

Economic geography and economic performance in Australia

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The OECD has found that Australia's economic performance is not as strong as might be expected given the strength of its economic policy settings. Differences in geography — distance to world markets, natural resource endowments, and population settlement patterns — help explain differences in economic performance across OECD countries. However, these findings reinforce, rather than reduce, the importance of good policy. Economic policy settings affect the extent to which countries exploit their geographic advantages and their ability to adapt to geographic disadvantages. The purpose of this paper is to review the OECD's recent study of the impact of geography on economic performance and consider the implications for Australia's economic performance and policy.

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Introduction

The ultimate goal of economic policy is to improve the wellbeing of Australians. One element of wellbeing is standard of living or gross domestic product (GDP) per capita. Cross-country analysis can improve our understanding of the factors that affect GDP per capita, thereby helping us implement economic policy that is effective in improving standards of living.

OECD analysis has confirmed the importance of economic policies for GDP per capita. However, economic policy alone does not explain all of the difference in GDP per capita across OECD countries. Australia's economic policy settings have been assessed by the OECD as being close to best practice, in many of the areas identified as important. Despite this Australia's GDP per capita lags behind that of the leading OECD countries.

Economic geography is one of the other factors that can explain part of the cross-country differences in GDP. Economic geography refers to the location, distribution and spatial organisation of economic activities. Various elements of geography and history can influence the spatial aspects of economic activity, including a country's location in the world, climate, topography, natural resource endowments, and size and population settlement patterns. In its 2008 *Going for Growth* publication the OECD examined the impact of economic geography on GDP per capita across OECD countries.

The first section of this paper provides an overview of the sources of economic growth. The second section explains how geography affects economic performance. The third section reviews the OECD's recent work on the impact of economic geography on GDP per capita. The fourth section considers some broad policy implications of Australia's geography. The final section concludes.

Sources of economic growth

In 2003, the OECD published *The Sources of Economic Growth*, the culmination of a four-year project analysing the causes of differences in economic performance across OECD countries. The project also identified reforms that could improve countries' long-term growth prospects.

The OECD used the Solow-Swan model augmented with human capital to explain the differences in GDP per capita levels and growth patterns.² In this model, GDP per capita is assumed to be a function of physical and human capital, labour and

² See Solow (1956) and Swan (1956).

the level of technology. This model has been widely used due to its simplicity and flexibility (Boulhol, de Serres & Molnar 2008).

The OECD then added a wide range of policy variables to the basic model to see whether they were able to explain GDP per capita variations among OECD countries. For technical reasons, these additional variables were not added to the model all at once but were introduced one at a time. The key results are outlined below.

Improvements in the quantity and quality of physical and human capital that lead to capital-deepening support higher GDP per capita. The OECD (2003) estimated that a 1 percentage point increase in the accumulation of physical capital could lead to an increase in long-run GDP per capita of 1.3 per cent.³ For human capital, an additional year of education, on average, (corresponding to an increase in human capital of about 10 per cent) could lead to an increase in long-run GDP per capita of 4 to 7 per cent.

A number of policy and institutional variables were found to have a significant impact on GDP per capita. These included: the inflation rate; the variability of inflation; the tax burden; the intensity of business research and development (R&D); and trade exposure (Table 1). These variables are proxy measures for macroeconomic and microeconomic policy settings.

Lower and more stable inflation rates reduce uncertainty, improve price signals and decision making. The OECD (2003) estimated that a reduction in the inflation rate of one percentage point could lead to an increase in GDP per capita of 0.13 per cent. If the variability in inflation is also reduced then the increase in GDP per capita could be larger. For example, a decrease of one percentage point in the standard deviation of inflation could lead to an increase in long-run GDP per capita of 2 per cent.

The overall size of government, the composition of expenditure and the structure of taxes used to finance expenditure may affect GDP per capita. The OECD recognises that many components of public expenditure, such as health, education and infrastructure, are likely to be beneficial for GDP – at least up to a certain level. However, they also note that the taxes required to finance government expenditure may reach levels where the negative effects on incentives and investment decisions may outweigh the positive effects. The OECD (2003) estimates that a one percentage point increase in the tax burden decreases long-run GDP by 0.6 to 0.7 per cent.

More recently, the OECD has shown that the structure of taxes – the degree to which a country relies on income taxes, social security contributions, and taxes on goods and services – can also impact on GDP per capita (Arnold 2008).

3 Physical capital accumulation was measured by an investment to GDP measure: the ratio of real private non-residential fixed capital formation to real private GDP.

Innovation, leading to new products, services and business processes, is a key determinant of GDP per capita in the long run. Innovation is usually measured by business expenditure on R&D. However, business expenditure on R&D is an imperfect measure of innovation. Innovation includes a much wider array of activities in the economy, including workforce skills, management, venture capital, adoption of new technology, work reorganisation, and public expenditure on R&D. Having low business expenditure on R&D does not necessarily mean a country has low levels of innovation. In addition, the level of business expenditure on R&D in a country is dependent upon other factors, such as industry structure and exposure to international trade and investment (Davis & Tunny 2005; Tunny 2006). The OECD (2003) estimated that an increase in business R&D intensity of 0.1 percentage points of GDP increases GDP per capita by 1.2 per cent.

Exposure to international trade allows countries to specialise, and it brings additional benefits through economies of scale, exposure to competition and diffusion of technology and knowledge. The OECD (2003) estimated that an increase in trade exposure of 10 percentage points increases long-run GDP per capita by 4 per cent.

Table 1: Impact of changes in policy factors on GDP per capita

Factor	Proxy	Change	Impact on GDP per capita (per cent)
Level of inflation	Rate of growth of private consumption deflator	+ 1 %	- 0.13
Variability of inflation	Standard deviation of the rate of growth of the private consumption deflator	+ 1 %	- 2
Tax burden	Tax and non-tax revenue as a percentage of GDP	+ 1 %	- 0.6 to - 0.7
Innovation	Business expenditure on R&D as a percentage of GDP	+ 0.1 %	+ 1.2
International trade	Weighted average of export intensity and import penetration as a percentage of GDP	+ 10 %	+ 4

Source: OECD 2003.

In addition, the OECD (2003) found that there were a number of other policy variables that could also be important to understanding differences in GDP across countries. These included product and labour market flexibility, the development and diffusion of new technologies, and the ability of financial systems to direct capital to their most efficient use. Unfortunately, due to a lack of time-series data and poor proxy measures, the OECD was not able to include these variables in its model in the sources of economic growth study. However, it did find that these policy variables are associated with higher GDP.

The Sources of Economic Growth substantially improved our understanding of the determinants of economic growth, highlighting and quantifying, the impact that economic policy can have on GDP per capita levels and growth.

However, economic policies are not able to explain all of the difference in GDP per capita across OECD countries. Economic reforms undertaken in Australia in the past quarter century mean that Australia's economic policy settings on many of the areas analysed by the OECD are close to best practice. Australia's economic performance is not as strong as might be expected given Australia's overall favourable policy settings.

In its annual *Going for Growth* publication the OECD, extends the work undertaken in *The Sources of Economic Growth* by undertaking thematic studies to look at specific policies and factors that influence GDP per capita. In the 2008 publication, the OECD examined the impact of economic geography on GDP per capita.

Why geography matters

Geography encompasses a number of elements, including a country's location in the world, climate, topography, natural resource endowments, size and population settlement patterns. The two most commonly examined variables are distance from world markets and natural resources. These factors primarily affect GDP per capita by influencing productivity and income.

Distance from world markets

Distance from world markets directly increases transport costs, which has the effect of reducing trade. A reduction in trade limits opportunities for countries to specialise in the activities where they have a comparative advantage. It also limits access to economies of scale, exposure to competition and diffusion of technology. As a result, productivity is likely to be lower in countries that are distant from world markets.

In Australia, distance from world markets has been found to have a significant impact on trade and productivity levels. Battersby and Ewing (2005) found that if Australia were as close to world markets as the United Kingdom, Australia's level of trade would be expected to increase by around 50 per cent. Battersby (2006) estimated that distance from world markets accounts for around 45 per cent of the gap in labour productivity between Australia and the United States. Tunny (2006) found that Australia's distance from world markets has limited its exposure to foreign R&D.

Distance from world markets can also affect income levels. A remote country has to absorb transport costs into producer prices of tradeable goods and services in order to remain competitive in world markets. Because the factor price of capital tends to be

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equalised across locations labour often bears the cost of remoteness. Even if technologies are the same everywhere, firms in remote countries can only afford to pay relatively lower wages (Redding & Venables 2004).

Distance between domestic markets is also likely to affect productivity and income for similar reasons. Densely populated countries, with large population centres within reasonable proximity, are likely to benefit from more effective labour and product markets – as firms locate near to each other they will benefit from having a large pool of suppliers, customers and labour, reducing costs, increasing market size, raising competitive pressures and allowing a greater degree of specialisation. They may also benefit from lower infrastructure costs and spillovers associated with the clustering of innovative activities. However, congestion costs limit the benefits of agglomeration.

Dolman, Parham and Zheng (2007) and Davis and Rahman (2006) found that Australia's sparse population settlement pattern across its vast internal spaces (a product of both geography and history), in combination with its distance from world markets, negatively affected productivity by limiting the benefits available from specialisation, economies of scale and competition between producers.

Natural resource endowments

A country, like Australia, that has abundant natural resources benefits from the rent received from extraction and also from the low cost of inputs to production. The extent to which a country benefits from these rents depends on the effectiveness with which it collects and invests them.

Natural resources can impact on GDP per capita either positively and negatively. If a country has an abundance of a commodity whose relative price on world markets has increased then the economy is effected in two ways (Gregory 1976; Corden & Neary 1982; Corden 1984). First, the rise in demand for labour and capital in the commodity sector leads to a shift in labour and capital away from the manufacturing and non-tradeable sector. Second, the extra income generated by the rise in the commodity price increases the demand for manufactures and non-tradeable services. Increased demand for non-tradeables increases their price relative to the price of traded goods, resulting in an appreciation of the real exchange rate. The appreciation of the exchange rate reduces the international competitiveness of manufactures.

These adjustments are an efficient response to a relative price change and result in higher real income. However, if the adjustment to the change in relative price is obstructed, or if resources are not reallocated following a rise in the price of the commodity, then GDP per capita will be lower than it would otherwise be.

There is an additional channel through which natural resource endowments can negatively affect long-term GDP per capita. If countries with abundant natural resources are exposed to rent-seeking behaviour by those that control the resources then corruption and misallocation of resources may mean resource rents are used inefficiently, leading to a reduction in GDP per capita (Sachs & Warner 1995; Gylfason 2007).

Strong political and legal institutions raise the possibility that resource rents will be used efficiently. However, even in countries with strong institutions resource rents may have adverse long-run effects on growth by reducing incentives to undertake economic reforms, increasing macroeconomic instability if rents are spent freely, raising protectionist pressures in response to the decline of manufacturing, or investing in projects that fail the market test, for example, channelling resources to declining industries (Boulhol, de Serres & Molnar 2008).

Geography has an important influence on a country's economic performance. The OECD has extended its analysis of the sources of growth to quantify the impact that economic geography has on GDP per capita.

Economic geography and GDP per capita

In the 2008 edition of *Going for Growth*, the OECD analysed the impact of economic geography on GDP per capita using a similar methodology to that used in the original study. The economic geography variables of proximity to world markets and natural resource endowments were added to the basic model one at a time to determine their impact on GDP per capita (Boulhol, de Serres & Molnar 2008).

The initial estimation of the model, including only the basic determinants of physical and human capital accumulation, labour, and the level of technology, explained only one-third of the variation in GDP per capita across countries. The inclusion of the economic geography variables increased the variation explained by the model to one-half. Adding the individual policy variables would further increase the amount of variation explained. This represents a significant improvement in our understanding of the factors that affect economic prosperity.

The impact of economic geography on GDP per capita

The OECD (2008) estimates that distance to markets and natural resource endowments have a significant impact on GDP per capita in OECD countries (Table 2). Taking Australia as an example, the OECD finds that the distance from Australia to world markets contributed to lowering Australia's GDP per capita by 10.6 per cent on average between 2000 and 2004 relative to the average OECD country. Australia is the

OECD country most disadvantaged by its distance from world markets, while the centrally located countries of Belgium and the Netherlands benefit the most.⁴

Table 2: Impact of geography on GDP per capita, average 2000 to 2004

Difference compared to the average OECD country

	Distance to markets (per cent)	Natural resources (per cent)
Australia	-10.6	1.7
Austria	1.8	-0.8
Belgium	6.7	-1.2
Canada	2.1	1.7
Denmark	2.2	0.3
Finland	-2.4	-1.0
France	3.4	-0.7
Greece	-3.7	-1.1
Ireland	0.6	-0.7
Italy	1.3	-0.8
Japan	3.0	-0.8
Netherlands	5.6	-0.5
New Zealand	-10.1	-0.5
Norway	-1.5	8.5
Portugal	-2.7	-1.3
Spain	-1.2	-1.0
Sweden	-1.4	-0.6
Switzerland	3.3	-0.7
United Kingdom	3.8	0.1
United States	-0.3	-0.6

Source: OECD 2008.

The OECD (2008) found that the distance to world markets reduces trade to a similar extent today as it did in 1970. The unchanged sensitivity of trade to distance belies the commonly held view that falls in transport costs as a result of technological advances, such as containerisation and better jet engine technology, have reduced the relevance of distance for trade. Using new transport costs data, the OECD found that real average international transport costs for Australia and New Zealand more than doubled between 1973 and 2006.⁵

It may be that rising fuel costs and port and airport charges have offset the gains from technological innovations in the transport industry. Alternatively, the benefits from

4 New Zealand is the most remote country in the OECD, but because it is located near Australia, which is a much larger market, the impact of distance to world markets on GDP per capita in New Zealand is less than the impact in Australia.

5 The OECD constructed a new set of indicators to measure transport costs, calculating country-specific transport costs per kilogram transported (Golub & Tomasik 2008). Real total average transport cost is a weighted average of maritime, air and road transport costs. The average cost is expressed in \$US per kilogram deflated by the US manufacturing goods deflator, with 2000 as the base year.

technological improvements may not have been as large as assumed (Boulhol, de Serres & Molnar 2008).

On the other hand, the OECD (2008) found that international communication costs have fallen to very low levels in OECD countries. This has facilitated trade in services and the transfer of some parts of the production process to more distant areas. However, the extent to which certain business processes or services can be conducted remotely is dependent upon the extent to which the information being transmitted can be codified (Withers 2007).

Natural resources benefited Australia, contributing 1.7 per cent, on average, to GDP per capita compared to the average country. Similarly, the other resource-rich OECD countries (Norway, Canada, Denmark and the United Kingdom) all benefited.

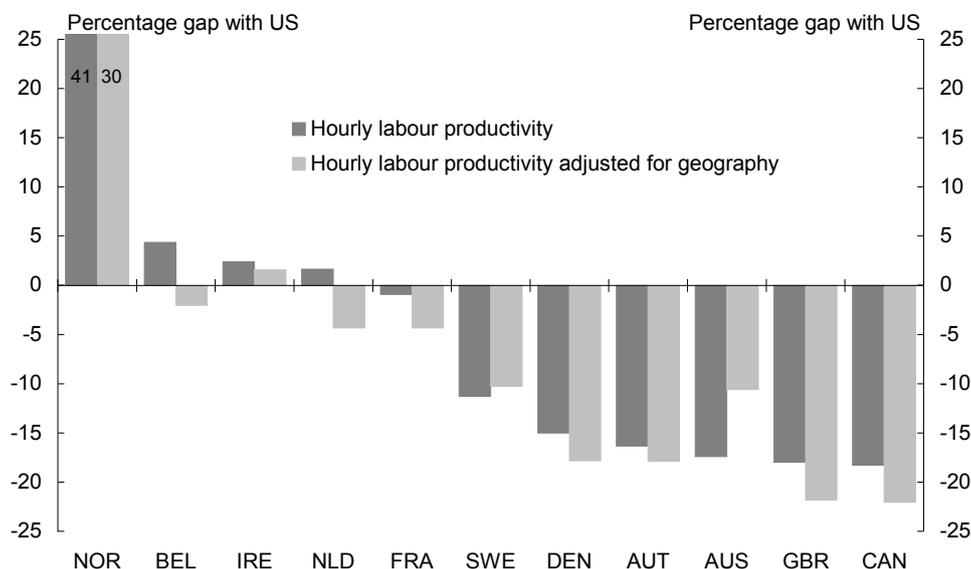
The positive contribution of natural resources to GDP per capita implies that OECD countries have not suffered from the resources curse. This contrasts with other studies, such as Sachs & Warner (1995), which found that natural resources have a negative impact on economic performance. A key difference between the OECD's work and other studies is the sample of countries used: while the OECD considers 21 OECD countries, the other studies tend to use a sample comprised of both developed and developing countries. The relative strength of institutions and governance in OECD countries is likely to be a key factor in the positive contribution of natural resources to GDP per capita as they allow resource rents to be collected and invested effectively (Collier 2007).

Geography reinforces policy priorities

Geography is essentially a given and there is little, if anything, government can do to affect it. Having quantified the impact of economic geography on GDP per capita, the OECD (2008) then adjusted each country's performance for its geographic advantages and disadvantages to determine underlying performance, which can be influenced by economic policy.

Economic geography primarily influences GDP per capita by affecting productivity. As a result, the OECD (2008) compares actual labour productivity with labour productivity adjusted for geography (Chart 1). Each country's productivity is measured relative to the United States.

Chart 1: Actual and adjusted hourly labour productivity, 2006
 Percentage gap vis-à-vis the United States, total economy, selected OECD countries



Note: The 11 best productivity performers in the OECD are shown. Both measures of productivity performance are relative to the US. Labour productivity is measured as GDP per hour worked. This is then adjusted to take into account the estimated effects of both access to markets and natural resources. Only the countries covered by the OECD's empirical analysis are shown. Source: OECD 2008.

For Australia, adjusting labour productivity for geography reduces the productivity gap with the United States from around 17 per cent to just over 10 per cent. This helps explain why Australia's GDP per capita continues to lag behind that of the leading OECD countries, despite Australia's favourable economic policy settings. Policy improvements in Australia are capable of narrowing the productivity gap, but the scope for improved performance may be limited because of Australia's distance from world markets.

Belgium and the Netherlands are the two countries with the most favourable locations in the world. Labour productivity in these two countries is slightly higher than the United States, but once adjusted for geography, it falls slightly below that of the United States. That is, once their favourable geography has been taken into account, there is still significant scope for these countries to improve economic performance by improving economic policy. This reinforces the importance of good policy and implies that countries' economic policy priorities to improve productivity and labour utilisation remain the same, regardless of their geography.

Distance between internal markets also matters

One weakness of the OECD's study of the importance of geography for GDP per capita is that it does not capture the impact of population settlement patterns. The market potential indicator, used by the OECD to measure distance from world markets, includes internal distance, which is measured simply but sometimes inappropriately.⁶ It does not take into account the possibility that a country's domestic market could be fragmented into regional markets, as in Australia, where the majority of the population is found in the coastal fringe on the eastern seaboard.

Measuring internal distance in a way that more accurately reflects settlement patterns is important because of the impact of internal distance on GDP per capita. Australia has a relatively small population scattered across a vast land mass. The large distances between Australia's internal markets likely has a negative effect on productivity.

Broad policy implications for Australia

Whether a country is able to exploit geographic advantages or overcome geographic disadvantages depends on the policy framework within which individual firms make their decisions. Geographic advantages and disadvantages, whether due to proximity or distance to world markets, dense or sparse population settlement patterns, and rich or meagre resource endowments, do not affect what are good economic policy settings to improve productivity and labour utilisation. It follows that geography should not be used as an excuse for bad policy.

Australia has proved successful at extracting its rich natural resources deposits. The Australian mining industry is one of the most productive in the world with a productivity level in 2000 over one-and-a-half times that in the United States (Young, Wilkie, Ewing & Rahman 2008). Australia's strong political institutions also mean that Australia has not suffered from a misallocation of resource rents. Economic reform in Australia over the past quarter century has resulted in a flexible competitive economy able to adjust to external shocks like commodity price increases.

On the other hand, Australia's geography is likely to be an ongoing limiting factor and contribute to low productivity in industries like manufacturing, where Australia's productivity level is only around 60 per cent of the level in the United States (Young, Wilkie, Ewing & Rahman 2008). Australia's market is small and fragmented and for

6 This measure gives more weight to countries that are large, dense and close together. It also takes into account each country's domestic economy. Internal distance is usually smaller than external distances; as a result, it is associated with greater weight. The underlying assumption used to measure internal distance is that a country is a disk where all suppliers are located in the centre and consumers are located uniformly over the area.

much of Australia's history tariff barriers isolated its manufacturing firms from large foreign markets. As a result, Australian manufacturers are unable to access the same economies of scale that firms in the United States are able to access in their own large and well integrated domestic market.

Good economic policy will facilitate the adaptation of firms to Australia's geographic advantages and disadvantages. Policies that seek to subsidise firms for the higher costs associated with Australia's distance from world markets provide a benefit to those firms that are disadvantaged by distance but penalise those that are not affected by distance. The effect of such subsidies would be to limit the extent to which firms adapt to geography.

Conclusion

In *Going for Growth*, the OECD (2008) has shown that economic geography significantly helps explain differences in GDP per capita across OECD countries. The OECD found that distance to world markets reduces GDP per capita in remote countries. Distance remains an important influence on trade and productivity levels. The OECD also found that abundant natural resources increase GDP per capita. This finding implies that strong political and legal institutions in OECD countries have helped them avoid the negative effects of abundant natural resources.

These results have important implications for policy as economic geography explains more of the differences in GDP per capita. Taking economic geography into account does not change a country's policy reform priorities.

This work has particular importance for Australia. While Australia has favourable economic policy settings, its GDP per capita continues to lag behind the leading OECD countries. Economic geography explains part of this gap. Australia is one of the most remote countries in the OECD and our distance from world markets has a large negative impact on GDP.

On the other hand, Australia's abundant natural resources have a positive impact on GDP per capita. Strong institutions and a flexible economy mean that Australia has escaped the resource curse. However, the positive contribution of natural resources to GDP per capita is not large enough to offset the impact of distance.

While the OECD has quantified the impact of distance and natural resources on GDP per capita, further work needs to be done in determining the size of the impact of population settlement patterns on GDP per capita. Australia's vast internal spaces are likely to have a significant negative impact on GDP per capita.

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Economic policy can do little to change geography itself, but economic policy still has an important influence on economic performance and the wellbeing of Australians. Indeed, good economic policy helps a country exploit and maximise the benefits from its geographic advantages. Good policy also helps a country to adapt to and minimise the costs associated with geographic disadvantages.

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