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Absorbing a windfall of foreign exchange: Dutch disease dynamics ☆

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ABSTRACT

The permanent income rule is seldom the optimal response to a windfall of foreign exchange, such as that from a resource discovery. Absorptive capacity constraints require domestic investment, and investment in structures requires non-traded inputs the supply of which is constrained by the initial capital stock. This, particularly when combined with intra-sectoral capital immobility, delays adjustment and creates short run 'Dutch disease' symptoms as the real exchange rate sharply appreciates and overshoots its long run value. Optimal revenue management requires investing in the domestic non-traded goods sector and a slow build up of consumption. Accumulation of foreign assets adjusts to accommodate the time-paths of domestic consumption and investment.

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1. Introduction

How should an economy respond to a foreign exchange windfall such as that associated with discovery of a natural resource or a commodity price boom? The standard prescription is the permanent income hypothesis (PIH) that suggests an immediate and permanent increase in consumption to its new level, with foreign assets (such as a Sovereign Wealth Fund) being used to smooth the difference between the cost of incremental consumption and the time-profile of the windfall. This is the benchmark case but needs to be modified for numerous reasons, such as limited access to international capital markets and consequent capital scarcity (van der Ploeg and Venables, 2011, 2012); expectations about the sustainability of the windfall (Gelb and Grasmann, 2008); and the political economy of alternative choices (Collier and Gunning, 2005). This paper focuses on a further issue, which is the ability of the economy to absorb additional spending. Resource rich developing economies often face supply bottlenecks and consequent upwards pressure on prices and the real exchange rate as they seek to scale-up domestic spending. We provide a micro-founded model of these constraints on absorptive capacity, and analyze their implication for optimal management of windfall revenues.[1]

The central issue, important in many contexts, is that the economy faces adjustment to a new long run structure, such as a larger non-traded goods sector. The reference point is an economy which can jump instantaneously to this new structure. This is possible if all sorts of capital – skills, equipment, and structures – can be redeployed or bought and sold on world markets, so that bottlenecks are not encountered and relative prices need not change. We argue that this

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[1] The term 'absorptive capacity' is used frequently in the development economics literature, particularly in the context of international aid, e.g. Bourguignon and Sunderg (2006). While our focus is resource booms, similar issues arise in discussion of scaling up aid, e.g. de Renzio (2005), Mavrotas (2007). The industrial organization literature uses the term absorptive capacity quite differently, to mean a firm's ability to absorb new ideas or technologies.

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may not be feasible, for two reasons. First, much physical capital is sunk so cannot be redeployed without cost, and second, some sorts of capital are non-traded and cannot be acquired on world markets. This latter point is crucial although country specific. Some resource rich countries (some of the Gulf States) have made essentially all capital tradable; human capital is imported by immigration of skilled workers, and structures are imported by immigration of construction workers. But in many other countries this option is infeasible, so the essential problem is that creating new capital requires *non-traded* capital. This may be physical capital, or may be human capital; it takes teachers to produce teachers. It is this shortage of 'home-grown' capital that we believe is the quintessential feature of absorptive capacity.

Whilst our approach to absorption is applicable to structural change in various contexts, our focus is on newly resource rich economies that face the problem of managing resource revenues. Spending from these revenues increases demand for non-traded goods and crowds out domestic production of traded goods, causing structural change and creating 'Dutch disease' concerns (e.g. Corden and Neary, 1982).[2,3] Our analysis brings together the previously unrelated literatures on optimally managing a windfall (e.g. Collier et al., 2009; Davis et al., 2002) and on Dutch disease, both of which have been at the centre of most of the economic analyses of the consequences of resource abundance. There is a clear but hitherto unexplored interaction between the issues.[4] The rate of spending determines the magnitude of Dutch disease effects, and relative price changes associated with the Dutch disease influence optimal spending patterns. This paper studies these interactions. It develops a model in which a windfall of foreign exchange will bring about structural change, but change is not instantaneous; the need for home-grown capital creates supply rigidities which mean that relative prices change (the real exchange rate experiences short and medium run appreciation), and this shapes the appropriate revenue management policy. We show that optimal policy typically has three elements. First, there is a rapid build up of investment and capital in the non-tradable sector.[5] Second, there is slow build up of consumption to its new long run value. Third, foreign assets should be managed to ensure that domestic spending (consumption and investment) is on an efficient path. In a central case this involves 'parking' resource revenues offshore until absorption constraints have been relaxed. Compared to the PIH it may be optimal to place less revenue in offshore funds in the long run, because of the need to finance structural change, but more in the short run, because of absorption constraints.

Our framework for analysing the optimal management of foreign exchange windfalls in the presence of absorption constraints builds on earlier work on optimal growth in a two-sector closed economy (Uzawa, 1964) and is related to a strand of two-sector dependent economy models (Turnovsky, 1997, 2009; Turnovsky and Sen, 1995). These models have perfect factor mobility across sectors and capital produced entirely by the non-traded sector. They have regimes with sluggish adjustment of the real exchange rate if the non-traded sector is capital intensive, and instantaneous real exchange rate adjustment if the traded sector is capital intensive. Our framework extends this work in the following directions. First, we allow part of capital to be traded (so that it can be imported following a windfall) and part of it to be home-grown. This matters crucially for the adjustment dynamics. Second, although investment can be directed at any of the sectors, once it is installed it is difficult to unbolt and reallocate it to another sector.[6] This irreversibility is crucial for the adjustment path, regardless of the relative capital intensity of sectors. Our primary contribution is, however, not so much to put forward a new two-sector dependent economy model, as to analyse the optimal way of harnessing a windfall of foreign exchange and of managing the consequent choices between consumption, domestic investment, and foreign asset accumulation.

The outline of our paper is as follows. Section 2 sets up the benchmark for managing a windfall, based on the PIH. We generalize the standard PIH by allowing for a tradable and non-tradable sector, although in this section we retain the assumption of perfect tradability of capital. The economy experiences structural change following the windfall and this changes its physical capital requirement. Although adjustment is instantaneous, the simple PIH recommendation of holding the entire windfall in foreign assets does not generally apply, as part should go to meeting the altered capital requirements of the domestic economy. Section 3 turns to our main argument, assuming that although financial capital is internationally mobile, physical capital is not. Production of capital equipment requires non-tradable inputs (or structures), so must be at least partly home-grown. Even though the economy has perfect access to international capital markets the requirement that it accumulates capital goods with a domestic component means that it cannot jump instantaneously to a new steady state. Instead there is an adjustment path along which relative prices are changing and economic agents vary consumption and investment in response to the path of prices. We show that if the non-traded sector is intensive in home-grown capital, the real exchange rate sharply appreciates and overshoots while capital is gradually built up. Section 4 presents the most general version of our model in which capital is partly home-grown, and is also immobile between sectors. Exchange rate overshooting, and undershooting of real consumption, is then a general consequence of a windfall because it takes time for the economy to adjust to meet increased demand for non-tradable goods. We examine the determinants of the magnitude of these effects and their implications for the level and composition of asset accumulation. We also extend the model to include a capital market imperfection. A resource boom then causes both structural change and more general capital deepening; this has real income benefits, but creates further short and medium run problems of absorptive capacity. Section 5 interprets our results in the light of the earlier literatures on Dutch disease including sectoral adjustment costs and knowledge spill-over effects, and on uncertainty about future oil prices and reserves discoveries. Section 6 draws out policy implications and conclusions.

[2] Early evidence on Dutch disease effects was mixed (e.g. Sala-i-Martin and Subramanian, 2003), but more recent evidence points to the presence of effects. Ismail (2010) using sectoral data for manufacturing finds that a 10% increase in the size of the windfall is associated with a 3.4% fall in value added across manufacturing, but less so in countries that have restrictions on capital flows and for sectors that are more capital intensive. Using as counterfactual the Chenery and Syrquin (1975) norm for the size of tradables, countries in which the resource sector accounts for more than 30% of GDP have a tradables sector 15 percentage points lower than the norm (Brahmbhatt et al., 2010). Harding and Venables (2013) look at the trade side, finding that, on average, a windfall brings a fall in non-resource exports by 70% of the amount, while non-resource imports increase by 30% of the amount.

[3] Related aspects of the Dutch disease have to do with short run macroeconomic adjustment and the role of monetary and exchange rate policy (e.g. Eastwood and Venables, 1982; Gupta and Heller, 2002; Neary and Purvis, 1982).

[4] There have been two previous studies of this interaction. The first is the dynamic model put forward in the appendix of Sachs and Warner (1997) which abstracts from real exchange rate volatility and absorption constraints, since all adjustment comes from the capital stock while the real exchange rate is pinned down by the world interest rate. The second is Matsen and Torvik (2005) who study the optimal management of a resource windfall in a Dutch disease model with learning by doing externalities, but abstract from accumulation of domestic capital and foreign assets and the government budget constraint. They find that it is optimal to have a permanent *moderate* appreciation rather than a temporary *sharp* appreciation of the real exchange rate and a permanent lower growth rate.

[5] This does not occur in the one-sector economy with perfect capital mobility where none of the windfall is spent on domestic investment. If there is capital scarcity, it is optimal to spend part of the windfall on investment as investment is sub-optimally low (van der Ploeg and Venables, 2011). Here we show that in a two-sector economy it may be optimal to allocate part of the windfall to investment even with perfect capital mobility.

[6] One could allow for intrasectoral costs of capital adjustment (e.g. Morshed and Turnovsky, 2006).

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