Universal Basic Income as an instrument of regional development policy:

a micro-macro economic analysis for Scotland*

January 2021, revised June 2021

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Abstract

Regional development now encompasses inclusive growth so that welfare spending becomes a potentially important policy for regions with devolved powers. Universal Basic Income (UBI), an unconditional payment to all citizens, has been gaining traction, including internationally. We provide a system-wide analysis of a region-specific UBI for Scotland on the level and distribution of regional activity. Using both micro- and macro-economic models we find that, although UBI has a beneficial effect on equity among households, it may adversely impact the level of economic activity unless there is a social contract in place and/ or there is a substantial stimulus to productivity.

Keywords: Regional development; Inclusive growth; Universal Basic Income; Citizen's Basic Income; Computable General Equilibrium

JEL: R11, R28, D58, H24, J30

1. **Introduction: regional development and welfare spending**

There has long been a recognition that regional development is about more than simply GDP per capita (e.g. Pike et al, 2007, 2017). Poverty and inequality, general well-being and environmental quality are widely regarded as crucially important dimensions of regional development. In particular, there is general agreement that it is not simply the level of income that matters, but its distribution across regions and households

General acceptance of the broader conception of regional development is apparent in the widespread adoption of "inclusive" growth, with a focus on the distribution of economic activity as well as its level, as an objective of regional development. (See, for example, the EU, 2010; the Scottish Government, 2015, and the Welsh Assembly Government, 2017.) Lee (2019), RSA (2017), JRF (2016) provide reviews and the IGAU and SIPHER websites provide examples of continuing research activity.[1] There is wide acknowledgment that inclusive growth is not just about ensuring that the benefits of growth are shared more equally, but that greater equality may actually boost the regional economy and/or make it more resilient.

There is a recognition too that how precisely economic development is defined should reflect local judgements of what constitutes well-being (Pike et al, 2007); even if there is agreement on *what matters* to regions in general, *how much* each element matters is likely to vary among regions. Thus, regions may take quite different views on the importance of equity and any trade-off with efficiency.

This wider perspective implies that welfare spending should be regarded as a potentially important policy instrument with which to stimulate regional development. However, while regions may have different tastes for welfare spending, whether simply because of their judgement about the importance of equity and/or about its potential as an investment in human capital, they may have limited means to alter this depending on the degree of fiscal decentralization.[2] In fact, one of the key arguments in favour of fiscal decentralization is that it permits better matching of local preferences (e.g. Oates, 1972) and there has been a significant move in this direction in recent years. After a few years of retrenchment to the centre, regional economic development policy is arguably once again

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[1] See https://wwthew.mui.manchester.ac.uk/igau/ and https://sipher.ac.uk/.
[2] Danson (2020) refers to the greater communitarian tradition in Scotland as compared to England. However, Bell and Eiser (2015) found little evidence of significant differences in preferences.

becoming increasingly local. [3] And there is a drive to consider issues beyond 'traditional' regional development policies, to include wider social policy and welfare tools.

Early analyses of fiscal federalism emphasized the potential dangers of devolving elements of the tax and transfer system, given that likely responses by mobile factors seemed to imply a more severe trade-off between equity and efficiency (Oates, 1972). However, this is a view that has been moderated in later literature (Oates, 1997), and is often (at least implicitly) challenged by advocates of inclusive growth who see the potential for welfare spending to stimulate economic activity (for example, through enhanced productivity) (Lee, 2019; Delsen, 2020).

The notion of a Universal Basic Income (UBI) is, despite its radical nature, gaining increasing traction as a policy to impact poverty and inequality. (See e.g. the contributions in Delsen ed., 2020, on planned or actual field experiments in a range of countries.) A UBI is typically defined in terms of a payment made to all citizens in a region/ nation that is unconditional, permanent and substantial. While the idea of UBI is not new, interest in it has grown significantly over the last few years and been given further impetus by the coronavirus lockdowns. A recent survey of 12,000 people in the EU found that 71% supported the introduction of a UBI.[4] Support for the UBI naturally focuses on its impact on the distribution of income, but also emphasises a wide range of other benefits including reduced precarity and improved mental health (Emery et al., 2013), echoing the concerns of the recent regional development literature. Much of the UBI literature is couched in terms of national economies, however: it is clear that a UBI offers a potentially powerful instrument to assist in achieving the wider objectives of regional development policy; many field studies of UBI-type interventions have been implemented on a regional or local/ urban context, with a clear spatial focus (Standing, 2017) and there is a nascent literature concerned with its implementation at the regional level (Danson, 2020).

Scotland is at the forefront of possible UBI implementation at the regional level. It was the policy of the last Scottish Parliament to implement a pilot UBI scheme and in Scotland's 2021 election four of the five major parties (the exception being the Scottish Conservatives) supported further work being undertaken to explore the possibility of implementing a UBI. More generally, the devolution of a number of social security powers to the Scottish Parliament, ongoing debates about 'more powers' and recent initiatives such as legislating for

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[3] This links into the wider debates around devolution in the UK, including for England, Regional Mayors, City Deals, the Preston Model for community wealth building (https://www.preston.gov.uk/article/1334/Community-Wealth-Building) and the levelling up agenda.
[4] https://www.thetimes.co.uk/article/70-of-europeans-want-the-state-to-pay-a-basic-income-kbgdzz3bv
See also Delsen and Schilpzand (2020).

strict child poverty targets, has ushered in a vibrant debate in Scotland about inequality, inclusive growth and economic resilience.[5] Furthermore, the plan is for a UBI that does conform to the characteristics of the archetypal scheme and there appears to be significant support for trialling such a policy from the public and the Scottish Government.[6] The implementation of a UBI at scale would represent a major societal shift that would inevitably impact economic activity in the host region. The primary purpose of this paper is to provide a systematic analysis of these likely effects on regional development. While the specific numerical results to a degree reflect the characteristics of the Scottish economy, our approach and analysis have widespread applicability for regional economies more broadly, wherever substantial UBI interventions are under consideration. Since a UBI at scale has never been implemented, there is considerable uncertainty surrounding behavioural responses. Accordingly, the novel micro/macro approach that we develop does not attempt to predict specific impacts; rather we seek to identify and analyse the likely mechanisms and effects that can inform regional policymakers of a range of options and what they could do to facilitate inclusive growth.

Section 2 provides a brief review of the literature on UBI-type schemes. Section 3 is an ex ante analysis of the likely impact of a UBI on inclusive growth in a regional economy. Section 4 outlines our innovative modelling approach, which combines microsimulation to identify the immediate impacts of the with a regional macroeconomic model to identify and analyse the wider impact of a range of potential behavioural responses, thereby addressing major lacunae in the existing literature on inclusive growth.

Section 5 uses the microsimulation results to generate the UBI-induced disturbances to a macroeconomic model of a highly open, regional economy, namely Scotland. The analysis allows us to explore the nature of any trade-offs between equity - among both households and regions - and the level of activity, which are shown to depend, *inter alia*, on the financing of the UBI, the strength of the migration response and workers' attitudes to taxes and transfers. Section 6 discusses a number of additional questions relating to the policy debate around UBI in a regional context. Section 7 is a brief conclusion.

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[5] See https://basicincome.scot/wp-content/uploads/sites/75/2020/06/Draft-Final-CBI-Feasibility_Main-Report-June-2020.pdf. Also, the independent analysis reported here was commissioned by the Scottish Government.

[6] See https://www.heraldscotland.com/news/18471823.coronavirus---now-two-thirds-scots-support-universal-basic-income-poll-finds/ and Danson (2020).

2. **Brief overview of the UBI literature**

To date, much of the literature has focused on microeconomic case/ field study evidence with two key economic impacts of a UBI emphasised, namely changes to household incomes and labour supply. In fact, there exist a number of recent, extensive reviews of the literature, so this review can be brief. Gibson et al (2018), Standing (2019), Fraser of Allander (2020, Annex A) and Delsen (2020) review the evidence on the impact of previous UBI-type interventions. While these contributions provide details of a wide range of interventions, there are reasons to be cautious in assuming that the findings of this evidence base can be translated to the implementation of an archetypical UBI at a regional level.

The vast majority of the existing evidence base relates to UBI-type interventions that are small in scale, locally targeted, often temporary and are either non-universal or conditional or both. Many such interventions/events would typically not be expected to have significant system-wide effects at a regional level, and indeed involve no apparent costs to the recipient (often targeted) population. The literature and field study evidence suggest a wide range of potential benefits arising from the introduction of a UBI, including enhanced freedom and security and reduced poverty, inequality and precarity. Gibson et al (2018), for example, review the evidence on the impacts of the Alaska Permanent Dividend Fund and the Tribal Casino Dividends, as well as on similar unconditional cash transfer schemes in Iran, Indonesia and India, also find little evidence of adverse labour supply effects. The contributions in Delsen ed. (2020) also report on various UBI-related schemes in the US, Canada, Finland, Switzerland, Italy the Netherlands and France, which report some benefits and few costs. However, this literature often abstracts from the (typically adverse) effects of having to finance a UBI at least partially through higher taxes.[7] Yet these funding decisions will have significant impacts on inclusive growth too as we show in the next Section. In practice, responses to financing decisions are likely to prove critical where archetypal UBI schemes are concerned.

In the UK context, there have been a number of detailed microsimulation studies of the likely effects of a UBI implemented on (at least a partially) balanced budget basis. Martinelli (2017) explores a comprehensive range of options for the UK as a whole. Mackenzie et al. (2016) model the effects of proposals by the Scottish Green Party to provide a weekly basic income of £50 for children and £100 for adults. Painter et al (2019) also considers a Scottish-specific UBI, finding that, even for small transfers, large changes in tax rates are needed. The results of microsimulation analyses are invaluable in providing a detailed analysis of the immediate effects of the distributional impact of the UBI under

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[7] Such funding may not be required in some cases (e.g. Alaska), but this is far from typical.

various assumptions about financing, but typically do not allow for behavioural responses, nor the system-wide effects on the regional economy, to what are often substantial changes in tax rates and household incomes.

There are very few studies of the system-wide impacts of a UBI, and none that we are aware of that are regional in nature or are published in refereed journals. Thurlow's (2002) computable general equilibrium (CGE) analysis of a proposed UBI in South Africa focuses on the system-wide impacts of the financing of the UBI and finds that even the most favourable option implies a negative impact on GDP and employment. Two recent studies have provided an ex ante assessment of the likely effects of the introduction of a (hypothetical, substantial) UBI in the US. Nikiforos et al (2017) report that the UBI would have a substantial beneficial impact on GDP and employment, using a traditional Keynesian model with a passive supply side. The Penn Wharton Budget Model (PWBM, 2018) analysis of the same policy intervention, however, finds evidence of significant negative impacts on GDP and employment, given its very different model of the supply side.

Overall, the field study literature has limited applicability to today's debates on regional UBIs – including the Scottish example – and the literature on the system-wide impacts of a UBI is thin and contested. We clarify and extend this literature by: providing an ex ante analysis of a UBI implemented at scale within a regional economy; simulating the policy's impact on the fiscal balance, the level of economic activity and the distribution of income among households (and, at least implicitly, regions), using micro- and macro-simulation models to identify both impact effects and a range of potential behavioural responses not previously considered.

3. **The system-wide impact of a UBI given an imperfectly competitive regional labour market**

An externally funded UBI, in the context of a small, open regional economy in which external prices are exogenous, would increase demand across all household groups (though concentrated in low-income households), which would stimulate the domestic economy. With limited labour mobility this would be liable to push up wages and prices and induce a degree of crowding out of net exports, but a strong migration response could ultimately offset that and result in an even greater stimulus. Regardless, we would expect both an increase in equity among households and a stimulus to regional

economic activity – a "double dividend" for regional development - reflecting the absence of a trade-off between equity and efficiency.[8]

Matters become more complex in the more realistic case of an internally funded UBI, requiring some rise in taxation as well as some reduction in other benefits. In the case of a rise in income taxation we would still expect some stimulus to demand given a redistribution from higher to lower income households, it would be far smaller than in the externally funded case. However, In the conventional bargaining model (Layard et al, 2005) the increase in income tax would lead to an upward push on wages as workers seek to restore their real take home wage. This adverse supply impact could easily offset the beneficial demand effect, so that economic activity would actually fall. While one dimension of regional development – equity among households - would still be enhanced, economic activity would contract.

The scale of the adverse supply-side impact is critically dependent on workers' (and migrants') attitudes to the UBI and the associated rise in tax. So, if workers take account of their personal UBI payments in their wage bargaining behaviour the adverse supply effect would be reduced. It would be further reduced if workers also took their family's UBI payments fully into account. But since a UBI is paid irrespective of employment status, even that would still result in some upward pressure on wages. However, if workers valued all of the UBI payments and bargained over a "social wage" that effectively included valuation of improved equity, there would be no consequential upward push on wages since workers would feel as well off after the change as before (Emonts-Holly et al, 2019). Of course, there may be some doubt about the ability to negotiate a social contract of this nature given the implied willingness to accept a cut in the real take home wage. However, in such a case there would be no adverse supply effect at all; only the beneficial demand effect would remain, and so regional economic activity would expand.

A predominant demand effect is only assured under a social wage and in this case the UBI would improve both the level of economic activity and its distribution among households. The presence of a strong migration response – such as in Layard et al (2005) where flow migration ultimately ensures restoration of real wage and unemployment differentials between Scotland and RUK - typically increases the scale of any change in regional economic activity. Under conventional bargaining (and internal financing) outmigration in response to the fall in the real *post-tax* wage and rise in the unemployment rate continues until these rates are pushed back to their initial levels. The trade-off

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[8] The notion of a double dividend was first introduced by Pierce (1991) in the context of implementing a carbon tax that may simultaneously improve the environment and, through recycled tax revenues, stimulate the economy. In the context of simultaneously reducing income inequality and boosting economic activity see OECD (2012), chapter 5.

between equity and the level of activity is at its worst in this case. Under a social wage bargaining and migration effectively respond to the *pre-tax* real wage and it is this wage that is ultimately restored to its original level, and here the trade-off is mitigated or entirely offset.[9]

4. **Modelling approach**

To capture these effects and to assess their relative strength we first use a microsimulation model to identify the scale of the fiscal transfers that are required and their distribution across households within the region.[10] Second, we use this to shock our regional macroeconomic model to assess the impact of this policy initiative on the Scottish economy. Finally, we explore the impact of UBI-induced migration flows.

4.1 The microsimulation model and results

We analyse the impact of a regional Scottish UBI of £73.10 per week to each adult over 25, £57.90 per week to adults between 20-24, £163.00 to pensioners and £84.54 to under 20s, uprated in line with the Consumer Prices Index to 2023/24.[,11] This is intended to ensure that UBI payments to all individuals broadly match existing UK minimum benefit level payments. The changes are funded by a combination of reduced regional benefits and increased regional income tax rates[12,13].

We employed the Institute for Public Policy Research microsimulation model, maintained by Manchester Metropolitan University (Corlett, 2019) to assess the impact of a proposed UBI on income

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[9] There is a literature suggesting that benefits (typically focussed on unemployment benefits) increase union bargaining power and unemployment (e.g. Nickell, 1997). Others have argued that benefits improve the efficiency of search activity and ultimately reduce unemployment (e.g. Biegert, 2017). Overall, there currently seems to be little convincing evidence that benefits as a whole have a major impact on unemployment, although this may reflect the net outcome of these countervailing forces. Accordingly, we do not explore these impacts further here. (See Fraser of Allander, 2020, Annex E.)

[10] The microsimulation model also provides us with data that allows us to explore those bargaining specifications that require knowledge of the proportion of households with employees and with families.

[11] The proposed UBI scheme could not be implemented without the collaboration of the UK's HMRC and DWP. See the feasibility report:
https://basicincome.scot/wp-content/uploads/sites/75/2020/06/Draft-Final-CBI-Feasibility_Main-Report-June-2020.pdf. See also Danson (2020).

[12] The UBI was assumed to replace: all benefits with the exception of the elements of Universal Credit designed to help with childcare or housing costs or those that provide additional support for families containing disabled adults or children; all personal allowances.

[13] Income tax is the principal devolved tax of sufficient scale – for example, it currently raises around £13 billion as compared to around £2.5 billion from Council Tax. Even if other combinations of tax rises and expenditure cuts could be used they would not change the fundamental trade-off between the benefits of UBI payments and the costs associated with their financing (except under the conditions assumed by Modern Monetary Theory).[14] The model used the Family resource survey with an enhanced Scottish sample, averaged over three years (2015/16, 2016/17, 2017/18)

distribution and the fiscal balance.[14] Table 1 summarises the key results of the microsimulation for present purposes. Full details are provided in Fraser of Allander (2020) Section 2. However, it is worth noting that the implementation of the UBI necessitates an increase of eight percentage points on each of the five income bands in Scotland (resulting in a minimum marginal rate of 27% and a maximum rate of double that).[15]

Table 1 Income impacts by household (2019 basic prices).

Household Group	Total quintile income (£ million)	Average income	Average change per year	Change (percentage)
HG1	10,166	£9,967	£3,588	36.00%
HG2	14,438	£13,621	£2,860	21.00%
HG3	23,812	£22,465	£1,924	8.56%
HG4	34,129	£31,311	£156	0.50%
HG5	54,860	£54,317	-£5,304	-9.76%

Note: HG1 relates to the household group for the lowest income quintile.

These average changes in income per year per household are introduced in the AMOS UBI model through transfers from the Scottish Government to household groups. Overall fiscal balance is imposed though adjustments in income tax.

4.2 The regional macro-simulation model

Here we employ a multi-sectoral, regional general equilibrium macroeconomic model, which provides a detailed description of the economy that captures the key interlinkages between the private sector, households, government, international trade and the labour market. These models allow extensive simulation of the impact of policy changes. They are used widely by governments to assess the merits of alternative policy choices.

In this paper, we use a UBI version of the modelling framework AMOS, calibrated on an eighteen sector Social Accounting Matrix (SAM) for Scotland for 2013. (See Figus et al (2018) for a full model listing.) In addition to the 18 sectors/commodities, within the model there are three internal institutions -

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[14] The model used the Family resource survey with an enhanced Scottish sample, averaged over three years (2015/16, 2016/17, 2017/18)

[15] The estimated costs of around £27 billion are broadly consistent with Martinelli's (2017) estimate for the UK of £227 billion (with Scotland around 8.4% of the UK population).

households, firms and governments - and two external, the rest of the UK (RUK) and the rest of the world (ROW). External RUK and ROW prices are exogenous. Commodity markets are assumed to be competitive. Financial flows are not explicitly modelled and the interest rate is assumed to be exogenously determined at UK level.

This framework has been used in a wide variety of applications (e.g. Allan et al., 2014; Harrigan et al., 1991) and a variant is used by the Scottish Government for policy analysis.[16] The model allows for a degree of flexibility in the choice of model closures and parameters. The version used in this paper assumes myopic expectations. Fundamentally, the model assumes that producers minimise cost using a nested multilevel production function. The combination of intermediate inputs with RUK and ROW inputs is based on Armington (1969). Output is produced from a combination of composite intermediates and value added, where labour and capital combine in a constant elasticity of substitution (CES) function to produce value added, allowing for substitution between these factors in response to relative price changes.

There are four components of final demand in the model: household consumption, investment, government expenditure and exports. Household consumption is a linear function of real disposable income. Government expenditure is constant in the model, while exports are determined again based on an Armington function and so are dependent on relative prices.

All simulations are run in a multi-year setting. The model is initially assumed to be in steady-state equilibrium implying that, with no exogenous disturbance, the model simply replicates initial values over all subsequent time periods.

The supply side of the regional economy determines the use of capital and labour in the model. Capital, in the first period, is fixed but in subsequent periods each sector's capital stock is updated through investment, which responds partially to the gap between the desired and actual (adjusted for depreciation) levels of capital stock – in line with the neoclassical investment formulation (Jorgenson, 1963).

For this paper, AMOS has been adapted to account for the implementation of a regional UBI. First, households have been disaggregated into quintiles to allow an analysis of the distributional effects of

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[16] The specification of the model is informed by a range of micro and macro theory. Many of the parameters of the model are obtained when the model is calibrated to the base year SAM and other key parameters are obtained from external, often econometric, evidence. Parameterisation is complete when the model solves for the base year SAM in the absence of any shock. Various model tests are then run, including for homogeneity. Furthermore, the properties of the model under particular conditions are known and the model tested for these (e.g. reproduction of augmented input-output results under passive supply conditions).

the policy. Second, within the model we generally assume that the UBI is paid as a transfer from the Scottish Government to Scottish households funded partly by a reduction in some benefits with the balance funded by an increase in income tax. Third, we modify the wage curve and the net migration function to reflect the alternative wages that workers and migrants may focus on, with the net of tax real wage and the social wage providing the limiting cases.

Labour force changes in the model are solely attributable to inter-regional migration; there is no change in natural population. Migration to Scotland is determined by the gap between the Scottish and UK unemployment and real wage rates. The regional economy is assumed to have zero net migration in the base year (2013) and, where we allow for migration, this flows continuously to re-establish initial real wage and unemployment rates. The migration function is given by (Layard et al, 2005):

$$m = \sigma - 0.08[\ln(u^s) - \ln(u^R)] + 0.06\left[\ln\left(\frac{w^s}{cpi^s}\right) - \ln\left(\frac{w^R}{cpi^R}\right) - \beta\ln[1-\tau]\right] \qquad (1)$$

In equation (1): w^S is the net of tax nominal wage; m is net in-migration as a proportion of the Scottish population; u is the unemployment rate; the S and R superscripts stand for Scotland and the Rest of the UK, respectively; and σ is a parameter calibrated to generate zero net migration in the base period. β is the parameter indicating the extent to which households value the benefits of the UBI as against general private consumption. It represents the subjective net valuation by households of the benefits of the increased UBI (including greater equity) weighed against the corresponding increase in their income tax. If β=1 migrants respond to the *gross/ pre-tax* real wage; the rise in tax does not impact their migration decision since they feel as well off after the change as before. They value the benefits of the UBI as much as their loss of real take home pay.

The regional bargained real wage curve is:

$$\ln\left[\frac{w^s}{cpi^s}\right] = c - 0.113\ln[u^s] + \alpha\beta\ln[1-\tau] \qquad (2)$$

The parameter α represents the extent to which any private valuation of the UBI and any amenity effect associated with greater equity generated by the UBI is reflected in the wage bargain and *c* is a calibrated parameter. In the conventional bargaining model above both *α* and *β* equal zero so that the last term on the RHS of (2) is zero. In this case bargaining and migration are motivated by the real *net-of-tax* consumption wage (LHS of (2)). However, in the Social Wage case *β=α=1*, so that (2) implies that workers bargain over the *pre-tax* real wage: the tax hike has no impact on

the bargained wage. Intermediate cases where workers bargain over the wage adjusted for their personal or family UBI receipts are reflected in values of 0< $\beta=\alpha$ <1.

5. The system-wide results

We begin by assuming there is no migration response. From the analysis of Section 3 we expect the implementation of an archetypical UBI in Scotland to generate simultaneous demand and supply side shocks. Since there is considerable uncertainty surrounding the precise behavioural response to UBI, we consider a range of scenarios and emphasise the transmission mechanisms at work rather than the precise numerical results.

The first column of Table 2 reports the results of the case where the UBI is externally funded. All results are reported as percentage changes from base. As anticipated, the impact is a substantial rise in consumption of 8.6%, and a 3.5% stimulus to regional GDP, with all household quintiles benefiting.[17, 18] In this case, the UBI stimulates economic activity as well as effecting a substantial redistribution in favour of lower income households. However, since Scotland has an above average level of GDP per capita, the unilateral UBI would actually increase inequality among UK regions. Second and subsequent columns all report the impact of introducing a balanced budget UBI. The second column, however, isolates the demand side impact of the income-tax-financed UBI by fixing the nominal wage, thereby precluding any "wage push" response. There are some surprising aspects of the results. First, perhaps surprisingly, the overall stimulus to GDP is extremely modest (0.1%) despite the scale of the redistribution, reflecting the fact that the impacts of the increasing consumption of lower income households (the first three quintiles) are largely offset by the reduction in consumption of higher income households. Indeed, aggregate consumption is unaffected – the GDP stimulus is primarily due to an increase in investment (and capital stock, of 0.5%). Second, employment falls slightly (by 0.1%).[19] These results reflect the greater capital intensity of low-income households' consumption. Third, the real (and nominal) take home wage falls by 13.1% due to the substantial rise in income tax combined with a fixed nominal wage. In fact, the average rate of income taxation rises by 10.4 percentage points, as compared to the 8.0 percentage point rise implied by the microsimulation; the difference reflects the adverse impact of the fall in real labour income on income tax revenues once macroeconomic impacts are incorporated.

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[17] The result indicates that GDP is 3.5% above base i.e. it is 3.5% higher *than it otherwise would have been* in the absence of the UBI (under the assumed conditions).

[18] This case could also correspond to the outcome for a national economy with its own currency if the assumptions of Modern Monetary Theory were to hold.

[19] If the lowest income quintile takes on the same consumption pattern as the next lowest, the GDP effect increases to 0.4% and the employment impact becomes positive (0.1%)..

The next four columns of Table 2 report the long-run macroeconomic impacts of the UBI under alternative assumptions about workers' responses to the rise in income tax that funds its implementation. These results confirm the qualitative analysis of Section 3 and illustrate the sensitivity of the scale of the system-wide impact to workers' responses to the substantial rise in income taxation.

Table 2. The long-run macroeconomic impacts of implementing the UBI across various bargaining models (with no migration response)

Results (percentage change from base)	Externally funded	Fixed Nominal wage	Conventional Bargaining	Bargaining adj. for worker's UBI	Bargaining adj. for family's UBI	Social wage
Column Number:	1	2	3	4	5	6
Economic activity (GDP)	3.5	0.1	-8.8	-4.4	-1.7	0.2
Employment	3.0	-0.1	-9.7	-5.0	-2.1	-0.1
Exports	0.0	0.0	-10.5	-5.3	-2.1	0.1
Investment	4.0	0.5	-7.9	-3.7	-1.2	0.5
Unemployment rate	-2.8	0.1	9.1	4.7	1.9	0.0
Nominal gross wage	0.0	0.0	13.2	6.3	2.4	-0.1
Real take home wage	0.0	-13.1	-9.9	-11.5	-12.4	-13.1
CPI	0.0	0.0	4.0	1.9	0.8	-0.1
Consumption of lowest quintile	31.5	30.8	26.7	28.7	30.0	30.8
Consumption of highest quintile	2.1	-12.5	-18.4	-15.4	-13.6	-12.4
Effective increase in average tax rate (percentage point)	0.0	10.4	13.8	12.1	11.1	10.4

It is apparent from Table 2 that there is a predominant adverse supply shift in all the bargaining models: the impact of the upward push on wages for regional competitiveness and GDP dominates the small positive stimulus to goods demand, so that there is a contraction in economic activity (and

employment always falls further than in the fixed nominal wage case).[20] However, the scale of this contraction varies depending upon the response of wage bargaining.

While under conventional bargaining workers resist any reduction in their net-of-tax real wage, it does fall by 9.9% in the long run (compared to 13.1% under a fixed nominal wage) – their attempt to maintain their net real wage ultimately results in a rise in the unemployment rate of over nine percentage points and a relative fall in GDP and employment of 8.8% and 9.7% respectively (third column of Table 2). The consumption of the lowest quintile increases by 26.7% while that of the highest income group falls by 18.4% and the average income tax rate rises by 13.8% reflecting the impact of the greater contraction in economic activity on income tax revenues

While these are striking results, conventional bargaining implies that workers fail to fully value their own UBI payments and so, in effect, attempt to increase their post-tax earnings. If, instead, workers were persuaded fully to value their own UBI payments in wage bargaining (column 4), the upward pressure on wages is moderated – the gross nominal wage rises by 6.3% and real take home pay falls by 11.5% - as is the scale of the adverse supply effect. Ultimately GDP falls by 4.4% and employment by 5.0%. The contraction is further moderated if wage bargainers fully value their entire family's receipts of the UBI (column 5), in which case gross nominal wages rise by 2.4% and the real take home wage falls by 12.4%, with much smaller falls in GDP and employment of 1.7% and 2.1% respectively. The required rise in average income tax rates is also moderated as workers' valuation of the UBI benefit increases.

The results of the social wage simulation are very similar to the fixed nominal wage case, but now the nominal gross wage falls slightly. As implied by our earlier analysis, bargaining focuses on the gross wage in this case, but it is subject to downward pressure because of the slight contraction in labour demand that we observe under a fixed nominal wage. Accordingly, the positive aggregate demand effect is enhanced in this case by the supply side response, with GDP increasing by 0.2%. Even so, employment continues to fall slightly, by 0.1%, because of the shift in the composition of consumption away from comparatively labour-intensive goods. The required change in the average income tax rate is 10.4%, as in the social wage case, reflecting the similar changes in labour income. However, note that the real take home wage falls by 13.1%.

It is worth considering the plausibility of the results reported in Table 2. The external funding case, attractive though its outcome is, seems unrealistic unless the UK government were to adopt an activist

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[20] With a predominant adverse supply shift the nominal gross wage rises in all the bargaining models, but falls in the social wage case. Of course, the real take home wage falls in all cases.

policy of "levelling" up through funding UBI (though this presumably would not be limited to the Scottish case) or if Scotland could call on a sovereign wealth fund (perhaps available in the past with different decision-making on North Sea revenues). The fixed nominal wage case may seem more plausible that it otherwise would do given apparent wage stickiness since the Great Recession, but nonetheless seems unrealistic as a longer-term phenomenon. It also seems highly unlikely that the worst-case scenario in Table 2 considered above would ever be realised. First, we expect some further policy intervention if there was a tendency for contraction on this scale. Secondly, it would seem irrational for workers to push for higher wages because taxes have gone up while ignoring the fact that their disposable income has been much less impacted. A similar argument could be advanced, perhaps less convincingly for the results in column 5. The case for a sustainable, if slight, stimulus to overall economic activity seems to rest on the feasibility of a social wage. This is an issue we consider further in Section 6 below.

The results reported above are achieved only gradually over time. In the short run capital stocks are fixed and it takes time for these to adjust to their new desired levels. As profitability declines capital stocks are gradually reduced. Figure 1 shows the gradual adjustment of GDP to its new long-run level for each of the bargaining models.

Figure 1. Adjustment path of GDP under alternative models.
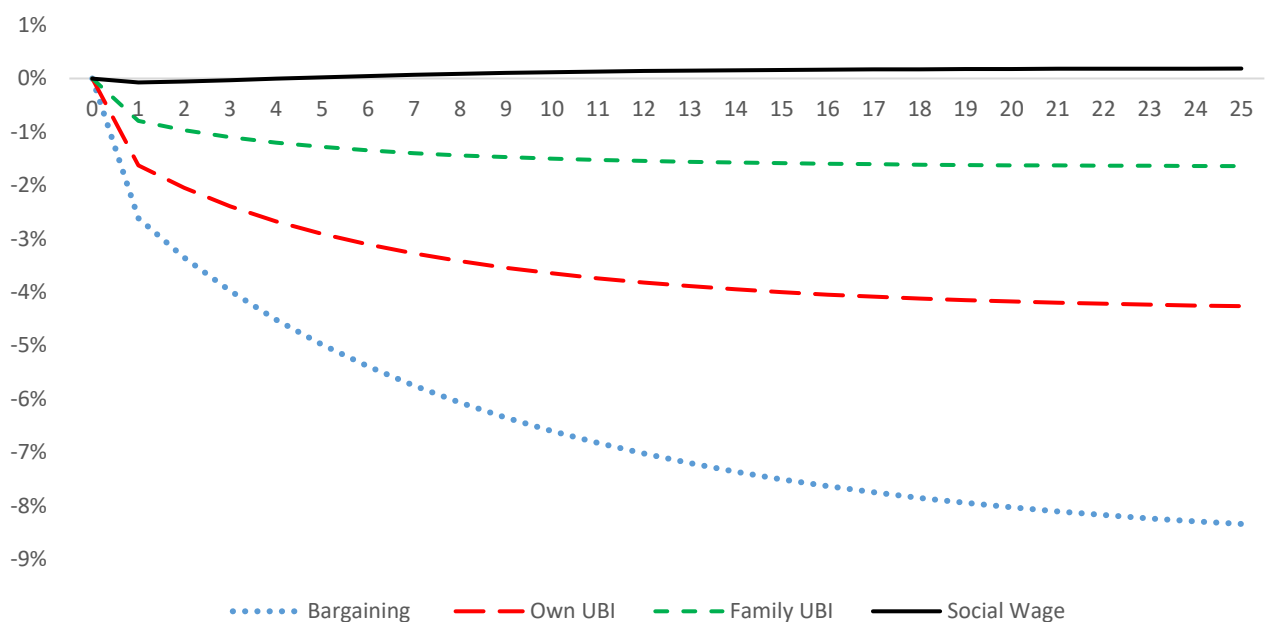
We noted in our ex ante analysis that allowance for migration would tend to exacerbate the scale of any contractionary impact in the labour market on the host regional economy under any bargaining model, and the results reported in Table 3 confirm this. In all of the results in Table 2, the unemployment rate rises providing a strong incentive for outmigration that continues until unemployment rates are restored to their original levels, given our assumption of symmetric responses between migrants and workers.[21] Real wages increase as a consequence of this regional out-migration as, therefore, does the scale of the adverse supply shock. However, the model here implies the presence of a migration response that is very powerful over the long run; it effectively implies an infinitely elastic supply of labour over that interval.[22] While the model has some supporting econometric evidence it could only literally hold in the absence of financial and psychic transactions costs. Accordingly, we interpret its operation as indicating the direction in which induced migration flows shift the macroeconomy and attach little weight therefore to the precise numerical results.

Table 3. The long-run macroeconomic impacts of implementing the UBI across various bargaining models with a powerful migration response

Results (percentage change from base)	Fixed Nominal wage	Conventional Bargaining	Bargaining adj. for worker's UBI	Bargaining adj. for family's UBI	Social wage
Column Number:	1	2	3	4	5
Economic activity (GDP)	0.1	-37.2	-15.2	-5.8	0.1
Employment	-0.1	-38.1	-16.4	-6.5	-0.1
Exports	0.0	-43.3	-18.0	-6.9	0.0
Investment	0.5	-34.2	-13.8	-5.0	0.5
Unemployment rate	0.1	0.0	0.0	0.0	0.0
Nominal gross wage	0.0	83.0	24.5	8.4	0.0
Real take home wage	-13.1	0.0	-7.7	-11.0	-13.1
CPI	0.0	20.7	7.2	2.6	0.0

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[21] It is as if labour is perfectly mobile across long-run equilibria. In practice various transactions costs may inhibit the scale of the migration response, although the qualitative changes would be very similar to those reported.

[22] Furthermore, it would not be rational for migrants to neglect the full impact of UBI on their family's income (as is in the results in columns 2 and 3).

Population	-0.5	-24.8	-10.7	-4.2	-0.1
Consumption of lowest quintile	30.8	-1.2	23.7	28.1	30.8
Consumption of highest quintile	-12.5	-39.2	-22.8	-16.3	-12.5
Effective increase in average tax rate (percentage point)	10.4	27.2	16.4	12.6	10.4

In fact, the scale of the additional adverse supply shock in the conventional bargaining case is such that outmigration has to be very substantial to push to restore the real take home wage and unemployment rates all the way back to their initial levels. Even where bargaining and migration fully value individual workers' UBI receipts there is a major further contraction of the economy induced by outmigration: nominal wages increase by 24.5% and real take home wages are driven up relative to the no-migration case (but they still fall by 7.7%) to the point where GDP falls by 15.2% and employment by 16.4% (which, coincidentally, is also the required rise in the average income tax rate). There seems little doubt that if, in the unlikely event that migration responses were this powerful, there would be further policy intervention. The key point to take from these simulation results is simply that migration can augment any contractionary impact that the implementation of a UBI may induce (although worker rationality would preclude the most extreme outcomes).

Allowance for continuing flow migration would mean that even where bargaining and migration fully value families' UBI receipts, there would again be a significant additional adverse supply shock relative to the case where there is no migration, with GDP falling by 5.8% and employment by 6.5% (and real wages now falling by 11.0%).

When we allow for migration motivated by a social wage, the macroeconomic impacts of the tax-financed UBI become only slightly less favourable than for the corresponding no migration case since there is only a small fall in gross wages and rise in unemployment in this case. Accordingly, while there is still an incentive for outmigration, only a 0.1% loss of population is required to restore the real *gross* wage and unemployment rates to their original levels, and we obtain the results reported in the final column of Table 3. GDP rises by only slightly less (0.1% as compared to 0.2%) and employment only falls by 0.2%.

In all the bargaining models (other than the social wage), the results imply a trade-off between the level of economic activity (and per capita GDP) and the distribution of income among households, but, given that Scotland enjoys above average GDP per capita, inequality between regions declines (though not because of rises in the living standards of less well-off regions). Any trade-off between regional

economic activity and equity among households is typically more severe the more powerful is the migration response and the less workers value their UBI payments. The trade-offs between equity among households and efficiency can be very severe, especially where migration responses are very powerful, except where workers adopt a social wage: society has to really desire enhanced equity among households and be willing to accept a significant reduction in after tax real wages if adverse impacts of a UBI on economic activity are to be avoided. However, even in the case, the macroeconomic impacts are such that the tax rises required are even greater than is indicated in the microsimulation. We consider the feasibility of establishing an appropriate social contract, among other issues relevant to the UBI debate, below.[23]

6. Discussion

We now discuss a number of additional questions that are relevant to the policy debate around UBI and its likely efficacy as an instrument of regional development policy. [24] Inevitably, our discussion identifies potentially fruitful areas for future research, involving new applications and extensions of our micro-macro approach.

What does our modelling of a regional-specific UBI suggest are the main factors that are likely to govern its impact for regional economic development?

First, the issue only arises as a realistic policy option within the context of significantly devolved regional fiscal systems. Our modelling makes it clear that the introduction of a UBI represents a very significant policy intervention that will inevitably have implications for regional economic development. Micro simulation analysis is not sufficient to allow an overall evaluation (although it remains necessary); some assessment of the scale of regional macroeconomic impacts is essential.

In general there are positive system-wide effects, through a stimulus to demand as a consequence of a general redistribution to poorer households. The scale of this impact depends upon the distribution of income and consumption patterns among households and the sensitivity of consumption to income. However, if the UBI has to be financed within the target region, through income tax rises, any positive demand effect may be dominated by resultant "wage push" (and possible migration) effect(s), with adverse consequences for competitiveness and the level of regional economic activity. The scale of the wage push effect depends on the nature of regional wage determination within the target region. However, this is an aspect of the structure of the regional economy that may be affected by

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[23] The Appendix explores the sensitivity of the results to the values of key parameters (demand and substitution elasticities).

[24] This Section of the paper was prompted by the questions posed by two anonymous Referees and the comments of an Associate Editor.

Government – in particular, by its capacity to negotiate a social contract in which workers agree to value UBI payments and the reduction in poverty they generate.

The system-wide economic impact of the UBI for any given wage push effect is also governed by the structure of the regional economy. In particular, the degree of its openness in terms of: the importance of trade flows and their sensitivity to changes in competitiveness; the scale and sensitivity of migration flows; and the integration of financial markets since this impacts the long-run responsiveness of investment. (Applications of our micro-macro approach to other regions would provide the basis of a rigorous comparative analysis of the importance of different elements of economic structure, as we also note below.)

Many of the determinants of the likely regional economic development impacts of a UBI are discussed in more detail below.

Why have UBI schemes often been pioneered at the sub-national level?

It is clear from the literature referred to in Section 2 above that UBI-related schemes have, in fact, typically been implemented at a sub-national level. It may be that sub-national implementation does provide greater flexibility and scope for innovation where there is some degree of fiscal decentralisation. Indeed, more generally, the enhanced scope for local innovation is often a motivation for devolving fiscal powers. We strongly suspect, however, that the main reason for sub-national implementation is suggested by a key feature of our own results. Often UBI-like schemes at the subnational level are effectively spatially targeted, but funded *externally* to the targeted area. In this context they effectively reflect a centralised regional/ spatial policy aimed at "levelling-up", which are implemented (and at least partially funded) by an extra-regional authority. As our simulation results demonstrate (in the first column of Table 2), the effects of interventions such as these are unambiguously positive for the targeted area.

However, when a UBI has to be fully funded from within the target region/ area, matters become more complex. First, its very universality implies that a UBI involves substantial costs, which have to be funded within the target region – most naturally in the present case by a rise in income tax rates. The overall macroeconomic impact can be either positive or negative, in principle, but as our results show, in the Scottish example the impact is typically negative where workers bargain over the real value of their take-home pay.

Are there particular types of UBI scheme (i.e. targeted on age groups or particular localities) that might best offset the negative macroeconomic effects of an internally-funded UBI?

In practice, UBI-like schemes have often been spatially targeted, for reasons discussed above. Some have also been targeted on sub-sections of a regional population. However, targeting the UBI to any

group, while it would undoubtedly reduce costs, conflicts with the principle of universality There are numerous potential partial UBI-like "income guarantee" schemes, which could form the subject of future research. However, such interventions would not relate to implementation of a genuinely universal basic income.

The main hopes for a positive macroeconomic impact of an internally-funded UBI within any given region appear to lie in some form of wage restraint, whether generated by institutional rigidities (for example, national bargaining), an absence of bargaining power on the part of workers or some kind of social contract. Anything that limits the "wage push" response to the rise in taxes improves macroeconomic outcomes. Of course, the structural characteristics of different regions may be more or less favourable to a predominant beneficial demand effect of a UBI, and such differences would be revealed by future applications of our micro-macro approach to other regions. We consider the prospects for a social contract further below.

What considerations should guide the balance between local, regional and national taxes that could be used to fund a regional balanced-budget UBI (assuming good faith negotiations between policy actors)?

Considerations about the appropriate allocation of tax powers among different levels of government is the subject matter of the literature on fiscal federalism (e.g. Oates, 1972, 1997). However, the implications for the allocation of income tax and social security systems are much less clear cut than they appeared to be in early analyses, just as regional development has broadened to encompass inclusive and sustainable growth. One enduring guiding principle is that revenues should be raised through taxes with less distortionary impacts. Under the existing system, however, land taxation, which is typically regarded as having the least distortionary impact, does not appear an option, although that could be altered over the longer term. Exploration of alternative ways of funding a UBI should be a priority for future research.

The wider issue of whether a regional UBI could be at least partially funded by the national government as part of an activist (centralised) regional policy would, of course, depend on the willingness of the national government to adopt this mechanism, rather than alternatives, as part of an attempt to "level up" activity across regions. A full analysis would necessitate a comparison of alternative activist regional policies, another area worthy of exploration in future research.

Why should UBI be considered a useful regional development policy tool, rather than other social security benefits (such as those already within the devolved powers of the Scottish Parliament)?

While UBI is a component of the social security system, and that is where its impact effects are most immediately and extensively felt, our analysis shows clearly that it should be regarded as a

transformational change to the tax and benefit system; it constitutes a truly radical change and has to be assessed as such. The scope and scale of its likely impacts makes it a potentially important regional policy instrument. In contrast the currently devolved social security benefits in Scotland represent only a very small part of the system (concentrated on benefits associated with ill health and disability and the regulated social fund) and are too small and targeted to have the significant system-wide effects that we expect to be associated with the implementation of a UBI; they would likely be incapable of exerting a substantial impact on general regional development. More generally, a comparative analysis of alternative social security benefit policies would be an interesting focus for future research.

How can regional governments negotiate a social contract targeted at inhibiting any wage-push response in a liberal market economy?

We note above that institutional and structural differences across regions and countries may generate different micro and macroeconomic impacts, which can be revealed by the wider application of our approach. Probably the most favourable institutional context in which such an agreement could be negotiated is one where there is a unionised labour force operating within a highly centralised bargaining system, since this offers the potential for a negotiated settlement that covers most (if not all) workers and in which workers representatives might be persuaded to recognise the "external benefits" of a UBI (the reduction in poverty).

It is worth noting that the Scottish Government has sought to use its powers of leadership to support change in labour market institutions, including through its Fair Work Convention. But that being said, in the current context, the labour market structure as a whole does not conform to these conditions. The public sector comes closest (with average unionisation rates of 61%, while private sector rates are around 14%, Emonts Holley et al, 2019), but implementation of a social wage in this sector, while moderating any adverse macroeconomic consequences, would open wide net pay differentials between the public and private sectors.[25]

Cleary much work would need to be done across the policy spectrum in any region before a UBI could be introduced with confidence that it would not have a negative impact upon economic outcomes. Developing a social contract is likely to take time, but discussions on the introduction of a UBI might be one way in which a debate over the creation of a social contract could start to build momentum. This is, again, an area that could benefit from further research.

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[25] Allowing for a social wage in the public sector and conventional bargaining in the private sector widens the wage differential between the two sectors by nearly 15%.

This is a single-region analysis that prompts the question: how typical is Scotland?

First, Scotland is of particular interest because of the advanced and developed state of the debate over UBI there. This is currently a live policy debate in Scotland that seems likely to be replicated elsewhere, given the widespread and increasing policy focus on inequalities. However, the novel approach that we adopt here – combining microeconomic and macroeconomic simulations – is intended to be generally applicable to any regional implementation of a UBI (including by a partially nationally-funded, regionally targeted UBI as a "levelling up" policy).

Of course, in general, the specific macroeconomic outcomes reflect the countervailing forces of the demand stimulus and (likely adverse) supply impact associated with financing, and the balance of these is an empirical matter, which will depend upon: the particular fiscal system; the method of financing; the nature of wage bargaining; the capacity of the target region to establish a social contract (which we discuss below) and the structure of the economy, including the distribution of income among households, the allocation of their expenditures across products and the labour intensity of impacted industries. However, the general economic factors and issues that we have identified will hold. In particular, our analysis suggests that the response of wages to the introduction of the UBI is likely to prove a particularly critical factor.

While the specific characteristics of labour markets and fiscal systems will vary across regions, and, more markedly, across countries, the factors that we have identified will be of crucial importance and the methods that we have applied - regional and country-specific, micro- and macrosimulation models – will capture these characteristics, which would be reflected in differentiated results. Future research that applied our micro-macro approach to other regions would provide a rigorous basis for comparative analysis.

Finally, it would be interesting to extend the analysis explicitly to the multi-regional case in future work.

How would Scottish independence change (or constrain) the administration's policy options?

There are a number of important points to make in this context. First, if Scotland were to become independent the costs of implementing the UBI scheme should be unaffected; the scale of the required income transfers, and the associated level of funding needed, would not change.

Second, under independence – in principle – a future Scottish Government would have more flexibility over funding choices. Currently, limited borrowing powers preclude deficit-financing and the only devolved tax of sufficient scale is income tax, which is why this is the case we analyse in this paper. Under independence there would be other options for tax-funding (including new more radical tax changes – e.g. on land or wealth) and the possibility of deficit-financing, although even here, given the

relative size of income tax in the overall tax envelope it is likely to remain a key source of funding for a UBI. While the details (and incidence) may vary with the government's choice of tax mix, the scale of the required transfers would still involve substantial increases in tax rates.

Third, under independence, a future Scottish Government may have greater flexibility over how to support the creation of a 'social contract' through collective bargaining and the like (powers that are currently largely reserved to Westminster).

Finally, any discussion of independence would also need to include reflections on broader macroeconomic questions including currency and fiscal sustainability and related policy questions such as membership of the EU. An analysis of the macroeconomics of the complex combination of a move to independence and implementation of a UBI provides a challenging focus for future research.

7. Conclusions

Social welfare spending becomes a potentially important policy instrument for fiscally devolved regions given the current conception of regional development that emphasises inclusive growth. More widely, there has been growing support for the adoption of a UBI. Our analysis suggests that an externally funded, regional-specific UBI would stimulate regional development both through improving equity among households and increasing economic activity within the host region – a policy "double dividend". In the more realistic case, of an internally funded UBI, regional development would continue to benefit from improved equity, but the impact on economic activity could well be negative. Furthermore, the extent of the trade-off between equity and the level of economic activity is likely to be strengthened the lower are workers' valuations of UBI payments and the stronger is the migration response.

The impact of a single, region-specific UBI on the distribution of economic activity *among* regions is governed largely by the position of the host region within that distribution; a UBI that is successful in improving equity among households and stimulating regional economic activity, would only reduce inequality among regions – generating a "triple dividend" - if it was targeted on a poorer region.

Overall, on the basis of current evidence, we would advocate caution in the use of UBI as an instrument of regional development policy without a concerted attempt to develop an accompanying 'social contract'. On the conventional view of wage bargaining the scale of the likely contraction in economic activity generates concern about the ability of any induced productivity stimulus (through, for example, reduced precarity or a stimulus to entrepreneurship) to offset it – at least without further policy intervention. Accordingly, the likelihood of a UBI-induced stimulus to economic activity, as well as to equity, is likely to depend upon the ability of the regional government to negotiate a social contract targeted at inhibiting any wage-push response. In a post-COVID world key actors may be

more open to discuss such an innovation, but this would almost certainly require an extended period of intense negotiation.

Given our discussion of issues relevant to the debate around UBI as a potential instrument of regional development policy, future research should include: applying our micro-macro simulation approach to other regions to facilitate comparative analysis; exploring the impact of alternative funding options (including the introduction of new taxes); investigating the comparative efficacy of UBI and other instruments of regional development policy (including other elements of social security) and considering the effects of extending the framework to allow explicit assessment of the multiregional case. Finally, we anticipate the wider application of the combined micro- and macrosimulation approach that we develop in this paper to the evaluation of regional development policies more generally.

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