and the tax burden.

Notes

1. Means-tested transfers are subject to a recipient's own income and wealth. Conditional transfers depend on conditions: actively looking for a job or sending children to school, or contingencies, for instance, lay-offs or disability. Categorical transfers are narrowed down to specific groups of population, for instance, age groups or occupational sectors.
2. For more details regarding how to calculate $474, see section "Financing a basic income program".

References

ABS (2018a), "5260.0.55.002 - estimates of industry multifactor productivity, 2016-17", available at: http://www.abs.gov.au/ausstats/abs@.nsf/mf/5260.0.55.002

ABS (2018b), "Taxation revenue, Australia, 2016-17", available at: http://www.abs.gov.au/ausstats/abs@.nsf/mf/5506.0

ABS (2019), "Taxation revenue, Australia, 2017-18", available at: https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/5506.0Main+Features12017-18?OpenDocument

ABS (2022), "National, state and territory population", available at: https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/latest-release

Arthur, D. (2016), *Basic Income: A Radical Idea Enters the Mainstream*, Department of Parliamentary Services, Parliament of Australia, Canberra.

Banerjee, A., Niehaus, P. and Suri, T. (2019), "Universal basic income in the developing world", *Annual Review of Economics*, Vol. 11, pp. 959-983.

Brown, D. (1995), "Arguing for basic income: ethical foundations for a radical reform", *Journal of Economic Issues*, Vol. 29, pp. 316-318.

Brynjolfsson, E. and McAfee, A. (2014), *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*, WW Norton & Company, New York.

Colombino, U. (2019), "Is unconditional basic income a viable alternative to other social welfare measures?", *IZA World of Labor*, Vol. 128, pp. 1-11.

Connolly, K., Eiser, D., Kumar, A., McGregor, P.G. and Roy, G. (2022), "Universal basic income as an instrument of regional development policy: a micro–macroeconomic analysis for Scotland", *Regional Studies*, Vol. 56 No. 6, pp. 1043-1055.

Davidson, P., Saunders, P., Bradbury, B. and Wong, M. (2020), "Poverty in Australia 2020-part 1: overview", Australian Council of Social Service, University of New South Wales, available at: https://apo.org.au/node/276246

Francese, M. and Prady, D. (2018), "What is universal basic income?", *Finance and Development*, available at: https://www.imf.org/external/pubs/ft/fandd/2018/12/pdf/what-is-universal-basic-income-basics.pdf

Friedman, M. (1962), *Capitalism and Freedom*, The University of Chicago Press, Chicago.

Friedman, M. (Ed.) (1968), "The case for the negative income tax: a view from the right", in Bunzel, J.H. (Ed.), *Issues of American Public Policy*, Prentice-Hall, Englewood Cliffs, NJ.

Ghatak, M. and Maniquet, F. (2019a), "Universal basic income: some theoretical aspects", *Annual Review of Economics*, Vol. 11, pp. 895-928.

Hahn, J. (2015), *Humans Need Not Apply: A Guide to Wealth and Work in the Age of Artificial Intelligence*, Reed Business Information, New York, NY.

Hale, S. (2019), "A trial of universal basic income securing a future for all of us", available at: https://greens.org.au/sites/default/files/2019-03/NSW%20policy%20initiative%20%E2%80%93%20UBI_0.pdf

Hoynes, H. and Rothstein, J. (2019), "Universal basic income in the United States and advanced countries", *Annual Review of Economics*, Vol. 11, pp. 929-958.

Klima, G., Podemski, K., Retkiewicz-Wijtiwiak, K. and Sowińska, A.E. (2015), "Smets-Wouters' 03 model revisited-an implementation in gEcon".

Luduvice, A.V.D. (2021), "The macroeconomic effects of universal basic income programs", Federal Reserve Bank of Cleveland Working Papers (WP 21-21), Federal Reserve Bank of Cleveland.

Melbourne_Institute (2019), "Poverty lines: Australia", available at: https://melbourneinstitute.unimelb.edu.au/__data/assets/pdf_file/0007/3207823/Poverty-Lines-Australia-June-2019-Final.pdf

Nikiforos, M., Steinbaum, M. and Zezza, G. (2017), *Modeling the Macroeconomic Effects of a Universal Basic Income*, Roosevelt Institute, New York.

Parliament_of_the_Commonwealth_of_Australia (2010), "Inquiry into raising the productivity growth rate in the Australian economy", available at: https://www.aph.gov.au/parliamentary_business/committees/house_of_representatives_committees?url=economics/productivity/report.htm

Paulson, M. (2018), *Options for universal basic income: dynamic modeling*, Penn Wharton Budget Model.

R Core Team (2020), *R: A Language and Environment for Statistical Computing*, R Foundation for Statistical Computing, Vienna.

Rees, D.M., Smith, P. and Hall, J. (2016), "A multi-sector model of the Australian economy", *Economic Record*, Vol. 92 No. 298, pp. 374-408.

Rhys-Williams, L.J. (1943), "Something to look forward to: a suggestion for a new social contract: Macdonald", in Cunliffe, J. and Erreygers, G. (Eds.), *The Origins of Universal Grants*, Palgrave Macmillan, London.

Smets, F. and Wouters, R. (2003), "An estimated dynamic stochastic general equilibrium model of the euro area", *Journal of the European Economic Association*, Vol. 1 No. 5, pp. 1123-1175.

Standing, G. (2011), "Responding to the crisis: economic stabilisation grants", *Policy and Politics*, Vol. 39 No. 1, pp. 9-25.

Steenkamp, D., Havemann, R. and Hollander, H. (2022), "The macroeconomics of establishing a basic income grant in South Africa", Economic Research South Africa Working Paper, Vol. 881, MPRA.

Straubhaar, T. (2017), "On the economics of a universal basic income", *Intereconomics*, Vol. 52 No. 2, pp. 74-80.

Tobin, J. (1966), "The case for an income guarantee", *The Public Interest*, Vol. 4, p. 31.

Yamamori, T. (2016), "Christopher Pissarides, a Nobel Laureate, argues for UBI at the World Economic Forum at Davos", *Basic Income News*.

Corresponding author
Xuan-Binh (Benjamin) Vu can be contacted at: b.vu@griffith.edu.au

For instructions on how to order reprints of this article, please visit our website:
www.emeraldgrouppublishing.com/licensing/reprints.htm
Or contact us for further details: **permissions@emeraldinsight.com**