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HOUSING AND PRODUCTIVITY: ALL OR NOTHING AT ALL?

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September 2021



Acknowledgements

The authors would like to acknowledge financial and research support from the Housing Productivity and Research Network, the sustained encouragement and advice from Bill Randolph, Hal Pawson and Fatemeh Aminpour (all at UNSW) and the searching questions of Wendy Hayhurst (CHIA). They also recognise the support of the UK Economic and Social Research Council's 'Productivity Innovation Network' and Places for People in developing the conceptual framework used to shape the Australian study and the roles of Linda Christie and Julie Miao in shaping these ideas.

Suggested citation

MacLennan, D., Long, J., and Leishman, C. (2021) Housing and productivity: all or nothing at all?; Sydney: UNSW City Futures Research Centre <https://cityfutures.be.unsw.edu.au/>

ISBN: 978-0-7334-4002-1

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Executive Summary

Key Findings

- Housing markets have come to play increasingly important roles in capital allocation processes within the national economy, arguably diverting Australia away from an entrepreneurship/effort-based system and towards reliance on 'rentier' relationships that do not augment productivity
- Australian and international evidence suggests that housing impacts economic productivity through multiple channels:
 - Poor physical housing conditions, especially in childhood and teenage years, are strongly associated with diminution and underutilisation of lifetime human capital
 - High burdens of housing costs, especially for lower income households and renters, may divert household spending from efficient sectors to 'rentier' incomes and, as above, diminish the capabilities to enhance human capital
 - High housing prices in favoured locations may induce low and middle income households to live further from centres of employment and, in addition to commuting cost effects, impair labour market matching opportunities in ways that reduce lifetime incomes
 - Prolonged high housing costs in metropolitan areas may now be inducing firms and skilled labour to relocate away to less pressured places (with COVID-19 reinforcing this shift) that may be lower cost but also potentially less productive for the long term
 - Housing assets play important roles in the formation and growth of small businesses
 - Because housing sector processes may lag average productivity growth, housing booms may diminish short-term productivity growth
- Australian housing policy decision-making has traditionally failed to factor in these outcomes. This has diminished productivity growth.

Housing and Productivity – An Under-appreciated Linkage

Productivity is a measure of the effectiveness with which individuals, firms, institutions, cities and nations use their resources to meet chosen goals. Measures of economic outcomes are evolving beyond traditional 'GDP per capita' measures to embrace distributional and environmental goals. This paper shares this wider understanding of productivity and analyses how housing system outcomes impact conventionally defined productivity. Despite the wide-ranging economic impacts of housing sector functions, Australian housing policy decision-making has traditionally failed to factor in these outcomes. This has diminished productivity growth.

Omission of productivity considerations in housing policy-making has, arguably, led to under-investment in housing provision (physically defined), especially for poorer households. Lack of attention to inter-sectoral connections in the geographies of public provision that would best serve households and firms has underpinned mismatches in transport provision, housing and employment.

Most importantly, the sustained inability, or unwillingness, to address and attenuate high and rising housing prices and rents on the productivity of labour and capital has eroded real income growth in Australia for decades and now compromises the competitive advantages of the high productivity in the nation's leading metropolitan areas.

In recent years the productivity advantages of major metropolitan economies, believed to be based on positive agglomeration economies and widely identified at the start of this millennium, have been eroded by rising congestion costs. Rising house prices and rents are a form of congestion cost with negative effects for firms and households, especially lower income households. For much of the past decade high income countries such as Australia, the UK, Canada and the USA, have seen growing evidence of households and firms relocating away from the most innovative and potentially productive places to lower cost locations with more limited productivity growth potential. These shifts have been reinforced by the COVID-19 pandemic with increased opportunities to work from homes in well (electronically) connected towns and rural areas that have attractive amenity-housing costs opportunities but may lack innovation ecosystems to shape future productivity. Australian governments have barely grasped the problem; let alone assessed potential productivity effects or the housing and spatial policy changes that will help sustain real income growth through the emerging difficulties in global trading.

This paper notes Australian experts' views that housing productivity issues tend to be unseen or ignored by Australian governments. It also cites empirical evidence that officials dealing with local economic development and innovation strategies at sub-national scales seldom consider housing influences on economic progress. To begin to address this gap the paper outlines an economic framework for capturing productivity effects that are revealed by metropolitan and microeconomic

housing and economy studies. The approach views housing as multi-attribute, locationally-fixed, physical capital: in essence, essential economic and social infrastructure. Productivity effects arise from housing-related processes, such as building, maintaining, and exchanging homes as well as from the attributes of homes, such as space, tenure neighbourhood quality and location relative to work. At the more aggregate, macroeconomic, scale it is also important to consider the efficiency of housing markets as major capital allocation systems within the economy.

A review of relevant literature for Australia and similar OECD economies, using the process-attribute-allocative system approach developed in the paper, reveals substantial evidence of housing productivity effects but no systematic recognition of these effects in policy making. Much evidence of potential productivity effects arising from housing is *prima facie* in nature. While many studies are suggestive of housing effects on productivity few are definitive. This reflects a 'Catch 22' in research funding and processes. Generally, the detailed data and econometric research with the capacity to rigorously evidence such effects emerges from major government sponsored research programs. But because Australia's governments and academic economists, have under-rated their potential importance there are few major studies of housing-productivity effects. Housing scholars and advocates have to draw their inferences from data generated from health, education and other sector studies. This report provides a comprehensive review of recent Australian research.

Evidence Gaps

The review draws attention to where evidence already exists while also highlighting *prima facie* cases that suggest future research would be likely worthwhile. These include:

- Assessing the comparative productivity of housing provision processes and

contrasting them with other major Australian economic sectors, and with equivalent sectors in similar countries. This would include the productivity of processes in the housing supply chain, particularly construction and development, and the housing exchange systems that match households to housing. A Productivity Commission investigation of housing supply chain efficiency is recommended.

- The conventional housing lobby and policy merit good case for housing has included a strong view that poor housing (and neighbourhood) quality impairs household capabilities, implying that low income leads to poor housing, but there is a recursive link back from poor housing to poor educational and human capital outcomes. The review identifies many studies that explore and confirm these correlations but, in contrast to health and education research, there has been little work that tries to remove 'confounding' statistical effects. Neither the ARC nor AHURI have funded the substantial research that definitively tests existing data, such as the HILDA survey, to answer the question 'How do poor housing outcomes and experiences for young Australians impact their formation and uses of human capital by early adulthood'. Those who advocate for, and fund, affordable housing provision in Australia really need to ask and answer this question.
- Similar efforts to remove 'confounding' effects related to housing tenure choices also need to be undertaken to establish a clearer view of the potential productivity effects of such choices.
- A potentially more significant set of issues arises around the spatial choices of households. The effects of rising housing costs on potentially undermining growth in Australia's most productive locations was noted above and substantial research on

this question is urgently needed (and is feasible). Further spatial questions need to be asked in relation to price pressures forcing lower income households further away from zones with high job densities, and consequential weakening of labour market matching effectiveness. This lowers productivity. Our own 2019 research that demonstrated productivity losses from the absence of affordable middle income housing within Sydney suggests that such effects may well exist in other major Australian cities.

- The roles of housing assets and neighbourhood contexts in small business formation and growth are important and need to be better understood.
- At a more macroeconomic scale, there is an important question as to whether the house price appreciation history of the last 40 years has led to significant capital market misallocations and impaired growth prospects. Has the functioning of the housing system led to Australian 'progress' that has relied on increasing 'scarcity rents' rather than productivity driven profits and wages? Is further promotion of Australia as a 'rentier' rather than 'entrepreneurial' economy really in the national interest?

These topics are identified because there is strong prima facie evidence that they are important questions that policymakers need to grasp now.

Housing Policy Governance

Building on the research team's earlier findings, the review concludes that the weak economic governance of Australia's housing system fails to address the productivity consequences of housing decisions and outcomes. There is no clear conceptual framework within which to explore, question or design housing-productivity relationships. There is no coherent conversation within governments, across different ministerial

portfolios, about how housing systems and outcomes shape economic outcomes. Neither does such communication exist across different orders of government. Consider, for example, how an interaction across orders of government about 'Housing Investment Deals' similar to City Deals might prompt useful intergovernmental conversations about what housing does for local economies. Absence of such conversations reflects and reinforces weak collaboration and cooperation between orders of government on housing, economy and productivity issues.

Progress towards a better conversation and economic governance could be prompted at Commonwealth Government level by recognising how both national and local processes and policies impact more local changes in housing systems and by encouraging the Productivity Commission to undertake a systematic review of the productivity effects of housing outcomes.

At the metropolitan/regional scales, Federal and State Productivity Commissions/officials should prioritise work on identifying the productivity features of housing supply chains and the changing spatial choice patterns of middle- and lower-income employees. There also needs to be a rapid revision of guidance for assessing public investment in and planning approval for housing projects. More generally, recalling the need to think forward to more complex definitions of productivity, there needs to be greater clarity in the role of housing actions and outcomes in progressing metropolitan planning goals that seek productivity, inclusion and sustainability.

Insufficient priority accorded to the productivity implications of housing outcomes in economic policymaking is rooted in the educational and professional silos that predominate in housing provision, policy and practice. Housing advocacy and management has strong roots in social policy and the policy apparatus of 'needs assessment'. Planning has for a long time been

weak on grasping the economic drivers of urban change and the economic consequences of planning actions. Economics has regarded applied economic interest in housing markets with some professional disdain and focussed on developing conceptual frameworks that assume away many of the complexities that make housing systems interesting, and difficult to manage. There are signs that the walls of these intellectual silos are crumbling and the bodies who accredit professionals and organise continual-professional-development should now be insisting that understanding the cross-sector connections that shape productive housing, and other infrastructures, are a prerequisite for professional advancement.

Conclusion

Australian governments have consistently failed to consider the growth and productivity effects of housing outcomes and processes at both national and regional/metropolitan scales. Housing has been missing in conversations about and strategies for economic development. In the national interest, this urgently needs to change.

1. Housing and Productivity: New Challenges, New Synthesis

1.1 Changing Stories

This paper is based on an extensive review of Australian and international academic and policy literature¹ on the relationships running from the housing sector to productivity. It is one of four papers that outlines the base of evidence and ideas that under-pinned the recently published report 'Housing: Taming the Elephant in the Economy' (MacLennan et al., 2021). Associated papers on a statistical scan of Australian experts on the consequences of housing market outcomes and policies (MacLennan et al., 2021) and more detailed follow-up interview analysis (Pawson et al., 2021) have already been published and further papers on housing and economic instability (MacLennan, Leishman, Goyal and Long, 2021) and housing and wealth (Long, MacLennan and Leishman, 2021) are also now published.

The initial aim of the overall research project was to strengthen, with evidence, the economic narrative of housing policy cases made by policy advocates. As the research progressed it was recognised that the economic 'story' for housing deployed in housing and economic policy formulation within state and local governments was often limited to narratives based on in-principle, reductionist theoretical logics rather than informed evidence from real system functioning. Equal importance was then devoted to identifying evidence of

feedback effects that might also help shape a better economic policy narrative for national, sub-national and metropolitan governments².

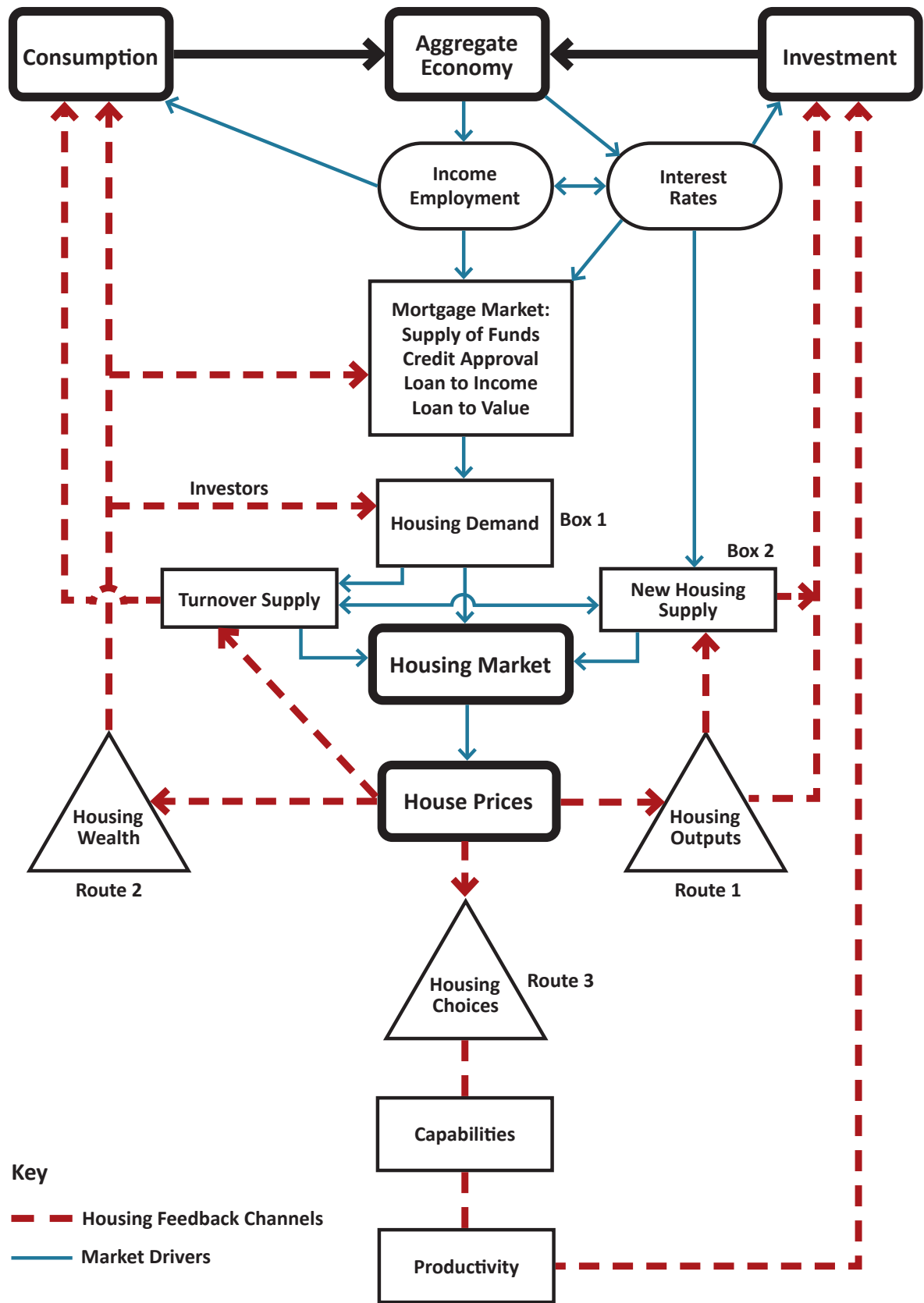
As governments start to consider how to build-forward better after COVID-19, there is both a growing awareness of the long-accumulating housing sector difficulties associated with rising homelessness, growing rent burdens and frustrated aspirations to enter, and remain, in home-ownership. Housing policies in many advanced economies, increasingly, adversely impact middle-income as well as poorer households and there is a broadening belief that younger households will no longer attain the housing tenure and quality outcomes, and lifestyles, that their parents did at similar life-cycle and career stages. This is a disappointing outcome in economies that have become more affluent over the last 40 years.

There is also now a stronger recognition, reflected in the recent landmark OECD report on housing policies and their consequences (OECD, 2021), that housing outcomes have potentially significant recursive effects on major goals for the economy. The range of potential housing to economy feedback channels that need to be considered is outlined in the simple heuristic model in Figure 1.

1 The literature review, using key search terms such as productivity, competitiveness and housing generated a set of references that were then filtered by vintage (pre-1980's papers largely excluded), geography (emphasising Australia, then more detailed comparisons with the UK, USA and Canada with similar housing systems, and then less intensive coverage of the other OECD economies but including international agencies such as the IMF, OECD and BIS) and emphasis (with empirical, applied economics papers emphasised)

2 A more detailed discussion of the different theoretical perspectives used in framing policy narratives, at national and sub-national scales can be found in MacLennan and Long (2021).

Figure 1: Stylised housing system connections and feedbacks



1.2 Focussing on Productivity

The related papers in this project focus on:

- Experts' views on housing-economy feedback effects and how effectively housing markets and policies support Australia's economic goals.
- Roles of housing and mortgage outcomes in economic and financial stability.
- The wealth effects of housing outcomes and their economic consequences.

These papers do touch on productivity effects. The experts surveyed and interviewed overwhelmingly agreed that productivity effects had played too little role in shaping Australian housing policies. Economic instability is widely regarded as damaging productivity growth. The role of housing prices in shaping housing wealth in Australia, over the long term has all the hallmarks of a system driven by rentier profit seeking from land and housing shortages rather than an entrepreneurial and effort economy.

Within these broader observations this paper focuses on recursive effects from housing activities and outcomes through multiple feedback channels, though it has a particular emphasis on effects through house price/rent channels. Section 2 clarifies and defines basic notions of productivity and, in rejecting a sole reliance on traditional production function approaches to exploring housing-productivity effects, draws attention to key economic considerations in shaping approaches to review and analysis. Section 3 brings these elements together to set out a simple framework to assemble the scattered, usually fragmented, evidence of housing-productivity effects. That framework is then used, in Section 4, to elaborate the influences of constructions sector and in Section 5, to organise an overview of empirical evidence of the effects of housing quality and tenure outcomes on the formation and utilisation of human capital, outcomes related to spatial choices and the functioning of city labour markets, Section

6, and finally in Section 7, housing outcome effects on the growth and uses of business/financial capital. That approach, allied to a recognition of the complexities of multiple sectors and levels in the governance of housing, underpins the conclusions of Section 8, that stress the imperative of exploring new intellectual connections, developing new policy conversations, incentives and institutions to seek to initiate or better coordinate housing-economy outcomes with productivity enhancement.

Remarkably, given the scale and complexity of housing in consumption and investment patterns in advanced economies, improving the productivity effects of housing outcomes has been a near absent concern of both national and metropolitan economic policymakers.

2. Productivity and Housing: Rarely Seen Together?

2.1 Productivity and It's Importance.

Paul Krugman famously remarked that "Productivity isn't everything but, in the long run, it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise output per worker" (Krugman, 1994). This is a telling and, in many respects, obvious observation.

At a similar level of generalisation, the definition or meaning of productivity is equally obvious. Productivity is a measure, or set of measures, of how effectively scarce resources are combined by an economic entity, such as firms, non-profit and public producers, to achieve desired outcomes (Jaffe et al., 2016). Physical measures of productivity, for instance how many megawatts of clean energy might be produced by different combinations of labour, capital and land, may be used for specific economic sectors, in a particular place at a specific point in time. More typically, when macro or cross sectoral aggregates are concerned, and contrasts are being made over different economies and time periods, measures of the values of outcomes are required rather than physical quantities. At microeconomic (firm), meso (sector or region) or macro-level mainstream (neoclassical) economics explores the productivity of capital and labour by assuming that competitive market outcomes and producers with well-behaved production functions underpin productivity estimates and comparisons. Different models are required where those major reductionisms of that approach seem no longer relevant to the product and factor market processes in play. In this project, as a whole, there has been a rejection of the assumption that standard equilibrium analysis (or what pundits often label Economics 101) is an appropriate framing to understand contemporary metropolitan housing markets.

It is also important to recognise values of outcomes beyond market processes, for instance externalities of production may need to be included in wider than market assessments of outcomes. The definition of what is meant as 'scarce resources' as well as 'required outcomes' and their 'valuations' then becomes crucial in assessing productivity.

2.2 Productivity: Two Current Concerns

There are two major discomforts in present discussions of 'productivity'. The first set of issues arises as governments begin to emphasise valued outcomes in addition to those captured by traditional measures of GDP, such as the distribution of income, inclusion, wellbeing and environmental sustainability. Recognition of measures of these outcomes beyond market values may involve different societal value judgements as well as a fundamental re-evaluation of the role of unmeasured externalities in 'output' and the recognition of the importance of un-priced forms of capital in production processes, especially home-work and natural capital. If governments continue to espouse more diverse goals then the evaluation of projects and policies as well as the empirical definition and tracking measures for productivity will have to change. The policy meaning of the 'productivity' of housing outcomes may be quite different a decade ahead from now. The importance of these issues is recognised but not further discussed here. The second major concern is how, given conventional productivity measures, productivity growth has slowed over the last decade.

2.3 Productivity: Slow Growth

Current and recent measures of macro-productivity, using conventional neoclassical estimations, have occasioned worry across the

advanced economies that labour productivity (output per worker) has grown slowly since the early years of this millennium. Concurrently, it has also been reported that emerging market and developing economies are undergoing a broad-based slowdown in labour productivity (Dieppe et al., 2021). In the UK, for instance, after a decade of reasonable growth, output per worker has flatlined since 2006 and in other OECD countries grown, at best, at low rates (Haldane, 2018). In Australia slow measured productivity growth has become a more marked concern than in the past because other drivers of income growth have weakened. For almost three decades, rising real incomes for Australians have been primarily driven by improving terms of trade for agricultural and mineral exports, especially to China. There is now enhanced uncertainty about these sources of real Australian income growth. That makes meeting the domestic productivity challenges imperative if overall Australian incomes are to grow in the decade ahead.

Australia has, since the early 1990's, benefitted from the capabilities of the Productivity Commission in auditing the productivity performance of sectors of the economy, including construction (Productivity Commission, 2014) and affordable housing services (Productivity Commission, 2021). The more recent emergence of similar state level productivity, competition and efficiency commissions emphasise how seriously Australian governments say they embrace major productivity issues. For instance, the 2021 NSW Productivity Commission (NSW, 2021) does note the importance of housing influences on economic development but, unfortunately, focusses exclusively on supply side effects induced by planning regulations. Australian governments, like most of their OECD counterparts, do not systematically question, as they would for labour market outcomes, whether national and state housing systems contribute to productivity growth and other key aims. For Krugman, productivity is 'almost everything'. For housing and economic policy-makers it seems to be 'almost nothing'.

Housing policy, as discussed in the concluding section, has come to be viewed by national/federal bureaucracies in countries such as Australia and Canada as a relatively unimportant element of social policies. Economics ministries and central banks have, at best, seldom had a coherent, integrated understanding of housing in the economy and, at worst, have all but washed their hands of any responsibility for, or interest in, housing outcomes. It is, across government sectors and levels a problem for everybody and the responsibility, apparently, of nobody. In the last month the Federal Minister for Housing, the Governor of the RBA and the Head of APRA have all emphasised that they are not responsible for solving the problems of housing affordability in Australia. Individually they may have good reason for their views, but collectively constitute a serious federal failure for the nation if they think not of the productivity, and other, outcomes generated within housing markets.

Part of the explanation for policy discoordination may lie in the absence of well-evidenced assessments of the productivity of housing markets. This research lacunae may well reflect the limitations of conventional productivity measurement approaches. These approaches are very briefly summarised below.

2.4 Conventional Approaches

a) Macroeconomic Perspectives

Productivity measures, as noted above, typically focus on how measured output is impacted by the input of well-defined factors of production. For instance, labour productivity, is defined as GDP per hour worked or gross value added per worker. Wage per worker is perhaps the most widely used measure, followed by total factor productivity or multifactor productivity (TFP or MFP) (Tsvetkova et al., 2020).

Output and labour productivity are (reasonably) expected to be higher if workers have more capital or better skills, or technological

knowledge (Mankiw, 2020). Economists call the relationship between outputs and the inputs (usually defined as capital and labour and sometimes, land) required to produce them, ‘the production function’. Both capital deepening (denoting more financial and human capital per labour input) and TFP growth (the economic growth that cannot be contributed to inputs such as capital and labour) contribute to labour-productivity growth (Fernald, 2015). In Australia’s context, labour productivity growth has largely been driven by capital deepening rather than TFP growth (Campbell and Withers, 2017). Comparably, it has been argued that most of the recent slowdown in labour productivity growth noted above has been driven by lower TFP growth (OECD, 2015a).

It has been argued, in respect of the macroeconomy, that two components contribute to aggregate labour productivity growth: one is the contribution to productivity effects arising from within individual sectors of economic activity; the other, is the across-sector contribution that arises from shifting patterns of production (and demand), also known as the structural change effect (Campbell and Withers, 2017). At the national scale, the former is the sum of sectoral productivity growth weighted by sectoral GDP share. The latter is the change in productivity from reallocation of workers and capital across different economic sectors (Campbell and Withers, 2017; Dolman et al., 2012).

As the overall economy share of construction and housing related activities varies both through major phases and shorter cycles of economic activity it is important to note that these ‘process’ (see below) effects will change over time. Further, if construction and real estate services have lower than average sectoral productivity then increased housing investment may, in the short term, lower national productivity. The RBA have noted (RBA, 2019) that phases of high construction output in Australia ‘act as a drag’ on national productivity growth. These are important observations, but it is also critical to recognise longer term

effects where the ‘low productivity construction and real estate services sectors’, respectively, build productive assets and rematch houses and households in ways that raise productivity in the economy. It is absence of a conceptual and empirical understanding of the latter set of housing outcome effects that is particularly apparent in conventional approaches.

Production function estimates, assuming such relationships exist, of labour and capital productivity, are estimated by exploring, either in cross section or time series studies, how output varies with changes in factor inputs (more labour, or more capital etc). Residual effects not explained by such variations in inputs are commonly attributed to technical change. Output elasticities are the key estimated measures of how output responds to changes in labour and capital.

Deriving productivity estimates output elasticities from these ‘aggregate production functions’, for private and public capital, and for national and regional economies, was commonplace between 1980-2000. Macro estimates for the output elasticities of public capital, prior to extensive privatisation programmes, and assumed to proxy public capital investment in infrastructure, were derived by Aschauer (1989). They were widely used to provide part of the justification for major infrastructure programmes, especially transport. Aschauer’s results were subsequently side-lined by improvements in measurement techniques and macro-level infrastructure productivity estimates are now given scant credibility and attention. The search for infrastructure productivity effects has continued with more success at regional and metropolitan scales in transport economics. Housing economists did not follow the Aschauer lead as the complex housing-economy interactions with the overall economy precluded any clear interpretation of already doubtful parameter estimates. In consequence, housing policy cases have typically focused on redistribution and short-term multiplier effects and a Pandora’s box of productivity effects has been largely left unopened.

b) Conventional Microeconomic Estimates

Productivity research by OECD confirms that microeconomic or structural factors do operate at the industry or firm level and accumulate to affect aggregate productivity outcomes (OECD, 2015b). Productivity enhancing microeconomic influences include: 1) the individual productivity performances of firms; 2) the distribution of firm characteristics across the economy (such as size, age, propensity to innovate); 3) the ability of markets to allocate labour and capital efficiently across firms; 4) the extent to which the business environment facilitates both the growth of the most productive and innovative firms and the diffusion of best practices across the economy; 5) the well-functioning process that encourages entry and exit of resources and firms into particular sectors, thus freeing up resources for the most successful firms.

Few of these ideas, other than narrowly defined assessments of construction sector efficiency and productivity, have been tested in relation to the housing economy. The literature review found that there is, really, still no empirically based conventional wisdom on housing and productivity. Research on business and infrastructure suggests that in the absence of reliable (or attainable) macro-production function parameter estimates a more bottom-up approach to estimating, and understanding, productivity is required using microeconomic and regional/metropolitan approaches. Few, if any, of the 'OECD' questions (where relevant) have been applied to housing processes and outcomes but whilst they form a starting point for our framework for assessing housing productivity effects there are some important refinements required and the next section outlines an approach.

2.5 How to Proceed

As house prices have continued to rise ahead of incomes in many (but not all) metropolitan areas a number of US studies have, within the general spatial equilibrium version of the conventional approach, addressed productivity consequences, and these studies

are discussed in more detail below (and summarised in Leishman et al, 2021). For example, Hsieh and Moretti (2019), draw attention to how high housing costs in relation to incomes can drive skilled workers and firms away from the long-run most productive places to current least cost locations. They are noted here, not solely because they are the most advanced application of the conventional production function approach but because they also highlight impacts on major metropolitan economies, and this is a critical issue for Australia. With agglomeration economies now widely regarded as a source of productivity gain their apparent dependence on density and proximity association often leads to an association with rising congestion and housing costs. If agglomeration economies matter then, with inherent urban housing supply inelasticities (even with liberal or zero planning regulations), housing system outcomes will have a core role in shaping major dimensions of economic growth patterns. This observation applies not just to intra- and inter-metropolitan patterns of economic change but will critically shape the distribution of the gains from growth between human skills and effort and effective and entrepreneurial business capital versus the rentier owners of scarce urban property. (MacLennan and Miao, 2017). Housing productivity, and associated distributional outcomes, then becomes a major and not a minor issue in national economic strategies

Research interest in housing and productivity in Australia has grown (MacLennan, Ong and Wood, 2015; Dodson et al., 2017). However, like the UK's Economic and Social Research Council's Productivity Innovation Network, that research has explored the (non) coordination of housing and productivity between planners, economic development officials and housing strategists in metropolitan housing policy-making (MacLennan et al., 2021a). Research on the causal links between housing outcomes and productivity growth factors has been missing. The City Futures Centre at UNSW, supported by the Australian housing and finance sectors, have explored and estimated

some of the productivity effects arising from housing and reviewed further key research and policy questions that might feasibly be researched (MacLennan and Long, 2020). That will require research approaches that go well beyond what is known and the conventional economics wisdom.

A renewed approach to rethinking housing and productivity relationships would be timely. An awareness of the importance of the spatially fixed factors of land, housing and other infrastructures in shaping major outcomes has been more apparent amongst economic development practitioners at municipal and metropolitan levels. Economic policymakers for cities have long been aware that, for example, poor housing quality, lack of housing diversity and high housing costs relative to wages may deter the attraction of households and firms. However, there is little systematic linkage of housing and economic development in municipal decision taking and local economic development professional bodies rarely take housing issues seriously.

The need for enhancement and systematisation of research on housing and productivity in Australia is now obvious to business and finance communities. This project's survey of housing economists and experts in Australia (MacLennan et al., 2021b) reported that the overwhelming majority of those surveyed, and interviewed, believed that housing market outcomes, especially related to high and rising house prices, have significant effects on productivity and growth that are unconsidered in government policymaking for housing. Most also believed that housing market outcomes tend to exacerbate inequalities and economic instability.

The remainder of this paper, having established the complexity and importance of the housing-productivity question, focusses on providing a consistent framework for organising research that illuminates the issue and to fill that framing with literature based evidence of the need for better research and policy in this key area. How do we go beyond the conventional wisdom?

3. Re-Framing the Economic Analysis

Establishing a preliminary evidence base to provide, at least, *prima facie* evidence that housing outcomes shape productivity is more akin to cross-sectoral, cross-disciplinary detective work rather than summarising a coherent body of solid applied economics research. In identifying what to include on this review three emphases were selected.

First, it was agreed that the standard economic approach that assumes that well-functioning markets, that promptly reconcile the fully-informed choices of producers, consumers and developers and lead to equilibrium outcomes, was often inappropriate for real economic analysis of housing markets³, especially in growing metropolitan areas. Other approaches that recognise housing markets as complex, often slow-adjusting systems with sustained periods of disequilibrium seem more appropriate. In that perspective, market failures, system structures and connections, and indeed planning too, may be viewed as impairing resource allocation efficiencies and productivity.

Second, productivity may be explored with different emphases on different actors within the economic system, for instance individuals, firms, groups of firms, institutions and the economy as a whole. Investigation also occurs at different spatial scales. This is important in the analysis of housing as it is spatially fixed, multi-attribute capital; in essence, complex economic infrastructure. But the spatial scale at which research takes place and policy is implemented is important in shaping the productivity research agenda. Traditional macroeconomic research uses highly reductionist models of economic growth, with national estimates derived from aggregate measures of output, capital and labour. However, those who analyse growth and productivity at regional and metropolitan scales increasingly recognise that more complex

models of, say, innovation and creativity processes and human capital formation are in play and are influenced in subtle ways by diverse housing outcomes. Metropolitan and neighbourhood level economic capability/capability consequences of housing outcomes can be as elusive as they are important. The more local the scan the less credible major reductionisms become. The spatial scale of research matters. Equally, and discussed further in Section 8, policy interventions usually involve multiple scales of government so that the spatial scale of government and governance will be critical in understanding roles and autonomies in coordinating productivity improvement.

The third emphasis was to recognise the productivity consequences of housing market outcomes and the overall resource allocation efficiency of the housing system as well as conventionally emphasised housing processes and their effects.

Providing housing, as both an asset and a service, requires the involvement of a number of production activities or processes provided by different sectors. Houses have to be planned, developed financed, built, sold, paid for, moved into, repaired and sold again. As noted in Part 1, these activities may typically involve, in peak market times, 10-15% of GDP. There are important questions to ask about the efficiency and productivity of these sectors, most notably construction, and they are explored below.

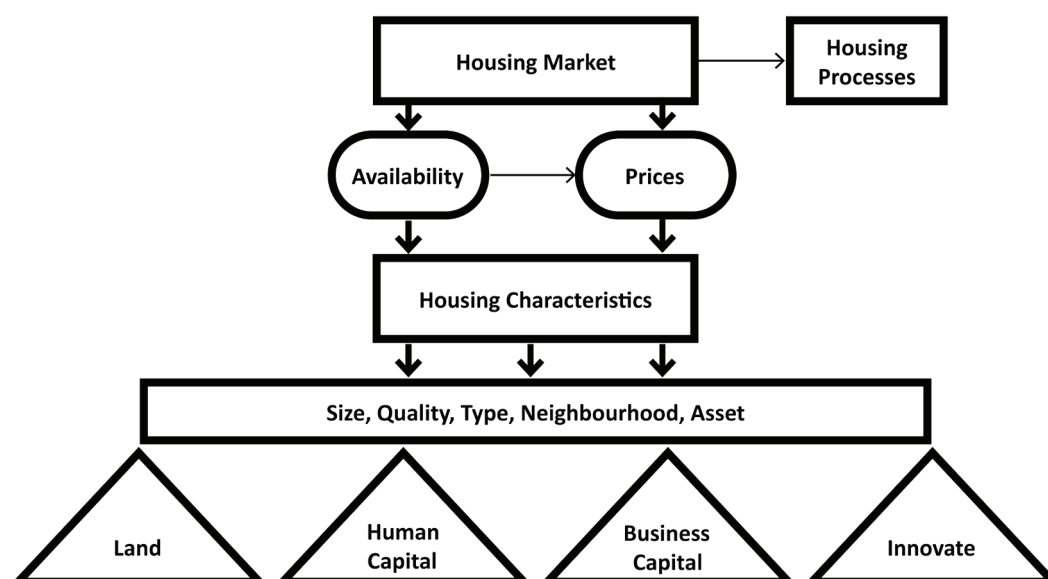
It is also important to recognise that housing is a good that has *multiple characteristics (or attributes)* including size, structure, location, neighbourhood, status, connectivity and with associated price and (for owners) asset characteristics. When households make, given their preferences and constraints, their *housing choice there is, for them, a vector of outcomes for different housing attributes*. These housing outcomes shape household capabilities (and has been demonstrated by both the incidence of and work-home adjustments to COVID-19) to

³ This real housing market economics approach has understanding market functioning as it's key aim rather than that of integrating housing into general equilibrium economic theory.

undertake a range of activities, including earning and learning. These household capabilities (and assets) then influence the more commonly recognised metropolitan growth drivers of human capital, business capital and creative/

innovative systems. These relationships, indicated schematically in Figure 2 are at the core of the interface between housing and productivity. Exploring a selection of them is the key contribution of this literature review.

Figure 2: Housing characteristics – productivity connections



A further, important, consideration is that the housing market is a resource allocation system, that matches households and housing and investors to housing investments. The housing market may, or may not, ‘clear’ and may operate with more or less efficiency in allocating resources within the economy (and influence productivity).

ability to start a business. Meanwhile, labour mobility and labour market matching may also be influenced by housing prices. In growth localities, rising housing prices/rents impact the price and availability of labour and the location choices of firms. Housing also influences the formation and use of human capital.

This tripartite framework for capturing *housing activity, housing attribute and housing system effects* is outlined in more detail in Maclennan et al. (2021a). It is applied, in very broad terms, to selected key issues in the sections that follow. Homebuilding as an industry is marked by lower productivity, thus price-induced investment in housing construction sector influences productivity growth as a whole in the economy. House prices affect the ability of markets to allocate capital efficiently across firms and they may affect individuals’

4. Housing Process Productivity Effects: The Construction Sector

4.1 The Construction Sector

There is no systematic literature coverage of the comparative productivity (over space or time or in relation national averages) of the wide range of sectors/services involved in producing housing assets and services. However, there are studies of productivity in housebuilding that, as discussed in Part 3, accounts for an important segment of the overall Australian construction industry. It has been widely reported, from a range of advanced economies similar to Australia, that the construction industry has poor productivity performance. Construction productivity is, typically, not only below that of the manufacturing sector, but is also below the national average in most countries. The US (Rojas and Aramvareekul, 2003), Canada (Harrison, 2007), Europe and Japan (Abdel-Wahab and Vogl, 2011), New Zealand (Jaffe et al., 2016) all have construction sectors with below average national productivity.

Aggregate measures suggest that the Australian construction conforms to international low productivity norms with productivity growing slowly and then remaining stagnant since 1985 (Australian Bureau of Statistics, 2013; Chancellor, 2015; Productivity Commission, 2014). These 'low-productivity' findings for construction reported in the paragraph above, have mostly relied on macroeconomic data (aggregated at the industry-level) to establish and verify the lower than average labour productivity. However, more detailed micro-studies suggest a different picture. Campbell and Withers (2017) reported that labour productivity in the construction sector in Australia has increased steadily, except for the periods from 1998 to 2000 and 2002 to 2006. Further, using microeconomic data (disaggregated at the firm-level), Jaffe et al. (2016) found contradictory evidence for New Zealand. They found that labour productivity and TFP/MFP in the construction sector have

been rising, and not deteriorating, since 2001. Their results showed that over the period 2001-2012, on average labour productivity in this industry grew by 1.7% annual and multi-factor productivity by 0.5% annually, higher than the other measured sectors for both these productivity measures (0.5% per year and 0.1% per year respectively). However, with respect to sub-industries in construction, one of the major drags on overall productivity growth was cyclical productivity slow-down by firms in the housing construction sector (Jaffe et al., 2016). Borg and Song (2015) exploring construction prices, quality and productivity over time in Sweden also note that published studies frequently underestimate productivity growth as estimates usually fail to quality changes into account and that productivity in the residential construction sector has been underestimated since the 1990s because procedures for computing building price indices do not adequately account for changes in the quality of new residential construction. In consequence real price changes are over-estimated and productivity estimates too low.

4.2 A Drag on Productivity?

Despite the findings of these contrary 'microeconomic' studies, and they need to be more widely replicated, there is a widespread view, with different empirical evidence, that as the construction industry contributes a large share to the whole economy, poor productivity growth in this industry acts as a drag on the whole economy's productivity performance. A survey by the McKinsey Global Institute (2017) reported that contrasted with overall growth of 2.8% for the world economy and 3.6% in manufacturing, the global labour-productivity growth in construction has averaged only 1% a year over the past two decades, albeit with large regional differences. The importance of labour productivity in the construction sector arises from its large proportion of the global

economy (13% of GDP and 7% of the world's working population) and if construction sector productivity were to catch up with that of the total economy, this would boost the sector's value added by an estimated \$1.6 trillion, adding about 2% to the global economy a year. Construction has, of course, some difficult tasks to coordinate that frustrate productivity growth (activity is often outdoors and seasonally affected, labour supply chains are complex with multiple small contractor inputs, recession destroys labour supply chains, there are complex ongoing interactions with bureaucracies, and more).

4.3 Low Construction Productivity and Housing Prices

Apart from these direct impacts on overall economy productivity performance, the comparatively low labour productivity of the construction sector is likely to have an impact on housing prices. Despite the attention paid to other house price drivers, such as the important role of housing demand, fiscal and monetary policies and the supply side impacts of planning restrictions and infrastructure shortages, Iacoviello and Neri (2010) have additionally attributed part of the increase in real housing prices in America before 2006 to slower technological progress in the housing construction sector. Similarly, Galesi (2014) highlighted the productivity slowdown in construction could account, almost entirely, for the long-run trajectory in US and OECD housing prices over the 1970s-2000s. The primary mechanism involved is that the costs of construction inputs are induced to rise by competition for inputs from growth in other, more productive, economic sectors. Simply put, over time producing houses is becoming relatively less efficient and more costly because the prices of factors of production are decided by the most non-housing productive sectors. This results in relative productivity increases in the most productive sector increasing costs for the least productive sector, with an eventual knock-on impact as higher output prices in that sector.

With respect to the causes of lower productivity

growth in construction, Abdel-Wahab and Vogl (2011) suggested that the sector has been less efficient in combining the factors of production than other sectors. The differences in labour productivity growth between construction and total industries can be largely explained by construction's poor TFP performance. Huang et al. (2009) reviewed various alternative explanations: insufficient R&D spending in construction, the typical labour-intensive nature of construction projects, and ongoing shortage of skilled workers. Galesi (2014) documented a downward trend in construction productivity relative to other industries since the 1960's, attributable in part to the shortages of skilled labour. In terms of the residential construction sector, Allen (1985) noted that single-family construction projects are relatively less intensive in skilled labour. Although the 'contrary' microeconomic estimates for Australia and NZ, noted above, caution a careful assessment of other studies, there can be no doubt that improving construction sector productivity in Australia has to continue to be a core action in any attempt to assuage rising housing costs and prices in the longer term.

5. Housing Attribute Outcomes, Capabilities and Human Capital

5.1 Housing as a Merit Good

Although rarely expressed in such terms, the advocacy of housing policies has, from the demolition of slums in 19th Century cities to current OECD calls for increased social rental housing provision, always involved two key arguments. There has been a straightforward merit good (redistributive) argument that ‘all’ deserve and ‘need’ some decent standard of housing at a rent or cost consistent with their low incomes. For instance, the current aim of Canada’s national housing strategy is that ‘by 2030, everyone in Canada has a home they can afford and meets their needs’. However, aims for achieving greater equality of opportunity (as much as simple income redistribution) have almost invariably underlain such policies. There have been longstanding beliefs expressed by communities, politicians, officials and experts in local and national housing policy debates that housing interventions to support better housing outcomes will not just be ‘fair’ but will also enable the development of individual and household capabilities. That is, they will enhance human capital and improve opportunity and productivity for the future.

This capabilities-productive human capital dimension of better housing outcomes has been implicitly accepted for so long by housing policy advocates (Donnison and Ungerson, 1982) that little attempt has been made within housing research to theorise and estimate transmission processes between housing outcomes and impacts on the formation and use of human capital. Equally, labour market specialists exploring human capital have done little to synthesise housing ‘effects’ on human capital, for instance the seminal work of Boeri and van Ours (2021) on imperfect labour markets mentions housing not once. An evidenced understanding how housing contributes to human capital and labour productivity has been long ignored as an explicit issue in housing

policy and research. Paradoxically, housing lobbies and policymakers have not evidenced what is often a core case for low income housing policies. Without undermining core ‘fairness’ arguments’ it is important to demonstrate, as well as believe, that better and more affordable homes and neighbourhoods foster higher levels of human capital with significant wellbeing and productivity effects.

5.2 Capabilities, Complexity and Confounding Causes

There are wide-ranging studies that support the core proposition that housing impacts resident labour force outcomes on health, education and labour productivity (Meen and Nygaard, 2010), particularly for children from low-income households and young people. Investment in social housing infrastructure in Australia has recently been argued to deliver productivity outcomes as well as essential redistributive services (Lawson et al., 2018; Flanagan et al., 2019). However, in reviewing the wider housing literature, there is an inescapable conclusion that the effects of better housing on productivity⁴ and the formation and use of human capital often lack rigorous empirical confirmation.

Undoubtedly this reflects the absence of policy questioning, review and research (not least because the issues cross the research funding silos of different specialist interests) in the topic area. It also reflects the complexity of the issues involved and the logic/causal chains involved. Housing is a complex commodity with, as stressed above multiple attribute outcomes. These attributes interact, singly or in combination, with other household attributes. Housing and neighbourhood choices are ineluctably linked so that ‘housing’, ‘neighbourhood’ and context effects need to be

4 The literature search confirmed, somewhat disappointingly, that these relationships are much more researched for animals, especially pigs and chickens, than poorer children.

disentangled and estimated. If concerns are with the present generation, or some particular life-cycle group, then analysing outcomes always has to recognise the importance of 'selection' effects. That is, households with low human capital will have low incomes and invariably have to select housing with poor quality attributes that will perpetuate their low human capital. One has to separate these 'selection' effects from aspects of the housing choices that further erode labour productivity (for instance 'address discrimination, discussed further below). However, when a life cycle perspective is taken then the ways in which the housing attributes selected by adults impact the capabilities of younger adults and children in the households becomes significant in equality of opportunity perspectives. Disentangling these effects requires clear estimation models, appropriate data and policymaker commitment to understanding programme outcomes.

Our review of the empirical literature presented below identifies important evidence across a range of housing, health and education research that makes a strong *prima facie* case that housing outcomes appear to be important in shaping labour productivity. But research rarely moves beyond the *prima facie* case to verify the housing attribute mechanisms involved and the weight of effects. Often the apparent significant of housing emerges from research geared to health and education and research where government sponsored research has been substantially better funded than in the housing sphere. Often, housing researchers are limited to reviewing results that other specialisms have led (and this paper reflects such an exercise!). It is challenging, therefore, to make definitive claims about which attributes of housing can be reasonably expected to affect the formation and use of human capital, and by which mechanisms, especially in the absence of a large evidence base of intervention studies (Dunn, 2020). In the research cited below our assessment is that the spatial housing-market effects in Section 6 are more firmly grounded than for Section 5 but are still quite mixed. Despite these reservations, that will only be

removed when research is funded to move from *prima facie* to definitive cases, it is useful to review research that underpins beliefs that could impact human capital.

MacLennan and colleagues have previously reviewed research on housing attributes that could exert an impact on human capital (MacLennan, 2008; MacLennan et al., 2015; MacLennan et al., 2018). The broad housing attribute outcomes-human capital-productivity framework was illustrated above in Figure 2 and this can be applied to how different housing outcomes (such as distance from workplaces, repair quality, insulation standards, space for home-working and homework, internet and other connectivity and neighbourhood context) could individually or jointly impact the well-established growth drivers of economic growth and productivity, (MacLennan et al., 2015; MacLennan et al., 2018). These outcomes were particularly crucial in the pandemic when houses became an important part of normal life. Reflecting the discussion above, the remainder of this section considers potential housing to human capital productivity effects across the life cycle that relate to housing quality and costs, tenure and residential spatial choices. Issues that spillover between housing and entrepreneurship are discussed in the section on 'Capital'.

5.3 Life Cycle, Housing Quality and Price Effects on Human Capital

The wellbeing and productivity of individuals can vary systematically over their life course as does their broad paths of learning and acquisition of skills and knowledge. The context, and personal control, of their housing situation also changes. Education and physical and mental health are widely established as significant influences on capabilities to acquire and use human capital and thus the productivity of labour. The critical question, in this context, is whether the attributes associated with housing choices impact labour productivity directly and, or via their indirect effects through

education, health and other outcomes. Quality and price/rent outcomes are considered first, then tenure effects. Spatial choice questions are considered in Section 6.

a) Quality and Price Effects

There is a longstanding and high quality literature that has established the statistical correlations of bad housing and ill health, of poor housing and poor education performance and indeed of poor health and education performance. These associations in themselves make a strong case for joint programme deliveries when governments aim to resolve the multiple-deprivations of individuals or areas. However, it is also important to establish causalities rather than simply correlations. This section of the paper highlights studies that achieve or come closer to that aim but is in no way exhaustive. The evidence cited is intended to make the point that poor housing outcomes may diminish capabilities and labour productivity and to highlight how such effects are rarely, formally and coherently integrated into housing policy decision taking.

The patterns of high housing costs relative to incomes on housing choices, especially for the poorest fifth of Australians but increasingly for households closer to average incomes, are well known and widely recognised as problematic (see Pawson et al., 2020). Similar patterns arise if affordability is assessed by residual incomes (especially equivalised for household size). Aside from reinforcing wealth inequalities and capabilities for wellbeing in old age (discussed in Maclennan et al., 2021d), housing price and rent outcomes have, over the last 30 years, increasingly reduced the residual incomes of poorer households. They have also impaired the economic capabilities and productivity of poorer Australians and effects on different age groups, where evidence is available, makes the point.

Children

The association between poor housing conditions and poor childhood development and school performance has become increasingly

well-established, supported by a diverse and growing body of academic evidence. Previous reviews of 'housing effects' (Maclennan, 2008; Maclennan et al. 2015) map out the various ways housing conditions could impact the capacity of children to develop human capital. Importantly, these reviews stress that housing affects childhood development in two ways (2015: 37): "through the direct impact of poor quality housing, and its concurrence (and therefore heightened impact) with other challenges— particularly low socio-economic status." Several features of poor housing have been empirically shown to shape children's development outcomes. This section adds some additional relevant references but reaches similar conclusions about the need to improve understandings of causality rather than correlations and to make the usually unmade link from poor housing outcomes to future lost earnings and productivity.

In the UK and the USA, as broad comparators to Australia, there is well established evidence on the association of poor housing outcomes on child health and education performance. In the UK it is estimated that well over 3.5 million children in Britain lived in bad housing in 2013 (Shelter, 2013). Substandard dwelling conditions, identified as overcrowding, temporary accommodation and fuel poverty, were regarded as the most problematic housing outcomes and children were expected to be most at risk from these difficulties, not least because they spend more time in the home than adults.

Using cross-sectional reviews, government sponsored research (ODPM, 2004) concluded that there were relatively weak relationships between overcrowding and aspects of the health of both children and adults and even more limited impacts of overcrowding on childhood development and education performance. However, by 2011, research using panel data for families and children identified stronger, negative and more concerning outcomes (Barnes et al., 2011). A significantly higher proportion of the population had incurred some period living in poor housing (a quarter of all children) and that those who had lived longer

and persistently in poor homes had more serious negative impacts (than well housed or shorter term poorly housed children). Children in poor housing were: less healthy (25% of children who persistently lived in poor conditions had a long-standing illness or disability compared to 19% of better housed children); less safe (29% of children had been bullied compared with 12% who avoided poor conditions); and had less access to a quiet space at home to do homework (12% of school-age children compared to 2% who avoided overcrowded accommodation). Logistic regression analysis established 'housing effects' by controlling for other factors. Duration effects for the study are reported in Barnes et al. (2011) that also reports the potential for childhood ill-health to translate into adulthood and lifelong health difficulties.

At much the same time the Urban Institute (2013) produced a comprehensive and concise review of housing effects on schooling in the USA. They reviewed research that suggested

- children who experience homelessness, or are living in overcrowded housing, have no space (as above) to complete homework assignments or may lack access to school supplies
- parents experiencing homelessness or residential instability may be unable to help children with their homework or be involved in school activities
- health problems arising from housing quality affect school attendance and impair academic progress; possible causality chains linked to (though problems of establishing causality remain) included
 - low-income children living in rundown public housing, with infestations of cockroaches, mice, and mould, suffering from high rates of asthma
 - lead poisoning, an attribute of low-quality housing, was associated with child development delays and poor educational outcomes
- Residential instability usually leads to

frequent school changes and children involved frequently lag other students by a year or more in reading and maths, with half of this difference attributed to mobility. The difficulty in interpreting this finding is whether parents moved their children because of a particular housing issue (such as eviction) or whether social and economic tiggers (a job change, a relationship break-up) triggered the shift; families affected by foreclosure move and change schools more frequently (Been et al., 2011; Comey and Grosz, 2011).

Regardless of the causes, school changes, often require the children, having broken bonds with students and staff at their prior location, to quickly adapt to new teachers, colleagues and curricula and lessons often stall at elementary skill levels. Teacher morale may be poor and teacher turnover high impacting overall school performance. In relation to Australia, Ong and Leishman (2020) conclude that frequent relocation has an impact on the learning outcomes of children and, sometimes, adults.

A recent study (Von Simson and Umblijs, 2020) for Norway, 2015-17, links detailed housing, and other environmental conditions, to school performance in national exams. Their results 'show that living in a crowded home, in rented accommodation, being exposed to high levels of noise and residential mobility is associated with poorer exam results. This negative correlation is stronger for older children'. They note that they cannot longer rule out that the negative association between renting and overcrowding is driven by unobserved cofounders. Residential mobility and noise pollution, on the other hand, remain negative effects on performance even after controlling for omitted variable bias.

The Urban Institute's short review also incorporates a useful summary the difficulties in moving beyond revealing strong correlations between bad housing and poor child education (and health outcomes) to equally strong conclusions about the causalities involved. The collinearities involved in processes of exclusion and disadvantage mean that confounding influences, referred to above, operate. These

difficulties are also encountered in unravelling complex neighbourhood influences on educational performance when other ‘selection effects’ are in play. Some studies, cited above for the UK and Norway, establish housing effects on health and education outcomes that are likely to impair wellbeing and human capital acquisition that will ultimately lead to lower productivity. There are further possible ‘housing’ effects, that improved data and research techniques could adequately test. However, too few governments, including in the UK, the USA and Australia have committed to understanding what good and bad housing actually does to the acquisition of human capital. Housing effects on labour productivity can often only be seen hazily through a veil of inadequately researched relationships⁵.

Research on these issues in Australia is well developed and has a high international standing. In a series of important Australian studies, Dockery et al. (2010; 2013) outline a lengthy list of housing conditions/attributes that are likely to impact child health and educational performance. It includes environmental allergens and toxicants; cleanliness, housing disrepair and safety; building height and opportunities for outdoor play; crowding; housing affordability; home ownership; and frequent residential moves and homelessness. Efforts to determine the significance of these impacts in Australia inevitably encounter difficulties with data inadequacies, but three studies have identified modest but statistically significant associations between these housing variables and the wellbeing and development of children (Dockery et al., 2010; 2013; Johnstone et al., 2014).

Overall, the Australian studies showed only minor health impacts on children from these housing variables, reflecting the relatively high quality of the Australian housing stock (although indigenous children were a notable exception in this regard). These studies also confirm that different variables affect children

in different ways. While allergens, toxicants, cleanliness and disrepair are linked to poor physical health, “it is the things likely to impact upon the quality of relationships—frequent moves, renting rather than owning and being in financial stress—that appear to impact upon children’s social and emotional wellbeing” (Dockery et al., 2013: 51). This is of particular concern given the link between these factors and housing affordability, which has secularly declined across Australia’s major cities in recent years, especially Greater Sydney. National research shows a growing number of children are now living in private rental housing and are likely to be in less secure housing circumstances, with increased overcrowding and this reflects the consequences of housing shortages and pressures.

Baker et al. (2016) conclude that the evidence on the ways that housing influences health in Australia is poorly developed because the majority of the population are accommodated in good quality housing. In consequence, they argue that households, and children, living in poor quality and unhealthy housing are disadvantaged both by the quality of their homes and policymaker neglect of the issues. Using the HILDA panel dataset, they convincingly estimate sizeable effects of bad housing on health for poorer Australian cohorts that suggest potentially greater negative effects than Dockrey’s earlier analysis. They also find that Australia’s urban mobility patterns have distinctive socio-economic qualities, which they describe as a ‘two-speed process’, whereby: the relatively well off and the upwardly mobile improve the areas in which they live or move to over an extended period, while the vulnerable make more frequent, multiple moves—living in less advantaged areas each time. With rising numbers of Australian children living in potentially insecure rental housing that absorbs more than 40% of household incomes, the risk of poor social, emotional and educational outcomes is increasing and undermining the development of human capital.

⁵ In most countries health and education policy areas research establish their efficacy claims more thoroughly than housing ministries.

Clair (2019) notes that research on housing and relationships with health and wellbeing has tended to focus on adult outcomes and the assessment of housing effects on children has been more limited and not focused on children's well-being more broadly defined. That said, research progress over the last decade makes a strong *prima facie* case that poor housing is not just associated with poor child outcomes but, in all probability, contributes to them. It is increasingly safe for policymakers to conclude that the wellbeing, educational performance and human capital development of Australia's children, particularly for households in poorer rental accommodation, is adversely affected by: housing affordability, reducing both the standard of the homes they live in and parental income for other support; poor physical quality of homes reducing health; and secure living arrangements raising early age residential mobility and disrupting educational and social development. It is time for Treasury's, and perhaps the Productivity Commission, to join up the dots and follow through on estimating the future consequences not simply of higher costs for public programmes for health, training etc but to begin to estimate the lost productivity tomorrow arising from bad housing for children today.

Teenagers

Many of the studies reported above, and indeed below, include teenagers. Research on housing and neighbourhood choices and effects has given attention to the importance of neighbourhood effects in shaping residents health, education, work and other key outcomes. Housing and neighbourhood choices are always conjoined with neighbourhood attributes that have significant impacts on housing choices and prices/rents. Neighbourhoods shape access to public and private services, social standing, social interactions and networks of social capital as well as a context for children to learn and develop (MacLennan et al., 2018).

As children progress into their teens, and become aware of their new autonomies, life outside the home and within immediate social networks and facilities becomes

important. Researchers have argued that neighbourhood social interactions may shape school performance, wider life aspirations and subsequently entry into the labour market. Living in poor places arguably reinforces poor educational performance through peer group effects and makes labour market entry more problematic. Many of these observations apply to all adults and not just teenagers.

The existence and impact negative 'neighbourhood effects' (also called 'area effects') arising in disadvantaged neighbourhoods is hotly debated, and the evidence remains mixed (Galster and Freidrichs, 2015). The importance of, and difficulties involved in, identifying such neighbourhood effects are discussed at length in Van Ham et al. (2013). Researchers are right to stress potentially confounding effects⁶.

Overall, the international literature "suggests small yet statistically significant impacts on poorer households residing in poor areas" (Atkinson, 2008). While it is notoriously difficult to isolate the influence of specific factors in this context, several Australian studies have reached similar conclusions, indicating neighbourhood characteristics have small but significant impacts on educational outcomes (Dockery et al., 2013; Johnstone et al., 2014). These studies show only a 'modest' effect, and the conclusions are subject to various caveats.

The evidence of productivity impacts from negative neighbourhood effects in Australia is not as well established as in the international literature. In part, this reflects the different socio-economic qualities of Australia's urban neighbourhoods compared to the US and the UK, where much of this research was conducted. In particular, disadvantage in Australia has traditionally been more dispersed, and dictated by housing tenure (and possibly household income) as much as neighbourhood

6 A real difficulty arises when governments use the 'confounding' arguments to dismiss potential policy actions and trim housing policy investments that might raise long-term productivity and then simply fail to research the key outstanding conceptual and empirical issues. This 'excuse' has frustrated the development of key evidence-informed work on how poor housing outcomes reduce productivity and enhance inequality.

location (Hulse and Pinnegar, 2015). However, the increasing suburbanisation of disadvantage, and the spatial segregation of low-income households in Australian cities, is now reinforcing locational disadvantage, as lower income residents are being forced to move further away from areas with good access to jobs, transport and services (as is further discussed in the next section). The Australian evidence suggests there are more signs of neighbourhood effects now hampering the education and productive early work behaviours of young Australians (Atkinson et al., 2011; Randolph and Tice, 2014; Pawson et al., 2015). The emergent spatial structures of metropolitan housing and labour markets poses problems of job access for less affluent households, and younger women in particular. Pawson et al. (2015: 1), summarising the results of a major study of Australian urban disadvantage concluded that 'Alongside its acknowledged negative social and economic impacts for residents directly impacted, there is a dawning recognition that growing spatial polarisation of our major cities impairs overall urban productivity, thus imposing costs on all'.

Adults

The discussion of earlier life-cycle stages has raised many of the associations, causal effects and methodological problems reported in wider population studies of poor housing, health and education and repetition is minimised here.

Economics research on economic development strategies for poorer economies has no difficulty in accepting causality chains running from housing improvement, to better health and higher productivity for adult workers (Cattaneo et al., 2009; Huq et al., 2014). This validates the emphasis of Baker et al. (2016), cited above, that Australia has to focus on the experience of poorer people and places to identify substantial (and productivity reducing) health effects. Arguably, this observation applies to all of the advanced economies that have seen rising spatial concentrations of the poorest, 'left-behind' households since the 1990's.

Extensive research identifies clear links between housing and health throughout the life cycle, establishing the poor health effects of common housing issues such as poor plumbing, heating (Howden-Chapman et al., 2012; Daniel et al., 2021) and ventilation, mould, pest infestations, overcrowding, unsafe buildings, and exposure to carbon monoxide, excessive noise, cigarette smoke and general in-building environmental conditions (see Marmot, 2010; Baker et al., 2013; Phibbs and Thompson, 2011; MacLennan et al., 2015 for overviews). As MacLennan et al. (2015) note, Australian Governments have been aware of these housing-health links and concern has been expressed regarding the significant productivity impacts associated with the health of the national workforce. For example, absenteeism and presenteeism associated with poor health were estimated to cost the Australian economy upwards of \$30 billion a year (PWC, 2010). However, the concern has not been manifested in housing investment actions that would reduce ill-health and raise labour market productivity and participation.

Rental housing affordability effects (although rental burdens have diminished slightly through the COVID-19 pandemic), by reducing residual incomes with associated health outcomes, have been significant over the last decade, especially in the capital cities. For example, in Sydney in 2016, households with income up to middle income levels paid an average of excess of \$6500 (more than 10% of post-tax incomes) over and above 30% of their incomes. As well as forcing lower income residents into poor quality dwellings featuring the range of issues noted above, declining housing affordability also affects health in other ways. As Baker et al. (2013: 2) put it, "the overarching means by which housing affects health in Australia at the population level, appears to be affordability."

In addition to the impacts on children already outlined, there is evidence that links living in precarious housing circumstances with worse health outcomes for all residents, including poor mental health (Mallett et al., 2011). Research also indicates that individuals place

a high importance on housing security and need to feel settled before they start looking for paid work (Hulse and Saugeres, 2008). Substance use problems are also associated with experiencing housing problems (AIHW, 2016). More widely, it is recognised that social capital performs an important range of functions for adults. It is a source of informal resources that promote individual development through strong social networks. The home is a critical site for the establishment and maintenance of social ties (Dunn, 2020). If one's home is not an appropriate site for participating in social relationships, then that shortcoming may mean the losses of resources that can be acquired through reciprocal social relations and collective efficacy. This links through to productivity. For instance, research in the USA and UK has highlighted how a major source of labour market information is knowledge of job opportunities passed on from working neighbours in social networks. Residents of neighbourhoods where few work or where there are limited weak social networks will be disadvantaged.

Health, education and housing and neighbourhood quality issues are also linked to urban planning and the distribution of housing across the broader urban area. Past research shows considerable health gains flowing from city planning that encourages a compact city—namely, a city of short distances that promotes increased residential density, mixed land use, proximate and enhanced public transport, and an urban form that encourages cycling and walking (Kent et al., 2011; Stevenson et al., 2016). Notably, this compact and connected urban form is rare in the outer suburban areas where lower income residents are now increasingly concentrated. Over the last few years there has been a momentum to prioritising '10-15 minute neighbourhoods', (with international debates widely discussing the 'Melbourne model'), as a means to better health outcomes and sustainable development goals. However, the perceived inabilities of high-density places in avoiding and coping with the COVID-19 pandemic has questioned density effects as being problematic. Undoubtedly the COVID-19 experience has made it very clear

that housing and neighbourhood arrangements have significantly impacted infection rates and the ability of households to adapt to the pandemic. For many, the issue of poor-quality housing in poor neighbourhoods became about tolerable survival rather than simply productivity. Clearly, through health effects, housing systems are acute shapers of how societies and economies will cope with future pandemics and their productivity consequences.

Households choose more than the physical quality of their units and the key features of their neighbourhoods when they make housing choices. Housing economics has long stressed the importance of tenure and locational choices. Spatial choices and their impacts on housing-labour market interactions are discussed further below and tenure effects are presented briefly here.

b) Tenure

The consequences of choosing homeownership over renting for wealth accumulation and the potential for using housing wealth as collateral for productive business investment are discussed at length in section 7 below. Here the focus is on housing tenure choices and possible impacts on labour productivity.

A substantial body of studies have shown that children of homeowners have educational and related outcomes more conducive to developing human capital. In summary: they receive better school grades (see, Barker and Miller, 2009; Haurin et al., 2002); have higher rates of high school graduation (see e.g. Aaronson, 2000; Green and White, 1997); are better behaved (see e.g. Boyle, 2002; Cairney, 2005; Grinstein-Weiss et al., 2012; Haurin et al., 2002); and have lower rates of criminal conviction and have higher likelihood of being on welfare (Blau et al., 2019).

For adults, homeownership could bring positive benefits to individual subjective well-being and capabilities to learn better. Several mechanisms by which homeownership might exert such effects: on life satisfaction, on self-esteem through a sense of status, and on sense of

control via the experience of freedom at home (Andersen, 2011; Ben-Shahar, 2007; Bloze and Skak, 2012; Diaz-Serrano, 2009; Hansen and Skak, 2008; Manturuk, 2012; Lindblad and Quercia, 2015; Rohe and Stegman, 1994).

However, as for housing and neighbourhood quality effects, a few studies disentangle the interaction and selection aspects of socio-economic characteristics, housing tenure and neighbourhood effects. They tend to find that the differences in mental health across tenures were most likely a product of the characteristics of people by tenure rather than the result of any causal effect of tenure (Baker et al., 2013; Bucchianeri, 2009). There is no research that provides definitive evidence that the attribute of home-ownership per se raises human capital formation.

It has been well established by previous research that private renters exhibit higher residential mobility rates than those in other tenures, such as homeowners and renters in social housing. The extent to which this may involve recurrent disruption, especially for low income renters, to schooling and destruction of helpful neighbourhood social networks was noted above. However, there are also significant studies that confirm how, for a wide range of income groups, quick access market rental housing facilitates labour mobility across, as well as within, different housing markets and promotes effective, productive economic adjustments (see Whelan and Parkinson, 2017).

There may also be productivity implications of the ways on which rising house price pressures have changed life-cycle tenure choice patterns, and especially the reduction in home ownership rates since the mid-1990's. Home ownership rates are declining in Australia for all age cohorts under 60 and increasing numbers of Australians are living in private rental housing (Eslake, 2017; Janda, 2017). This shift is particularly noticeable for the traditional 'first home-owner' demographic – those aged between 25-39 (Stiles, 2017). Many young Australians are renting for longer before buying. This has a

number of potential productivity impacts. On the one hand, this extended period of private rental may make urban labour markets more flexible and efficient, as workers, unhindered by housing transaction costs, are more likely to maximise their productivity levels by moving to wherever the best work opportunities are available. On the other hand, that same mobility associated with renting may mean it is easier for skilled workers to quit metropolitan locations if they no longer present affordable lifestyle options meeting aspirations (Brook, 2017). A 'brain drain' effect of this kind would have clear productivity implications and it is discussed in more detail in Section 6.

Younger Australians are not the only demographics whose work-leisure choices are being reshaped by diminishing housing affordability. The housing market also shapes the economic behaviour of older Australians, especially those who have taken mortgages later into their life-cycle. Research suggests the growth in house prices may have some productivity benefits, as "rising levels of mortgage indebtedness appear to be extending working lives...[which] will help mitigate declining rates of employment and productivity slowdown due to population ageing" (Cigdem-Bayram et al., 2017: 1). At the same time, however, for those who fortunate enough to have accrued significant housing wealth, rising house prices can have counterproductive effects on labour market participation. Recent AHURI research shows that "higher house price growth leads to a reduction in labour market participation and hours of work for older women (precipitating early retirement) and younger partnered couples (substituting from market work to non-market carer activities)" (Atalay et al., 2016: 54). The significant growth in housing wealth of many Australian homeowners thus also has the potential to reduce labour supply, prompting Atalay et al. (2016: 54) to conclude that "policies that dampen house price inflation (e.g. new housing supply) may also contribute to labour force productivity growth." Further research exploring the balance of these different effects is required.

6. Housing Market Outcomes and Agglomeration Economies

Neighbourhoods are key elements of the place and space systems within cities and regions and the previous section indicates roles, or potential roles, of housing neighbourhoods in shaping the development of human capital. In this section we focus on wider spatial patterns within metropolitan and regional economies that consider how the separation of homes and neighbourhoods, reflecting housing choices, from work locations impacts the functioning or urban labour markets and labour productivity. Traditional urban economic models have raised such concerns. The commuting costs associated with residential location choices involve not just travel but time costs and travel time involves lost time for work inputs. Such effects are widely measured in transport investment studies (as a productivity loss, often to be addressed by increased transport investment; housing investment cases often omit the gains from locating closer to work). Housing-labour market mismatches, where the separation of homes and workplaces cause concerns regarding the burden of worker commuting and local labour shortages have been established as being important in some contexts (see, for example, Houston, 2005). Differences in housing costs and amenities between regions have also been long identified as frustrating growth enhancing labour mobilities (Murphy and Muellbauer, 1994).

Over the last two decades, however, there has been a renewed and mainstream interest in how agglomeration economies impact the productivity of major metropolitan areas and, more recently, in how housing systems may either reinforce such processes by providing appropriate mixes of homes and locations for skilled workers or consume the gains from productivity growth in rising housing prices and rents. Within the discussion of agglomeration economies and productivity this section, after briefly summarising key aspects of agglomeration economies, examines Housing Prices and Suboptimal Labour Allocation,

Housing Supply and Suboptimal Labour Allocation and, finally, Housing Prices and the Induced-location of Firms.

6.1 Agglomeration Economies and Metropolitan Productivity

Economists have long been aware (since Alfred Marshall in the 1860's) that the scale and density of economic activity within metropolitan areas may create a series of productivity gains that are not due to increasing returns to scale within firms but are attributable to city size. They have developed models related to the concentration of various types of sector firms and production factors (labour, skilled labour, innovators) in a city and the consequent generation of urban advantages of high density. The classification of agglomeration mechanisms which is most often used in the empirical literature is due to Marshall (1890), who described three mechanisms: labour market pooling, input sharing and knowledge spillovers as the main sources of agglomeration economies. Duranton and Puga (2004) added, in a slightly different classification, city market matching mechanisms that facilitating higher-quality matches between workers (supplying labour) and firms (demanding labour) as a key agglomeration mechanism.

Researchers, and policymakers, have explored agglomeration processes and outcomes in relation to two key urban processes, namely innovation and labour market functioning. In relation to innovation, the propinquity of major strategic service providers, the possibility of serendipitous social contact potential collaborators and accessibility to face to face contact required for key decisions when contracts are incomplete (as is often the case in innovation) are key 'innovation' economies. In that view, agglomeration economies benefit workers in innovation clusters through making them more productive, although measuring this effect can be difficult (Carlino and Kerr,

2014). Empirically, Moretti (2019) examined the location of U.S. patent inventors over time and concluded that if inventors were to be distributed evenly across the United States, their overall patenting rate would decline by 11% since gains from bigger clusters outweighs losses from smaller clusters. There are, often unrecognised, housing dimensions to creative and innovative processes within cities. Miao (2016) reports on the importance of appropriate homes and neighbourhoods for attracting and retaining knowledge sector workers and this connects to the housing and neighbourhood requirements for Richard Florida's (Florida, 2002) creative class. Whether framed as the 'creative class' (Florida) or skilled workers (Glaeser) housing quality, price and location play clear roles in such growth enhancing processes.

The bulk of this section deals with the second key application of the 'agglomeration economy' namely to understand the productivity benefits that firms, and workers, capture from the agglomeration of labour. The core idea is straightforward: denser, or 'thicker', labour markets within metropolitan areas mean that firms can, with low search and hiring costs, quickly hire (and replace) workers that have the very specific skills they require. Better skill-job match raises productivity. Workers, in turn, are able to move, without incurring the transactions costs of changing residential locations, to the jobs for which they have particular skills for or interests in. In consequence the labour market works more efficiently. Related, dynamic effects on worker productivity may arise. Rotemberg and Saloner (2000), observed that workers were more likely to undertake investment in human capital in thick labour markets as in a thin/small labour market, workers who invested in acquiring skills have weak bargaining power with local employers unless they were willing to undertake costly relocations. De la Roca and Puga (2012) provided evidence that workers tended to accumulate more valuable knowledge in larger cities leading to faster earnings growth.

Studies related to workers' skills have highlighted their importance in fostering the

growth of cities and the divergence of regional economies (Berry and Glaeser, 2005; Scott, 2010). In particular, a thick labour market, defined as a large number of employers and of workers being in close proximity to one another, represents a source of agglomeration economies by reducing employee search costs, increasing churning rates, and improving the likelihood of strong matches between workers and firms with respect to skills and tasks (Abel and Deitz, 2015; Albrizio and Nicoletti, 2016; Bleakley and Lin, 2012). The better the match, the higher the productivity of an enterprise will be. Rosenthal and Strange (2001) found that labour market pooling was the most important agglomeration mechanism at work. Hence, a diverse composition of skill levels and types in a dense local labour pool is a key feature accounting for city or regional competitiveness (Baccolod et al., 2009) and increases the overall stock of human capital (Kelly and Mares, 2013). In contrast, moving away from dense employment localities, and innovation centres, is likely to reduce labour productivity and entrepreneurial activities such as new business start-ups (Ong and Leishman, 2020).

The assumed (and sometimes identified) existence of these agglomeration effects has underpinned post-1990's policy thinking that metropolitan areas are the productivity drivers of economies. Around the start of this millennium, large metropolitan areas analysed in a range of studies (see Strange. W. C., 2019) tended to have productivity rates 5-10% above their national averages. In recent years this effect seems to have been diminishing, for instance the New Zealand Treasury have reported that by 2019 that Auckland, having long-led national productivity performance had, through the 2010's slipped back to the national average. MacLennan et al. (2016) suggested that housing 'congestion' costs in some Australian metropolitan areas, reflected in particular housing affordability and supply difficulties, may be attenuating these metropolitan productivity advantages. Leishman et al. (2021) have explored these effects for Australian cities more fully and suggest this is now a significant concern for economic growth and productivity

in Australia. Some of these shifts are consistent with some of the theoretical predictions of core economic models (Glaeser and Gottlieb, 2009) although Maclennan and Miao (2019) suggest a more applied economic framing addressing the real features of metropolitan housing systems is required.

As yet many of the strong claims of city agglomeration effects have relied on fragmented evidence and not generally been augmented by carefully designed longitudinal studies. Many, or perhaps most, empirical studies have been plagued by identification and endogeneity problems given the dual causality between city scale and migration of high productivity individuals. There are also possible, confounding, endogeneities between personal characteristics such as creativity and entrepreneurship and the presence of urban amenities highly valued by the creative class/skilled labour that can only be provided efficiently in cities of sufficient scale. Despite the major policy impacts of Florida's and Glaeser's, respectively, 'creative class' and 'skilled worker' arguments in shaping urban policies there have been remarkably few rigorous studies of housing market requirements and impacts on productivity. Does gentrification improve city productivity? Are rising real house prices (widely used as an unqualified indicator of city economic success) eroding short and long-term metropolitan productivity gains?

Systematic empirical research has not yet addressed key questions regarding how housing market outcomes in metropolitan areas are now inducing the shift of productive labour away from core cities to remoter suburbs and towns as they seek housing tenures, sizes and lifestyles beyond their means in the most productive places. The impacts of COVID-19 in raised (at least in the first year of the pandemic) such flows as workers became less tied to workplace locations and more oriented to housing/neighbourhood amenity and space. However, such shifts were well-established pre-COVID. Metropolitan housing shortages with rising housing costs and narrowing housing choices (reinforced by some of the

density/commuting effects of COVID-19) may now be driving, with recursive housing effects, patterns of economic growth that may constrain metropolitan productivity. There is scattered research evidence to address these important concerns and the sub-sections below review what is available.

6.2 Housing Prices and Suboptimal Labour Allocation

Rising housing prices exert influence on the skills distribution in labour markets within and between metropolitan places. In job-rich areas, housing tends to become unaffordable, thus households seek alternative housing opportunities in more affordable but as a result, less central locations (Ong and Leishman, 2020). In order to access cheaper housing with lower land costs, lower and middle-income home-owners who are disproportionately occupied by low-end and intermediate skills have increasingly located on cheaper land at the edge suburbs of metropolitan areas (Hulchanski, 2011; Bailey and Minton, 2018). While the high-income households can decide where to locate based on their location preference, the low-income households are left in locations where they can afford to live (Voith and Gyourko, 2002; Gyourko et al., 2013).

Van den Nouwelant et al. (2016) examined the extent of the 'spatial mismatch' between Australia's central cities, where many lower income jobs are located, and the more dispersed locations where most lower income workers live. They concluded that even in Sydney, up to 2015, the supply of lower-income labour to the central city is still generally 'thick'. However, there were then some potential warning signs emerging in relation to specific industries. This research suggests central-city businesses, on the whole, are not currently constrained by a shortage of high-quality workers for lower income jobs. A sustained supply of short-term workers (often immigrants), lifestyle choices and professional benefits, and good transport links—have insulated businesses from the effects of high housing costs to a great extent. However,

there were signs of constraints, particularly in the hospitality sector, that suggested labour market thickness is being affected by housing costs. By 2018 pressures in relation to public service workers has become apparent and business concerns about labour supply had grown significantly before the outbreak of COVID-19 in March 2020. As well as potential impacts on specific industries like hospitality, the housing 'strains' Kelly and Mares (2013) described in Australian metropolitan areas, affect the potential productivity certain groups more than others. Younger women are one such group, as they continue to take on the majority of parenting responsibilities. Limited childcare options can restrict parents to roles within a short commute from home, even if these are lower paid positions that do not take advantage of their full skill set (Kelly and Mares, 2013). This 'spatial leash' (Williams et al., 2009) has a negative impact on individual careers, and if it results in the best quality candidates being unavailable to fill the most highly skilled roles, can have negative productivity effects on the metro-wide economy. For those who can venture further from home to access the best job opportunities, this can often mean a lengthy commute.

The metropolitan economy consequences of these housing pressures leading to longer commuting have been well documented in a growing range of metropolitan areas. Duffy et al. (2005) reported that housing in Dublin emerged as an important infrastructural constraint affecting the overall labour market in Ireland. Employees with high-level qualifications and high incomes lived close to the centre of cities, while low-skill and low-income people tended to live further from the centre, due to the unaffordability of housing in the centre of cities. The Toronto Board of Trade (2021) confirmed that rising housing costs ahead of wage rates were pushing workers into longer commutes and indeed out of the metropolitan area with negative consequences for business costs and productivity.

These Toronto results were consistent with those for the Greater Sydney Area reported

by Maclellan et al. (2019) who established how housing costs in the Greater Sydney Area forced middle income households away from major job concentrations. They then designed a system 'shock' that would improve housing outcomes in terms of rental affordability and accessibility to employment density. The first-round improvements of the shock in terms of saved travel times and permanent incomes, were then modelled in a standard CGE model (similar to conventional modelling of transport investments). Providing better housing outcomes, in these terms, had significant effects on labour productivity for Sydney, New South Wales and the Australian economy (Maclellan et al., 2019). Maclellan et al., in effect, augmented conventional analysis of travel time effects and confirmed the even greater losses in productivity incurred as pushing workers away from high job density locations led to a thinning of their, and employers, labour market choices thus diminishing labour productivity and potential career earnings. That is rising housing costs diminished the potency of agglomeration related productivity and reduced GDP per capita for the long term. Other productivity reducing labour market effects may also arise. For example, Van Ommeren and Gutiérrez-i-Puigarnau (2011) found that short commutes reduce absenteeism by 15–20%, and that this is "consistent with extended urban efficiency wage models".

This changing pattern of where metropolitan labour lives has also been discernible more widely in Australia for at least the last decade. Kelly and Mares (2013) noted that labour supplies had become increasingly concentrated (more rapidly than jobs) in suburbs, particularly outer suburbs of Australia's biggest cities. Residents could reach fewer than 10% of all metropolitan jobs with a reasonable commuting time. Changing job patterns, in relation to skills requirements, reinforced these effects. Kelly and Mares note that the Australian economy has been characterised by two significant trends: one was the agglomeration of knowledge-intensive activities predominantly in the centre of largest cities and the other was increasing skill levels and specialisation

of jobs throughout the economy across cities. Although knowledge-intensive activities were a modest proportion of all jobs in most cities, they were particularly important for processes of innovation and productivity growth. Learning and matching processes appear to be particularly relevant to knowledge-intensive activities since they rely heavily on face-to-face communication to generate innovative ideas. Expanding the labour pool accessible to knowledge-intensive firms, for both higher and lower skilled roles, would not only improve productivity, but make opportunities in these firms accessible to a broader proportion of the city's workers.

Long commuting between workplace and home has been growing in many metropolitan areas in the OECD and is likely to have the negative productivity effects noted above (with estimates of lost productivity heightened if environmental damage and lost natural capital as a result of commuting were to be included). There is evidence that traffic congestion impedes metropolitan economic growth, however researchers have suggested two caveats. First traffic congestion diseconomies of scale seem to occur at very high levels of urbanisation (Leishman et al., 2021). Second, the relationship between metropolitan economic activity and traffic congestion is complex and unclear (Taylor, 2002), though housing roles and outcomes in these processes were not widely explored in the results discussed below.

Using panel data for 88 US metropolitan statistical areas, Sweet (2014) suggested that congestion slowed job growth and higher levels of congestion appeared to be associated with slower productivity growth per worker. Jin and Rafferty (2017) also noted that traffic congestion growth negatively affects income growth and employment growth in 86 US metropolitan areas. Severe traffic congestion consequently has negative effects on metropolitan economies. By contrast, Marshall and Dumbaugh's (2020) results showed that economic productivity is not significantly negatively impacted by high levels of traffic congestion in metropolitan statistical areas.

They asserted that traffic congestion could be positively associated with economic outcomes and not the limiting factor it is often considered to be. Traffic congestion is invariably seen as a 'transport system' requiring a transport policy solution, whereas the spatial pattern, price and availability of housing equally shapes the locational mismatch that commuting, with consequent congestion, reflects.

Rising house prices, as noted in Section 5 above, may also jeopardise the thickness of labour market through influencing migration across metropolitan borders. New high-productivity jobs are concentrated in higher-housing-cost metropolitan areas that attract higher-skilled workers, whereas lower-skilled workers are increasingly concentrated in lower-opportunity regions (Acolin and Wachter, 2017). There is also a general lack of evidence on relocation decisions taken by lower skilled workers in response to the disutility of long commuting times and unaffordable housing conditions, available evidence suggest it is likely that there is a feedback effect to productivity.

Rabe and Taylor (2012) reported that differences in house price levels in the UK are important determinants of homeowners' migration. In that case, high house prices prevent labour markets from adjusting through migration (Meen and Nygaard, 2010). The view that high housing costs reduce in-migration would appear uncontroversial (Hämäläinen and Böckerman, 2004; Meen and Nygaard, 2010). The important exception in Australia is that the most expensive, least affordable cities (Sydney and Melbourne) attract a disproportionate share of net overseas migration. The fairness implications of that outcome may be questionable but post-COVID with immigration at a standstill there may, through to 2025 be significant implications for labour supply in metropolitan Australia (and indeed Canada).

Past empirical evidence suggests that high house prices do not always induce migration outflows of workers from 'hot' housing markets (Hämäläinen and Böckerman, 2004). Flows may depend on the expectations of particular groups of workers regarding the likely future

trajectory of house prices in relation to their income growth expectations. What may now be different is that younger and lower income workers have experienced relatively flat entry wages and wage growth over the last decade that has diminished their expectations of a housing quality and tenure life cycle progression available to similar, earlier cohorts of workers. Key public service workers, for example, are often not highly paid and they become excluded from access to the core population and employment localities where they are most needed (MacLennan et al., 2019; Ong and Leishman, 2020). At the level of the metropolitan area as a whole these effects may raise quit rates, raised by the growing possibilities of working from home and online, from the most pressured metropolitan areas. There is growing statistical evidence that such processes are already impacting cities such as Sydney, London, Toronto and Los Angeles where they have been upward shifts in the rate of 25-40-year-old workers leaving the metropolitan areas for smaller cities and towns as a result of frustrated demands for housing tenures and sizes/qualities consistent with their life-cycle stage and expectations (Saks, 2008).

Housing unaffordability in metropolitan areas has increased the attractiveness of locating in next-tier cities, even for the elites (Chen et al., 2018). In Causa and Pichelmann's research (2020), housing-related reasons (41% on average) or family-related reasons (34% on average) accounted for the majority of moves whereas employment-related reasons explained a much smaller share, 9% on average. Nunns (2020) reported that rising house price diverted labour away from high-productivity regions in New Zealand, in particular Auckland and Wellington, to move to other New Zealand cities and Australia with more affordable housing.

Housing prices may represent complex push and pull factors for mobility (Haas and Osland, 2014) but there has been a consistent pattern emerging across many advanced economy cities. Rising housing costs and housing shortages in a metropolis could crowd out

certain types of labour. Housing poverty and unaffordability are becoming acute problems for low-skilled and low-wage migrants in metropolitan cities. Low-skilled migrants are engaged in the lower-end industries, and their income level and housing affordability are therefore below the average of permanent residents and high-skilled migrants (Grogger and Hanson, 2011). Rising housing prices in high-income areas deter low-skill migration, which have eroded the gains from migration. High-skill workers move to high-income places and low-skill workers leave (Ganong and Shoag, 2017).

The broad patterns of change in housing costs that impact labour productivity are becoming quite clear. If housing is affordable for middle and lower income workers only on the periphery of a given metropolitan area, or outside this, the spatial mismatch between places of work and residence grows. Growing mismatch raises losses from commuting and undermines the productivity gains arising from the thickness of particular local labour markets. Even worse for local and national productivity, it may induce workers to relocate elsewhere. This results in a suboptimal allocation of labour, as least cost locations are not the same as this that will maximise innovation and productivity for the long term, that will depress productivity in the metropolitan level (Been et al., 2019; MacLennan et al., 2015; MacLennan et al., 2018) and nationally (Hsieh and Moretti, 2019). Conversely, making mobility easier has positive implications by enhancing the functioning of the labour market through the job-matching process and therefore the efficient allocation of human resources (Causa et al., 2019), which can be linked to enhance labour productivity.

6.3 Housing Supply and Suboptimal Labour Allocation

Over the last decade, as house prices have grown, there is another strand of housing economics research that emphasised the role that housing supply constraints and the induced housing shortages has played in subsequent in suboptimal labour allocation.

Policymakers with responsibilities on the demand side of the housing system, anxious to avoid interpretation of the causes of house price inflation as being attributable to pro-housing tax breaks or monetary policy effects, have been quick to highlight supply side shortages as the key shaper of house price increases. And within the 'supply side explanations' there has been a willingness to argue, almost everywhere and always, that 'planning' is the key inelasticity. As we noted previously, planning may be problematic in some places but potentially positive in others and that much more informed evidence on the nature of regional/metropolitan/local supply chains is required. Supply side constraints will exacerbate the mismatch effects noted above. For instance, workers in areas with tighter restrictions on housing supply are more likely to be locationally mismatched and have to commute further, implying longer commutes (Cheshire et al., 2018). Housing economics has long recognised that housing supply is price inelastic and the complex supply chains involved in providing housing were discussed above. Housing shortages are not always attributable to housing supply regulations and planning policies: infrastructure and skilled labour shortages and strategic market behaviours of landowners and developers also owning land may also matter. Whatever the source of inelasticity, they are likely to amplify skill mismatch and decreasing labour market efficiency through suboptimal labour allocation (Causa et al., 2019; McGowan and Andrews, 2017).

Glaeser and Gottlieb (2009) and Glaeser and Gyourko (2018), using the framework of general spatial equilibrium models (that is critiqued in Maclennan et al. (2018)) demonstrate that differences in housing supply elasticity across different places can have a large impact on how housing prices and population growth in cities and how they respond to positive shocks from productivity growth. Consistent with this conclusion, Hsieh and Moretti (2019) explored US metropolitan-area-level data between 1964 and 2009 and found that highly productive cities actually grew less than expected

(see discussion above). They explain these variations, and essentially how rising housing costs eat into productivity gains, as arising from supply elasticity differences that they attribute to land planning and zoning.

The key point, regardless of the specific cause of sluggish supply, is that house price increases drive jobs out of the most productive locations (and Maclennan, Ong and Wood highlighted that as a key question for Australian cities in their 2016 report to AHURI: it has not been followed up). There is need to have regard to demand side stimuli, including tax and monetary policies, that raise housing demand and reinforce upswings. But the supply side explanation remains convincing. However, like Glaeser and Gottlieb (2009) and Glaeser and Gyourko (2019), Hsieh and Moretti see supply inelasticity, and consequent misallocation of production and labour supply, as arising mainly and directly from planning regulations and decisions. In a way this is unsurprising as their research framework, assumes well informed decision takers and free functioning markets without any embedded market failures. In consequence, with central banks absolved from any inflationary effects on housing prices, the fiscal system unremarked upon as a source of demand and supply distortions, the supply side becomes the problem and Glaeser et al. can then readily lay the blame for 4 decades of house price inflation at the doors on municipal (and State) planning decisions.

Supply chain analysis for cities and states in Australia, and elsewhere is not systematically available. Expert and industry conversations, whilst concerned about the costs and benefits of planning decisions, take a much wider scan of the supply side problems, that include: skilled labour shortages; labour regulations; materials shortages; inadequately resourced metropolitan infrastructure decisions; vertical fiscal imbalances restricting the budgets of metropolitan governments. Evidence on the supply side effects of such influences is badly needed related to housing to shape a more effective housing market supply system for Australia that will better co-locate productivity

and housing affordability. The potential gains could be substantial. For the USA, it is estimated that real GDP could be nearly 9% higher if there were plentiful new construction in just the three high productivity markets of New York, San Francisco and San Jose (Hsieh and Moretti, 2019). Glaeser and Gyourko (2018) have suggested that Hsieh and Moretti overestimated the costs of labour misallocation caused by land used restrictions in metropolitan cities, and they suggest a much lower effect of around 4%. That magnitude is not unimportant, whatever the cause.

The increased supply aim is supported by the evidence, the means to achieve it is not well-established and similar questions can be applied to the studies cited below. There is a growing tendency in mainstream economics to simply assume that planning regulations are the cause of supply inelasticity. Similarly, Ganong and Shoag (2017) and Shoag (2019) argue that stringent restrictions on housing supply have made the most productive labour markets in America inaccessible for many people. These restrictions appeared to have raised house prices, reduced construction, reduced the elasticity of housing supply, made high-wage places unaffordable to less-educated workers, so workers without a college education are now moving away from the places which could offer them the highest wages and their children the best later-life outcomes.

Restricted housing supply in developed metropolitan regions is near universal. In New Zealand, Nunns (2020) calibrated a spatial equilibrium model (that sees no positive gains from planning) using regional economic data for the 2000-2016 period and found that if the constraints to housing supply had been removed, the total economic output would have increased by up to 7.7%, implying increased output per-worker output by 0.9%.

There is some evidence that suggests different patterns and explanations. Turrell et al. (2018) found, in the UK, that the mismatch effect of housing supply restrictions on productivity had disappeared after the end of 2012. If the effects of housing supply restrictions on labour

mobility is true, one would expect a diminished response of migration to labour demand shocks. However, Zabel (2012) found that migration flows into and out of metropolitan areas in response to a demand shock were larger in areas with a lower elasticity of housing supply or a higher average initial price level, whereas migration flows did not seem to respond more to demand shocks in more elastic areas (Gyourko and Molloy, 2015).

The spatial aspects of housing choices and their relationships to labour market opportunities remains a key dimension of metropolitan economies that may influence productivity and that may be significantly impacted by COVID-19. This is a strong policy concern with a very weak evidence base.

6.4 Housing Prices and the Induced-location of Firms

In Marshall's agglomeration theory (1890), industries in strong clusters have higher job densities and wage growth, and higher start-up rates and patenting rates; industry performance is enhanced by clusters in the same region, and by the presence of similar clusters in adjacent regions. It is reported that inter alia the scale of local demand, the cost and the quality of the local labour force and the presence of agglomeration economies are all at work facilitating new firm births (Glaeser et al., 2010).

Traditionally, firms tend to cluster to enjoy the benefits from agglomeration economies, while the housing in these clusters is not affordable for workers, especially for firms in tertiary industries. Housing prices would influence the extent to which firms benefit from the agglomeration of labour.

This job-housing mismatch phenomenon in mega-cities has been well documented in urban economics. Making some productive places inaccessible for certain kinds of cohorts, as discussed above, may lead to labour misallocation. For these minorities, housing market characteristics and problems related to labour market accessibility may then add to the frictions and inefficiency already existing

in labour markets. This result may augment the problems related to gaining suitable employment for some firms or industries (Haas and Osland, 2014).

A mechanism involved is that with rising housing costs imposed on workers as a result of metropolitan growth, households may not be able to move into an area that would offer them the potential to earn a higher wage. This then means that potential benefits from agglomeration accrue neither to firms nor their employees but to those who own the scarce factors of production in the metropolitan economy, namely the owners of land and properties (MacLennan and Miao, 2017). Some firms are then unable to expand employment and output because workers' housing is simply too expensive. Firms then face the choice of relocating within or away from their present metropolitan home. This process may be particularly acute if the benefits of higher productivity through agglomeration are not distributed uniformly in the workforce but are, instead, concentrated on a subset or cohorts of workers with higher levels of human capital (the 'creative class' of productive worker alluded to earlier). If this is the case, productivity gains lead to higher wages for a subset, but capitalisation into higher land and housing prices is a process that affects all workers. Those not sharing in the higher wage levels arising from agglomeration nevertheless face higher housing costs, and may be displaced (see Nygaard et al., 2021, forthcoming).

In addition, rising house prices may change the composition and skill mix of the population within these metropolitan areas, which means the skills of the local workforce will change, thereby altering the industrial composition of local firms as well (Saks, 2008). There is emerging evidence that rural counties have increasingly attracted some businesses from urban counties in some metropolitan areas (Rupasingha and Marre, 2020). New establishments have tended to avoid locations with longer commuting times and congested traffic conditions (Chin, 2020). It would appear that some of the housing cost pressures on

households to leave more central housing locations have been, for different reasons, been a precursor to some of the immediate housing market consequences of COVID-19. Before COVID, and after the pandemic has subsided the problem remains that high housing costs may be driving workers and firms out of the potentially most-productive locations in our economies. There needs to be much stronger policy understanding and action to shape housing outcomes and policies are designed to foster rather than hamper productivity. A new awareness of the importance of housing in metropolitan economies is required.

7. Housing System Outcomes and Capital

7.1 House Prices and Capital Allocation: Macroeconomic Perspectives

In a competitive, market economy the allocation and reallocation of labour and capital to the firms that can use it most effectively is an important determinant of aggregate productivity (Andrews and Cingano, 2014; Hsieh and Klenow, 2009; Restuccia and Rogerson, 2017). Price signals in markets play critical roles in reallocating resources to optimise productivity (Cette et al., 2016; Hsieh and Klenow, 2009).

Housing prices, in shaping where the overall metropolitan or national economy uses its capital, are likely to exert significant effects on the real economy through capital allocation effects on productivity. House price increases are an important characteristic, or outcome attribute of a property that have significant recursive effects on capital allocation in the economy. These effects occur through the different transmission channels identified in the accompanying paper on monetary policy effects (MacLennan, Leishman, Goyal and Long, 2021). In general, rising housing prices impact resource allocation through both the collateral channel (households using their increased housing wealth to take additional borrowing to fund non-housing investments) and the investment channel or crowding-out channel (where there is diversion of investment flows to housing from other, more productive, innovative or entrepreneurial, destinations such as business start-ups or rapidly growing businesses or economic sectors).

The fundamental basis of capital reallocation from housing stems from its nature and function as an asset. Housing values shape housing wealth and that wealth then significantly influences further borrowing capacity. That capacity may then be used by the household to impact business investment. For one thing,

higher housing values mean a higher collateral value that enables potential entrepreneurs and directors in firms to relax borrowing constraints and have better access to credit in the case of small businesses and start-ups. Rising housing prices can increase asset values which can be used to mortgage, relieve financing constraints, and expand the scale of credit and investment. Supernormal profits may also attract manufacturing enterprises to purchase land. As collateral values increase along with house price appreciation, corporations with more collateral value are less financially constrained and thus may be able to obtain more finance for investment in the less productive activities which impairs their aggregate productivity, or their pursuit of more productive and innovative projects.

7.2 The Collateral Channel and Capital Accumulation

A wide class of models predicts that housing booms and bubbles, by serving as collateral, 'crowd in' capital investment (Kocherlakota, 2009). Real estate often constitutes a significant share of the tangible assets that firms hold on their balance sheet. Chaney et al. (2012) computed the sensitivity of business investment to changes in the collateral value of firms that owned real estate. They explained a \$1 increase in collateral value led the representative US public corporation to raise its investment by \$0.06. For a unit increase in the local property price index, a firm that owned at least some real estate increased its investment rate by 21 percentage points more than a firm that did not own real estate. They also estimated the sensitivity of investment to real estate price shocks for firms that acquire real estate before and after they do so. Before acquiring real estate, they assured the future purchasers were statistically indistinguishable from firms that never owned real estate. This guaranteed that the change in behaviours could be entirely

accounted for by firms' purchase of real estate. In addition, firms in the finance, insurance, real estate, construction, and mining industries were excluded from their sample.

Bahaj et al. (2020) explored the relationship between housing prices and investment of firms from an innovation perspective. Instead of focusing on real estate holdings of corporates and, in contrast to Chaney et al. (2012), they investigated the home values of the owners of firms. Using firm-level data for the United Kingdom, they found that a £1 increase in the value of the homes of a firm's directors increased the firm's investment (defined as the change in fixed assets plus depreciation) by £0.03. Further, the collateral effect was more concentrated among firms whose directors' homes were valuable relative to the firm's assets, that were financially constrained, and that had directors who were personally highly leveraged. Interestingly, they also indicated that a £1 increase in corporate real estate values led firms to increase investment by around £0.05, which is similar to the evidence from US on listed firms (Chaney et al., 2012).

Recently, Suh and Yang (2020) analysed international firm-level data to examine the relationship between housing price cycles and capital expenditure or R&D spending by firms. Their baseline results supported the existence of the collateral channel, as housing price growth and firm investment exhibited a positive relationship. However, the importance of this collateral channel was more marked for capital expenditure (including real estate investments of firms) than R&D spending itself, and in housing market downturns (when more firms are likely to be credit constrained) than booms. This, to some extent, reflected the limited effects of the collateral channel on innovation (R&D expenditures), an important growth driver.

Meanwhile, the collateral effect is more obvious in countries that rely more on bank financing, collateralised lending, and with higher mortgage loan-to-value ratios (Banerjee and Blickle, 2016). That is, local house prices have a larger impact on firms which are more likely to be

financially constrained, particularly small firms and young enterprises. UK based research (Houston and Reuschke, 2017; Reuschke and MacLennan, 2014). In consequence the size of the collateral effect may not be large in the most affluent countries and metropolitan regions. For instance, the collateral channel is found to be insignificant in the United Kingdom, compared to other countries, such as Spain and Italy (Banerjee and Blickle, 2016).

7.3 Crowding-out Channel and Capital Misallocation

In contrast, some studies point out that rising housing prices, by absorbing or requiring more capital, can crowd-out non-residential investment through capital redistribution. Miao and Wang (2014) indicated that enterprises allocated more resources to high-profit assets at the cost of innovation in their main business. If these high-profit assets have little technology spillover, capital for innovation would be crowded out. Real estate happens to be a typical sector with both high-profit and little technology spillover. Attracted by the high returns on real estate investment, entrepreneurs tend to cut down their investment in management and innovation and make high profits by investing in real estate. Rapidly rising prices in the housing market tend to attract excess capital, which could constrain production activities and impede real economic development, resulting in a decline in productivity (Rong et al., 2016).

Jordà et al. (2019) explored the rate of returns for equity, housing, bonds and bills over 16 advanced economies from 1870 to 2015 and found that housing returns were similar to, though slightly higher than, equity returns, but with much less volatility. The higher rate of returns and lower volatility could induce even the most productive companies to invest and diversify into real estate markets, thus limiting investment in other higher-productivity activities. More recent empirical work in China has suggested significant effects. Shi (2017), assuming an imperfect financial market, found that only successful business owners who had accumulated enough wealth and talent in the

non-real estate sector can enter the real estate market. A significant investment up-front is required for land and property purchases, thus leaving low-productivity business owners in the non-real estate sector and lowering aggregate productivity. Another finding in Suh and Yang's results (2020) is that large housing price booms jeopardised business investment (despite the collateral channel effect), which suggested a possible reallocation of resource from other production sectors to housing investment. From the organisation's perspective, this would restrain the individual improvement in total factor productivity due to the decreasing innovation propensities.

The overall crowding-out effect (also called the investment effect) is more obviously seen from the perspective of banks and other financial organisations. They would be tempted to increase more profitable mortgage lending and reduce business loans. Chakraborty et al., (2018) reported that commercial loans were crowded out by banks responding to profitable opportunities in mortgage lending. Firms that depended on commercial loans reduced their demand for capital and investment. However, the R&D expenditure was not influenced by rising housing prices, maybe because R&D was generally not financed by banks. Of course, their results rely on two important assumptions: the banks are constrained, and firms cannot easily substitute bank lending for new sources of capital. For these banks which are unconstrained and large firms, the housing prices have positive effects on investment.

A complementary study is provided by Doerr (2020). He found that firms that hold more real estate were less productive, although he did not provide the underlying reason. He implied that these firms expanded output by more, while those firms in the information technology industries, a high-growth high-productivity sector, did not increase their investment in housing booms. Rising real estate values disproportionately relax collateral constraints for low-productivity firms which hold a large share of real estate. Within industry, he found that a rise in average real estate values led

to a decline in productivity at the industry level, which can be due to resources are allocated towards low-productivity firms in this industry. More importantly, he demonstrated the existence of the crowding out channel by eliminating the reallocation channel and finding an insignificant effect of changes in real estate values on industry productivity. This entails more capital leaving productive sectors and decrease productivity by slowing down capital accumulation and technological innovations.

7.4 The Trade-off between the Collateral and Crowding-out Channels

If the crowding-out effect that housing prices have on capital investment dominates in regional and national markets, there is a potential that high housing prices could jeopardise aggregate productivity and its growth by reallocating capital away from productive business investments into higher house prices. This process would inhibit efficient allocation of resources because capital is diverted away from the (productive) manufacturing sector to the (profitable) real estate sector, that is away from high productivity firms to either raising prices of existing assets or supporting lower productivity construction. Resource misallocations between firms and sectors have been found to have substantial impacts on aggregate TFP. Thus, rising housing prices could impair the total factor productivity of the economy and its growth through inhibiting efficient allocation of resources, despite rising overall economic output.

The studies reviewed here suggests that collateral channel effects from rising housing prices have small impacts on capital reallocation and research and development expenditure. However, research on the crowding-out channel suggests that capital expenditures are significantly influenced by housing market outcomes. Taken together, this suggests that weak effects through the collateral channel means that rising house prices have limited impacts on capital investment and capital

accumulation, whereas the stronger effects in the crowding-out channel shapes where available capital and subsequent capital accumulation are invested within firms, sectors, and regions and cities. This balance of effects, that really needs to be much more extensively explored within national and regional economies, implies that house price increases have a negative effect on productivity and growth for the long term. Economic policymakers need to pay attention to this issue as a matter of priority.

The evidence strongly suggests that real estate prices dynamics are linked to capital reallocation. Fougère et al. (2019), and Cettè et al. (2017) claim that housing booms in advanced economies have led to significant capital misallocation across sectors and firms. On the one hand, for these constrained firms, a rise in real estate prices negatively affects the productive investment of firms holding few real estate assets. But such a rise has a significant positive impact on the productive investment of firms reporting more real estate assets. On the other hand, for both constrained and unconstrained firms, a rise in housing prices may also alter their investment choices, thus distorting the allocation of investment and employment growth across firms and affecting aggregate investment, aggregate production, and aggregate TFP (Fougère et al., 2019).

The direction or magnitude of rising housing prices on productivity through capital reallocation depends on two aspects: one is whether and the extent to which rising housing prices or increase in housing wealth relax financial constraints for firms; the other, is for what kind of sectors rising housing prices induce capital inflow and whether they are higher-productivity firms and sectors. These observations are absolutely central to why enterprise economies have to have much more regard to sustained, systemic rises in house prices. In essence they may drive an economic system based on taking the rewards from scarcities (a rentier economy) rather than innovation and effort (an enterprise economy). In Thomas Piketty's work on 'Capital' the key to understanding redistribution is that the rate of

return on capital exceeds the national growth rate. Rising wealth based on owning property shortages is a possible driver of such changes so that the role of housing in economic growth processes is inevitably linked to property-led wealth redistribution (and rising inequality). This idea is explored in the next Part.

7.5 House Price Outcomes and Micro-economic Effects: Entrepreneurship

Another pivotal indicator of potential productivity growth is entrepreneurship or self-employment. In addition to affect existing business, the collateral channel also works for potential entrepreneurs (Adelino et al., 2015; Black et al., 1996), which is generally believed contributing disproportionately to employment and output growth.

The interplay between house prices and start-up rates has been explored in some influential entrepreneurship literature (Berggren et al., 2017). Some authors found that rising house prices indeed enabled collateral constrained potential entrepreneurs to start new firms (Corradin and Popov, 2015; Schmalz et al., 2017). Using a large U.S. individual-level survey dataset for the 1996-2006 period, Corradin and Popov (2015) reported that a 10% increase in home equity raised the share of individuals who transitioned into self-employment each year from 1% to 1.07% due to the alleviation in credit constraints by extracting housing wealth from their residential property. In order to alleviate concerns that the house price boom was driving entrepreneurship predominantly in the real estate sector, they excluded business start-ups in construction, finance, and real estate from the analysis. This enhanced the impact of housing prices on promoting non-real estate capital investment and firm innovation. Therefore, their results confirmed that new-formed businesses tended to invest in sectors which had more potential to promote productivity of the whole economy. Schmalz et al. (2017) reinforced Corradin and Popov's (2015) conclusion using French data, as home equity withdrawals and second

lien loans are very rare in France. Further, a review of the formation and expansion of small business in the UK (Reuschke and MacLennan, 2014), in the wake of the GFC, highlighted the significance of housing equity and its treatment as collateral by mortgage lenders.

In general, previous results suggest that the relationship between homeownership and entrepreneurship depends on local housing market outcomes and the housing prices. In periods of rising prices, homeowners may utilise the home as collateral to start a business and build business wealth, while in downturns the collateral role of housing on business start-ups is insignificant.

The probability of starting a business is a function of wealth for reasons other than rising housing equity facilitating access to finance (Connolly et al., 2015). Fairlie and Krashinsky (2012) exploited matched Current Population Survey data from the US to show that, after controlling for changes in local economic conditions, housing appreciation measured at the level of Metropolitan Statistical Areas was a significantly positive determinant of entry into self-employment. Similarly, Harding and Rosenthal (2013) demonstrated that housing capital gains encouraged self-employment. Recently, they also suggested that links between homeownership and self-employment were strong enough to be important when home prices are rising rapidly, but modest when housing capital gains were limited or negative. Specifically, a 20% real increase in home value over a two-year period raised the likelihood of entry into self-employment by roughly 1.5%ages points, whilst self-employers would not choose to exit when faced with housing capital losses (Harding and Rosenthal, 2017).

In Australia, small businesses accounted for 43% of employment in the private non-financial sector and a third of production in 2012/13 (Connolly et al., 2015). Connolly et al. (2015) explored the relationship between housing collateral and entrepreneurship and found supporting evidence for a positive correlation between housing prices and entrepreneurship. Connolly et al. (2015) pointed out that the

wealth channel is different from the collateral channel and that Corradin and Popov (2015) and Schmalz et al. (2015) may have confounded the wealth channel and collateral channel. Connolly et al. (2015), differentiating their research from the earlier studies, directly verified the existence of a housing collateral channel by exploring how the use of business debt by new entrepreneurs varies with home equity. They expressed that a \$100 000 increase in home equity was associated with business debt being about \$5 000 higher. Meanwhile, they also suggested rising housing prices were more significant for small companies starting a business as they were more likely to be financially constrained. Rising housing prices increased the potential borrowing capacity of credit-constrained entrepreneurs, allowing them to finance more entrepreneurial activity by using their housing equity.

At national, and more especially at metropolitan and local scales, it is important that policymakers for housing (and planning) and business and economic development consider such interactions and effects. Research in Australia (MacLennan et al., 2016) and the UK (MacLennan et al., 2019) suggests urban economists and economic geographers take little account of such effects (Rodrigues-Pose and Storper, 2019).

8. Conclusions

The impacts of housing on wealth accumulation have long been recognised, albeit its effects on wealth inequalities have largely been ignored until recent decades. Since the Global Financial Crisis, policymakers and researchers have paid much attention to the possibility of economic instability and financial instability caused by housing markets. To some extent, the widely used macroprudential tools such as debt-service-to-income ratios, loan-to-value ratios, loan-to-income ratios and risk-weighted capital requirements exemplify this new wariness. The growing evidence of rising housing inequality, accompanied by economic and social vulnerabilities for households at the bottom of the distribution and young generations necessitates a critical re-evaluation of the traditional support that has made arguments for contemporary models of homeownership and urges a rethink of the role of housing in the economy. However, the influence of housing activities and outcomes on productivity has traditionally been ignored in policymaking processes. This results in a lack of emphasis on the long-term effects of housing on economic growth.

This paper thus explores new intellectual connections and develops new policy conversations, incentives and institutions to seek to initiate or better coordinate housing-economy outcomes with productivity enhancement. This paper focuses on recursive effects from housing activities and outcomes through multiple feedback channels, though it has a particular emphasis on effects through house price/rent channels. Instead of the conventional stress of the effects of housing prices on the consumption (such as the wealth effect), this paper highlights long-term drivers of economic growth. More specifically, the homebuilding sector, capital (in the forms of investment, innovation and enterprise), skills (labour markets) and human capital are all assessed and productivity effects identified.

Homebuilding as an industry is marked by lower productivity, thus price-induced investment in housing construction sector influences productivity growth as a whole in the economy, as well as housing prices. This significance grows when the construction sector is used as a stimulus for economy recovery.

House prices affect the ability of markets to allocate capital efficiently across firms and they may affect individuals' ability to start a business. Nevertheless, the net effect on business investment and entrepreneurship appears ambiguous. Meanwhile, labour mobility and labour market matching may also be influenced by housing prices and housing supply restrictions. In growth localities, rising housing prices/rents impact the price and availability of labour and the location choices of firms.

Housing activities and outcomes may also impact the formation of human capital in the medium or long run. However, the evidence drawn on from prior studies seems to be mixed and inconclusive. The effects of housing on the formation of human capital are confounded by neighbourhood effects and socio-economic characteristics, which makes it challenging to disentangle any causal relationship between housing and human capital formation. Housing market outcomes, especially related to high and rising house prices, have significant effects on productivity and growth.

Housing policy, has come to be regarded by national/federal bureaucracies in countries such as Australia and Canada as a relatively unimportant element of social policies, particularly in terms of productivity improvement. There has been little consideration of the role of housing on productivity in these countries. Certainly, it has not been identified as a key driver of productivity growth. Growth cases for housing are rarely made in the policy context.

The failure to make growth cases for housing partly reflect the conventional wisdoms

and assumptions of government economic policymakers about the housing system, and partly can be ascribed to the complexity of housing markets intertwined with other factors (such as the neighbourhood, income, risk preference at the micro level), which makes it harder for researchers to focus solely on the effects of the housing market on economic growth and productivity. Endogenous issues could be a problem here. Difficulties arise in researching productivity. While economists agree on the importance of productivity in sustainable income growth and poverty reduction, its measurement and drivers remain elusive. However, recently the consequences of housing outcomes for the metropolitan economy has drawn attention from policymakers in metropolitan or regional levels, such as in Sydney/New South Wales in Australia and Toronto/Ontario in Canada. Better research on housing-economy relationship could help to improve policymakers' understanding about the housing system.

With respect to policy, stimulating private and public housing investment and improving human capital could be employed by governments to raise productivity growth. Housing is best understood, in relation to its economic roles, as a form of spatially fixed, real capital expenditure, the provision of which enables the delivery of economic or productivity outcomes or essential services. Its characteristics and processes, principally size, structure, location, neighbourhood, status, connectivity and with associated price and (for owners) asset characteristics, influence the extent to which basic infrastructure can boost productivity. Housing also influences the functioning of labour markets and the business environment, which impact productivity growth. Better health also increases human capital. Despite the statistical 'noise' from neighbourhood effects and other socio-economic characteristics, housing certainly exerts an influence on individuals' health. In this sense, some efforts regarding housing markets can be made by governments at different levels to enhance productivity and its growth, for instance: promote productivity

via technology progress and skilled labours in construction sector; provide affordable housing in areas with plenty economic opportunities; enhance housing condition and neighbourhood environment, especially for low-income households; rely less on housing to allocate capital.

For these potentially significant and longstanding gains to be achieved there is an urgent need to recognise the collective failure of Australian governments to recognise that collaboration and cooperation are required to deliver the 'linkages' that make housing more or less productive. Productivity is every Australians problem. There is a need to rethink the purposive roles of governments, and indeed planning, in creating places that link living and working effectively. Housing and productivity is every governments problem-Commonwealth, States and municipalities. Within each government, at every level, there is a need to first converse and then collaborate across different departments (housing, welfare, transport, infrastructure, planning, education, health, economic development) in thinking through policy logic chains. Mostly, it just does not happen. And central agencies need to rediscover what housing is and does. The failure to work purposively across of orders of government appears to be growing and a new 'blame-game' for housing unaffordability is more prevalent in politics and the press. A period of reflection, evidence, truth and reconciliation of the common housing purposes of different orders of government may now be urgent, and our synthesis report calls for a Royal Commission to shape better governance. In that governance, engaging the competitive private sector is all important. Last, and first, whenever and wherever possible, localities and communities should have a louder voice in building and renewing the places in which they will create the next, and more productive, Australia.

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