

Trade Adjustment and Labor Income Risk

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I. Trade and Income Risk – An Introduction

Enhanced efficiency in production is an important channel through which openness to international trade can bring economic gains. For instance, it is expected that, with trade, countries will tend to specialize production in those goods in which they have comparative advantage. This improved allocation of productive resources and, the rationalization of industry structure caused by trade may lead to an increase in aggregate productivity, as low productivity firms are displaced by their more efficient counterparts.

While the benefits of trade through more efficient production are generally well understood, it is also true that the process of reallocation of resources necessary for this efficiency enhancement may not be an orderly or costless one and that it may not result in greater earnings for all factors of production -- an apprehension that underlies much of the public concern regarding trade and “globalization” more broadly.

Opening up to international trade may impact workers in a number of ways. In a benchmark theoretical economy, where workers possess no sector-specific skills and are able to move between sectors costlessly, trade liberalization is predicted to simply increase the rewards to abundant factors and lower returns to scarce factors – countries with a relative abundance (scarcity) of skilled workers are predicted to see a widening (compression) of their earnings distribution. An alternative characterization accounts for the fact that workers often possess experience and skills that are sector-specific. For instance, workers with long years of experience in the automobile sector may not be able to transfer their skills over to other sectors that are expanding. Here, trade liberalization will expose import competing sectors to greater pressure from imports and workers with skills specific to these sectors will experience reduced earnings. Of course, many factors of production may not be wholly specific to a sector. Following a decline in their sector caused by trade liberalization, these factors may move out to other sectors. However, the adjustment process may be a costly one. For instance, these workers may find jobs that only partially reward the experience they have earned in the previous sector of

employment.¹

In studying the impact of trade liberalization, the economics literature has traditionally focused on the average (mean) effect of openness on the labor force. In recent research (Krishna and Senses (2009)), we have studied instead what we believe to be an important but underemphasized aspect of the adjustment that takes place in labor markets in response to increased openness-- the risk that workers are exposed to due to the fact that similar workers may experience heterogeneous labor market outcomes with openness.

Figure I illustrates the main point. Here we depict income paths for a group of workers whose incomes in time period t are identical and equal to y_t . Assume that the economy opens up to trade at the end of this period. In time period $t+1$, we see that the average income for this group of workers changes to \bar{y}_{t+1} . However, around this mean change in incomes there is a variance in individual outcomes. To the extent that individual outcomes are unpredictable beforehand, this process is risky and workers exposed to risk would find it to be costly. It is this variance around y_{t+1} that we are interested in – while the prior literature has largely examined the mean income gap ($y_t - \bar{y}_{t+1}$).

It is important to recognize that the unanticipated changes in income that we are interested in measuring may be of a transitory or persistent nature. For example, during an adjustment process following trade liberalization, workers may experience temporary job loss resulting in a temporary loss of income. Alternately, individuals moving across sectors may see persistent income losses if the work experience they have accumulated in their previous sectors of employment is not valued and thus is not suitably rewarded in their new sector.

Figure II presents a heuristic illustration to clarify the differences between the risk

¹ The adjustment processes above have been discussed as one-time responses to trade liberalization. However, a more open economy may continually expose import-competing sectors to a more variable international economic environment, with changing international patterns of comparative advantage inducing reallocations of capital and labor across firms within and between sectors on an ongoing basis.

associated with transitory and persistent income changes. Specifically, Figure II illustrates the difference between transitory and persistent income shocks for a group consisting of two identical individuals whose incomes in time period t are both equal to y_t . At $t+1$, they experience shocks to income (some part transitory and some part persistent) that separate their incomes as indicated. By $t+2$, the transitory components of the income changes they experienced at $t+1$ expire and incomes for both workers move closer to their initial levels and stay at these levels for the rest of time. In this case, the magnitude of the variance of the persistent shock experienced at $t+1$ is measured by the spread in incomes at $t+2$ (and beyond). The spread in incomes at $t+1$ measures the sum of the variance of the transitory shock as well as the permanent shock experienced at $t+1$. Importantly, while in the face of a transitory income shock, workers may borrow or use their own savings to smooth consumption, this is clearly not feasible when income shocks are persistent. Thus, highly persistent income shocks have a large effect on individual well-being whereas the effect of transitory shocks is relatively small. Since it is the persistent income shocks that matter the most, it is on these shocks that we focus our attention.

A central analytical challenge addressed in this note concerns the measurement of income risk faced by workers in a sector using longitudinal data (where workers are followed over time) and, separately, the extent to which risk faced by workers in different sectors varies with the sector's exposure to international trade. In the sections that follow, this note describes the analytical approach that we have taken to study the issue of trade openness and labor income risk and outlines our main findings.

II. Data and Econometric Analysis

For the estimation of individual income risk, longitudinal data capturing individual income changes is desirable. It is generally not sufficient to use information on changes in the aggregate distribution of income to make inferences about the extent of income risk faced by individuals. For instance, while the aggregate distribution of income may stay

the same across different time periods there still may be stochastic (risky) transitions taking place underneath, with some individuals at the top of the distribution exchanging places with others at the bottom end of the distribution. To capture the risk in incomes faced by these individuals, longitudinal data, tracking these individual transitions, is clearly useful to have.

In Krishna and Senses (2009), we use longitudinal data on individuals from the 1993–1995, 1996–1999 and 2001–2003 panels of the Survey of Income and Program Participation (SIPP). Each panel of the SIPP is designed to be a nationally representative sample of the US population and surveys thousands of workers. The interviews are conducted at four-month intervals over a period of three years for the 1993 panel, four years for the 1996 panel and three years again for the 2001 panel. In each interview, data on earnings and labor force activity are collected for each of the preceding four months. SIPP has several advantages over other commonly used individual-level datasets in that it includes monthly information on earnings and employment over a long panel period for a large sample. Although the Current Population Survey (CPS) provides a larger sample, individuals are only sampled for 8 months over a two-year period in comparison to 33 months in the SIPP. While the Panel Study of Income Dynamics (PSID) provides a much longer longitudinal panel, it has a significantly smaller sample size compared to the SIPP and therefore does not support the estimation of risk at the industry level.

Our interest is in estimating labor income risk experienced by workers. Since labor income risk is defined as the variance of *unpredictable* changes in earnings, it is essential that predictable income changes are filtered out. To do this, we assume that the log of labor income of individual i employed in industry j in time period (month) t , $\log y_{ijt}$, is given by:

$$\log y_{ijt} = \alpha_{jt} + \beta_t \cdot x_{ijt} + u_{ijt} . \quad (1)$$

In (1) α_{jt} and β_t denote time-varying coefficients, x_{ijt} is a vector of observable

characteristics (such as age, age-squared, education, marital status, occupation, race, gender and industry), and u_{ijt} is the stochastic component of earnings. Changes in the stochastic component u_{ijt} represents individual income changes that are *not* due to changes in the return to observable worker characteristics. In this sense, changes in u_{ijt} over time measure the unpredictable part of changes in individual income.

We assume that the stochastic term is the sum of two (unobserved) components, a permanent component ω_{ijt} and a transitory component η_{ijt} :

$$u_{ijt} = \omega_{ijt} + \eta_{ijt} . \quad (2)$$

Permanent shocks to income are fully persistent in the sense that the permanent component follows a random walk:

$$\omega_{ij,t+1} = \omega_{ijt} + \varepsilon_{ij,t+1} , \quad (3)$$

where the innovation terms, $\{\varepsilon_{ijt}\}$, are independently distributed over time and identically distributed across individuals, $\varepsilon_{ijt} \sim N(0, \sigma_{\varepsilon js}^2)$. In this basic specification, transitory shocks have no persistence, that is, the random variables $\{\eta_{ijt}\}$ are independently distributed over time and identically distributed across individuals, $\eta_{ijt} \sim N(0, \sigma_{\eta js}^2)$. Note that the parameters describing the magnitude of both transitory and persistent shocks are assumed to depend on the sector j and the SIPP panel s , but do not depend on t . That is to say, they are assumed to be constant within a SIPP panel, but allowed to vary across panels. Estimation of $\sigma_{\varepsilon js}^2$ and $\sigma_{\eta js}^2$ therefore gives us industry specific, time varying estimates of transitory and permanent income risk faced by individuals. The specification of the labor income process (Equations (1)–(3)) describes shocks to income to be either purely transitory or purely persistent. However, this specification does not capture shocks that have duration greater than one period (i.e., are not purely transitory) but that are also not permanent (i.e., last for a finite amount of time). Estimation of

permanent income risk in this case requires us to filter out such shocks of longer duration. To achieve this, we admit into the specification some moving average terms which filter out shocks that last up to 12 months (See Krishna and Senses (2009) for details).

Table I presents estimates of persistent income risk obtained using the estimation procedure described above. As indicated in Table II, the mean estimate of the monthly variance of the persistent shock ($\sigma_{\varepsilon_{js}}^2$) is 0.0014, 0.0025 and 0.0031 for the 1993, the 1996 and the 2001 panels (with corresponding annualized values of 0.0168, 0.03 and 0.0372), respectively. The annualized standard deviations of the reported estimates of the variance of permanent income risk are 0.13, 0.17 and 0.19 for the 1993, 1996 and 2001 panels, respectively. Clearly, income risk is rising over time.

III. Openness and Income Risk - Results

We are interested in evaluating the relationship between trade openness and income risk. To get to this, we examine the association between industry-level, time-varying estimates of the persistent component of labor income risk and measures of industry exposure to international trade using regression analysis.

Our main finding is as follows: First, we find that within-industry changes in income risk are strongly related to changes in import penetration over the corresponding time-periods. Figure III plots the changes in estimated permanent income risk, against changes in import penetration calculated at the beginning of each panel. More specifically, Figure III plots changes in risk and import penetration between the 1993 and 1996 panels and between the 1996 and 2001 panels. As indicated in the plot, the relationship appears to be strongly positive, suggesting that an increase in import penetration is associated with an increase in income risk for the workers in that industry.

Regression analysis confirms the statistical significance of this relationship between income risk and import penetration. Furthermore, this relationship holds for the full

sample of workers as well as various sub-samples we consider – such as workers who switch industries within the manufacturing sector and those that switch out of manufacturing altogether. This result is robust to controlling for other time varying industry specific factors (such as exports, skill-biased technological change, offshoring, unionization, productivity) that are potentially correlated with both income risk and import penetration.

We should emphasize that our analysis focuses *exclusively* on the link between trade and individual income risk. Hence, our results should be taken together with the findings of a large literature on international trade exploring the many ways in which trade may affect the economy positively, through improved resource allocation, access to greater varieties of intermediate and final goods, greater exploitation of external economies and by possibly raising growth rates, *inter alia*. Specifically, the results presented here should not be interpreted as suggesting that exposure to trade results has negative consequences overall but instead as evidence that the costs of increased labor income risk ought to be taken into account when evaluating the total costs and benefits of trade and trade policy reform.

References

Krishna, P and Senses, Z. M., 2009, International Trade and Labor Income Risk in the United States, National Bureau of Economic Research, Working Paper Number 14992, NBER, Cambridge MA.

Table I: Individual Labor Income Risk Estimates

	Mean	Median	Std Dev
1993-1995	0.0014	0.0014	0.0019
1996-1998	0.0025	0.0026	0.0018
2001-2003	0.0031	0.0032	0.0025

Reported mean, median and standard deviations are calculated across point estimates for eighteen 2-digit SIC industries.

Figure I: Variance in Wage Outcomes

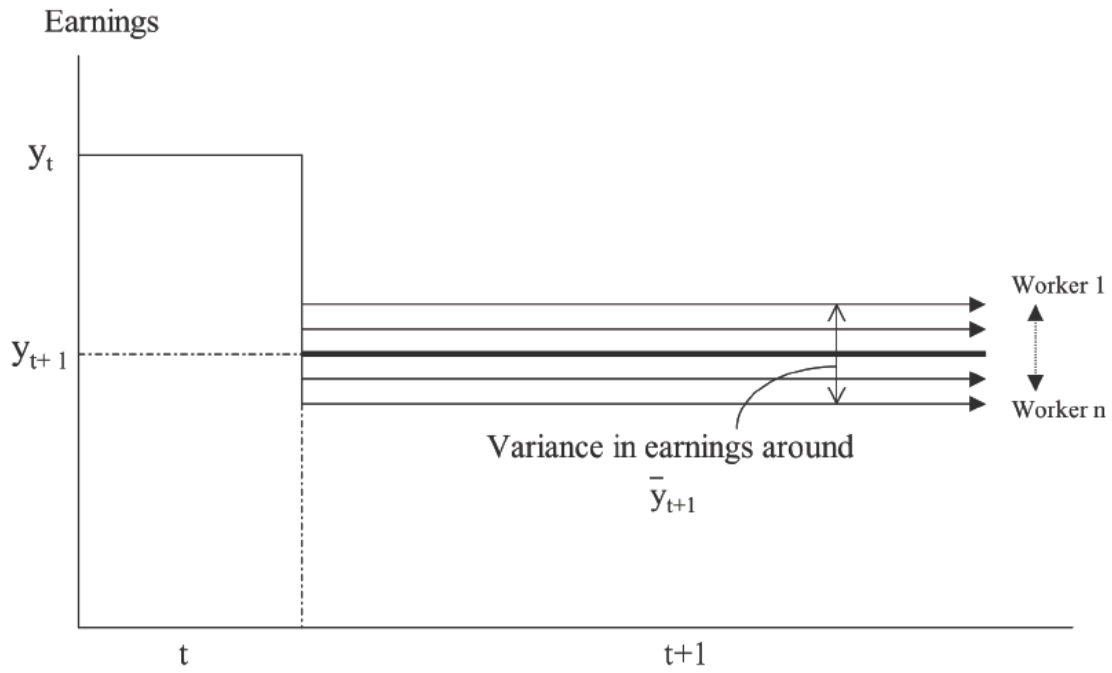


Figure II: Variance in Wage Outcomes

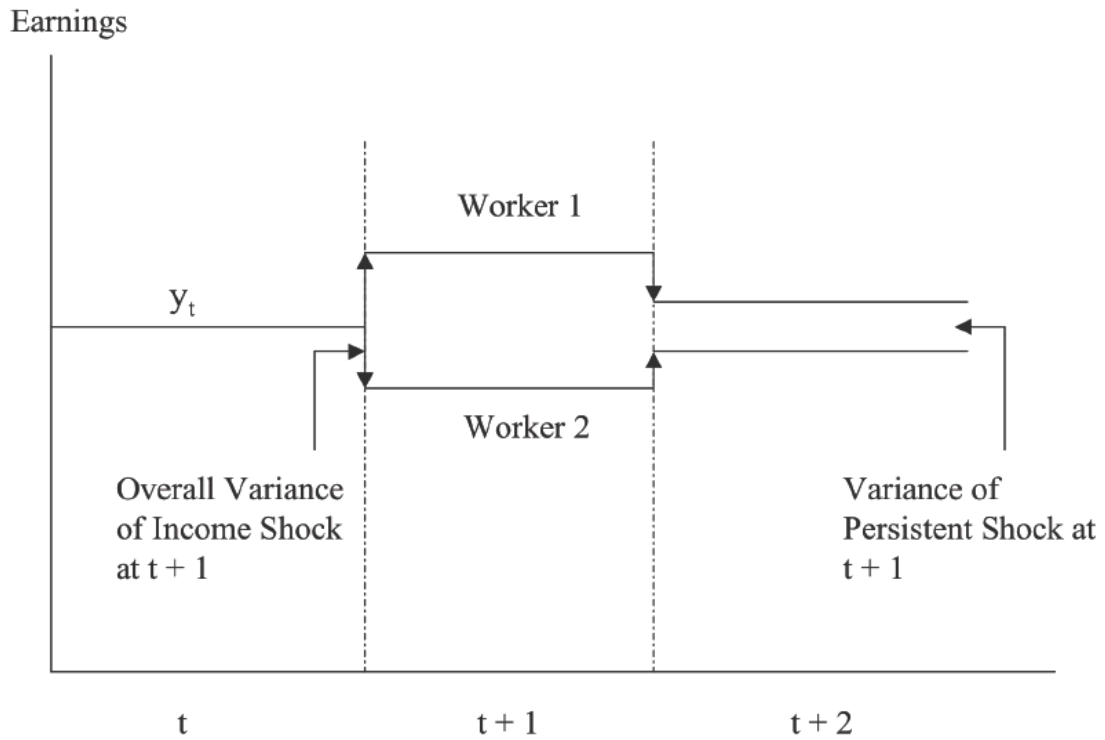


Figure III: Changes in Permanent Income Risk and Changes in Import Penetration

