Trade liberalisation and human capital adjustment

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ABSTRACT

This paper highlights the way in which workers of different ages and abilities are affected by anticipated and unanticipated trade liberalisations. A two-factor (skilled and unskilled labour), two-sector Heckscher–Ohlin trade model is supplemented with an education sector which uses skilled labour and time to convert unskilled workers into skilled workers. A skilled worker's income depends on her ability, but all unskilled workers have the same income. Trade liberalisation in a relatively skilled labour abundant country increases the relative skilled wage and induces skill upgrading by the existing workforce, with younger and more able unskilled workers most likely to upgrade. But not all upgraders are better off as a result of the liberalisation. The older and less able upgraders are likely to lose. For an anticipated liberalisation we show that the preferred upgrading strategies depend on a worker's ability and that much of the upgrading will take place before the liberalisation. Hence some workers who would have upgraded had they anticipated the liberalisation will not if it is unanticipated, and adjustment assistance that applies only to post-liberalisation upgraders will fail to compensate some losers and distort the upgrading decisions of others.

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1. Introduction

The links between product prices and factor returns are a key element of general equilibrium trade models. Interest in these links was heightened by the recent "trade and wages" debate, where lower prices of unskilled labour intensive products were put forward as one explanation for the decline in the relative wage of unskilled workers in advanced, skill-abundant countries. The underlying argument was based on the Stolper–Samuelson theorem which implies that trade liberalisation in unskilled labour scarce countries will lead to a fall in the relative price of unskilled labour intensive imports and a fall in the relative return to unskilled labour. The general conclusion of this debate seems to be that, while trade liberalisation may have been a contributing factor, technological change played the major role.

The changes in relative product prices that follow from trade liberalisation will also cause domestic resource reallocation towards those traded goods industries in which the country has a comparative advantage. These reallocations are an important source of gains from trade. But in the short run they will involve adjustment costs, and adjusting workers in particular are likely to suffer periods of unemployment, in addition to any longer run changes in their income streams. Although these costs are conventionally viewed as transitory

and small relative to the benefits of liberalisation (Matusz and Tarr, 2002, for example), the characteristics of the affected workers indicate that they may be larger than previously thought. Trade-related displaced workers tend to be older and have less formal education than other displaced workers, characteristics that reduce the re-employment prospects of any worker (Kletzer, 2004).

Our aim is to extend the analysis of adjustment to trade liberalisation in a slightly different direction. Accepting that liberalisation in developed countries leads to an increase in the relative return to skilled labour, we explore the implications this has for skill acquisition by the existing workforce — i.e. not just by new entrants. This is a relatively neglected aspect of adjustment. By treating workers within each skill group as homogeneous, most trade models implicitly assume all skilled and unskilled workers are affected equally. But the changes in relative factor returns will cause some currently unskilled workers to rethink and reverse their decision to stay unskilled. The adjustment process that this induces begins immediately, and may not be completed until long after the short run frictions have been overcome. Worker characteristics will be crucial in determining their decisions, and our paper highlights the way in which workers of different age and ability are affected by a trade expansion. In fact, our framework applies to any production or price shock that changes relative wages, including those induced by technological change. We focus on trade liberalisation because its timing is also a policy choice, which allows us to consider whether it should be pre-announced.

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Our model modifies and extends earlier work by Findlay and Kierzkowski (1983) [FK] and Borsook (1987). We consider a small economy which consists of a manufacturing (traded goods) and an educational sector. The manufacturing sector is Heckscher–Ohlin in structure and produces two traded goods using the services of skilled and unskilled labour. Unskilled workers enter the labour force without training. Education transforms unskilled individuals into skilled workers but takes time and resources.[1] We assume individuals differ in their (exogenous) ability level and, while the income of the unskilled is independent of their ability, more able skilled workers earn a proportionately higher income. Following Becker (1993), we model the educational investment decision accounting for the relationship between earning profiles, ability and age. In contrast to previous models we allow individuals to change labour status at any time in their working lives. The decision to enter the labour market as unskilled can be reversed later through schooling.[2] The return to education is an increasing function of ability and youth. Given relative product prices, all individuals with ability above an endogenous threshold will become skilled. A trade liberalisation changes this steady state threshold and affects relative factor supplies and hence outputs in the long run. While we also consider these long run changes, which are the main focus of Findlay and Kierzkowski (1983) and Borsook (1987), our main concern is with the medium run effects on the skill composition of the workforce existing at the time liberalisation occurs or is announced.[3]

Two key simplifying assumptions are worth emphasising. First, we abstract completely from the short run frictional costs that are the focus of much of the adjustment literature. The movement of skilled and unskilled workers between production activities is assumed to be instantaneous and costless. This simplification allows us to highlight the adjustment through skill upgrading by the existing workforce that has been largely neglected to date. Second, the HO structure implies that, as long as a country's manufacturing sector is non-specialised, factor returns depend only on product prices. In particular factor returns are constant throughout the adjustment process, so that workers' skill upgrading decisions are based on fixed and known

future earnings. It should be emphasised that these assumptions are made for simplification only. Their relaxation will greatly complicate the analysis but should not invalidate the general results.

We are concerned with issues in three areas. Once the model is set up, Section 3 considers the effects of an unanticipated trade liberalisation in a skill-abundant country. The increase in the relative return to skilled labour leads to some skill upgrading by the existing workforce. Which workers upgrade and which of them will gain (relative to the pre-liberalisation equilibrium)? In each ability cohort we determine an upgrader age cutoff, with younger workers upgrading and older workers remaining unskilled. The higher the ability level, the higher this age cutoff. But not all upgraders gain from liberalisation, and for each ability cohort we can also determine an analogous gainer age cutoff, which is lower than the corresponding upgrader cutoff. Thus in any given ability cohort older upgraders tend to lose and younger ones to gain from liberalisation. These results confirm a common perception that older adjusters lose. We then use the relative changes in US wages of high-school and college graduates over the period 1979–92 (as reported by Autor et al. (2008)), as the basis for simulating the effects of an unannounced trade liberalisation in 1992, to illustrate our results.

The effects of an announced liberalisation (to take place at a known future date) are then derived in Section 4. Here our main concern is the pattern of upgrading in the workforce existing at the time of announcement. Which workers will choose to upgrade and when? Interestingly, we find that the optimal timing of any upgrading depends only on ability. Upgraders fall into three ability categories. The highest ability upgraders will do so immediately after the announcement. The next highest group will upgrade immediately before the liberalisation and the final group immediately after. The significance of this is that much of the medium term adjustment (upgrading) to an announced liberalisation will occur before liberalisation takes place.[4] Freund and McLaren (1999) provide evidence that trade flows begin to adjust before preferential trading arrangements come into force, and refer to models where firms make anticipatory "investments" to explain this. We show that anticipatory investments in human capital can be a part of the same process. These results are illustrated by simulating the labour market outcomes if the 1992 liberalisation considered in Section 3 was announced in 1979. We also argue that worker adjustment in anticipation of the increase in the relative wage of skilled workers that took place after 1980 could provide an alternative explanation for the differing paths of relative wages and relative supplies of young and old workers considered by Card and Lemieux (2001).

Section 5 briefly highlights two implications of our analysis for the design of programs of adjustment assistance. The first is to note that those undertaking adjustment (the upgraders) are a mixture of gainers and losers from the liberalisation. Any given age cohort contains both, depending on the upgrader's ability. Since the latter is likely to be unobservable, it will be difficult to target assistance at losers. The second implication is that if the liberalisation is anticipated much of the upgrading will (and should) take place before it occurs. But if assistance is only provided post-liberalisation then early upgraders will not be covered. More importantly the decision on

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[1] Findlay and Kierzkowski (1983) and Borsook (1987) assume the economy is endowed with a fixed stock of educational capital. In the FK model all individuals are *ex ante* identical, and the productivity of those that choose to become skilled is positively related to the capital/student ratio at the time they are educated. But in a steady state all skilled workers are identical. Kreickemeier (2009) adds a fair wages mechanism to this model to analyse the effects of globalisation on wages and unemployment. Borsook assumes, as we do, an exogenous distribution of individual ability. His main concern is the link between ability and schooling undertaken by individuals of different abilities. While the length of time spent in school is fixed, more able students receive a more intensive education, because the optimal capital/student ratio is increasing in ability. Earnings differentials then reflect the interaction of ability and schooling and not just schooling. In both these models the relative stock of educational capital is an important determinant of the pattern of trade. We simplify the educational process by assuming that skilled labour (staff) rather than some exogenously given educational capital is the educational input (besides students) and there is a fixed staff/student ratio. Since our educational process has the same length and skilled labour input for all students regardless of ability, we assume their productivity as skilled workers depends only on inherent ability. Dinopoulos and Segerstrom (1999) make a similar assumption, but in their case schooling takes time only. In our case the trade pattern will be determined by inter-country differences in the length of working lives, birth rates and efficiency of the educational sector.

[2] A significant proportion of students have previous labour force experience, so reversing the decision to remain unskilled by formal education is a viable option for many, particularly younger workers. In 1990, 42% of US college students were 25 years and older. The corresponding figure in 2005 was 39%. During this period, college enrolment of students 25 years and older increased considerably (18%), although less than the enrolment of younger students (33%). Interestingly, between 2005 and 2016, the number of older students is projected to grow more rapidly than the number of younger students (21% versus 15%) (see http://nces.ed.gov/programs/digest/d07/tables/dt07_181.asp?referrer=report).

[3] In this sense our work can be considered complementary to Artuc et al. (2008), which considers the intersectoral adjustment of workers, and focuses on the decisions of (otherwise homogeneous) workers located in the import-competing or exporting sectors at the time of the liberalisation or its announcement.

[4] A similar outcome occurs in Artuc et al. (2008), although the motivation for early adjustment (avoiding higher adjustment costs) is different. They model labour market adjustment to trade liberalisation in a specific factors context. Workers, who are infinitely lived, choose their sector of employment in each period depending on their "costs" (which may be negative) of switching sectors. These costs have a common component and a time-varying idiosyncratic component. Adjustment to an unanticipated liberalisation is then delayed as import-competing workers with high current idiosyncratic costs wait to see if their costs are lower in the future, while some adjustment to an announced liberalisation occurs before the liberalisation itself, as import-competing workers with low current idiosyncratic costs move early for fear that these costs will be higher later.