Global Shocks, Costly Adjustment, and Political Overshooting

Emily Blanchard*  Gerald Willmann†

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Abstract

We examine the influence of costly adjustment on democratic political responses, and demonstrate the potential for political overshooting, in which unanticipated exogenous shocks generate radical policy reactions that gradually diminish over time. Our dynamic political economy model features overlapping generations, heterogeneous workers, endogenous investment decisions, and costly adjustment to shocks. In an application to trade policy, we show that beginning from a ‘political steady state’ in which the median voter votes to maintain the status quo, an exogenous economic shock – for instance, China’s accession to the WTO – can induce a dramatic increase in protectionism that overshoots the new steady state level before converging to the new policy regime. The magnitude of political overshooting increases both with economic inequality and with the extent of frictions in workers’ abilities to adjust to changing economic conditions. In contrast, political inequality – democratic disenfranchisement of lower-skill/lower-wage workers – reduces the potential for populist pressure that leads to political overshooting. Dramatic political swings may be a signal, then, of both economic inequality and healthy democracy.

Keywords: Dynamic Political Economy, Adjustment Costs, Skills, Overshooting

JEL Classifications: F5, D7, E6

*Tuck School of Business at Dartmouth; 100 Tuck Hall; Tuck Drive; Hanover, N.H. 03755; ph. (01) 603.646.8962; emily.blanchard@tuck.dartmouth.edu.
†Department of Economics, Catholic University of Leuven, Naamsestraat 69, 3000 Leuven, Belgium; gerald.willmann@econ.kuleuven.be.
“America has lost about 7.5 million jobs since the recession began. We cannot afford another job-killing trade agreement that ignores America’s middle class families.”

Rep. Linda Sánchez, April 13, 2011

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1 Introduction

In response to the global economic developments of the recent past, many observers fear that a protectionist reaction could be around the corner. And indeed, a recent report by the World Trade Organization (WTO) suggests such a retrenchment is already underway. Driven in part by well-intended GATT/WTO agreements, trade policy has come to rely increasingly on discrete, temporary measures, which tend to facilitate sharp reactions to local economic downturns. While economists tend to focus on long run efficiency, policy makers place more weight on short-run fixes. It is all very well and good to evaluate sustainable steady state trade policy, but there can be no doubt that transitional dynamics and populist politics will rule the day in actual policy implementation.

In the study of endogenous policy, we thus need to look beyond political steady states and analyze the adjustment and transition processes that play out in reaction to both temporary and permanent shocks in the macroeconomic environment. In doing so, it is important to take into account the differences in adjustment speed between different actors. Policy makers can adjust policy almost instantaneously, whereas investment decisions typically take time before they result in a fully adjusted economic structure. In this paper, we highlight the important role played by this difference in the degree of ‘stickiness’, and argue that it can lead to policy volatility – or political overshooting – so termed because of its similarity to Dornbusch’s seminal findings for exchange rate dynamics.

This paper develops an overlapping generations model in an endogenous policy setting to study dynamic political responses to macroeconomic shocks. In our model, two-period

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1Comments from the floor of the U.S. House of Representatives, Congressional Record (H2610)
2See in particular chart 1(b) the in the WTO Director General’s report from June 29, 2012, and the article ‘Protectionism Alert’ in The Economist Magazine printed June 30, 2012.
lived heterogeneous agents decide how much costly education to acquire during the first period of their lives, while reaping the benefits of their human capital investment in the second period. Policy is determined anew each period through majority voting; the decisive (median) voter at the time decides the policy for the period. In the context of trade policy, we show that starting from a political steady state tariff level with a positive, non-prohibitive tariff level, an exogenous terms of trade deterioration from the perspective of the median voter will lead to tariff overshooting: an immediate sharp increase in the tariff, followed thereafter by a slow decline in the tariff level converging to the new steady state tariff level as subsequent generations of agents gradually adjust to the new macroeconomic environment.

While our initial emphasis and exposition centers around trade policy, the fundamental insight is much broader. Political overshooting can result in any policy environment where there are differential costs of adjustment to macroeconomic shocks, whether costly adjustment of the ‘real’ economy is due to individuals’ human capital accumulation, firms’ investment decisions, geographic stickiness, or technological innovation.

The paper proceeds as follows. In the next section, we develop a model of political overshooting, applied to the trade policy context. We map out the basic mechanisms required for political overshooting to occur, and formally characterize the initial political steady state and transition dynamics following a large permanent shock. After demonstrating the key mechanisms within our trade policy example, we then formally lay out the generalized framework in Section 3. Section 4 of the paper sketches additional applications to environmental policy, income taxes, and social security. A final section concludes.

2 A Model of Political Overshooting

While the key mechanisms in the model apply broadly, we first develop the model within the context of a concrete example to fix ideas. Our initial application is to trade policy and the protectionist surges that can result from costly worker adjustment to economic globalization – a topic we find both timely and relevant. In the initial exposition of the model, we start
with discrete time to better highlight the key mechanisms; the results readily extend to a continuous time environment.

2.1 The Model Applied to Trade Policy

Consider a small open home economy that produces, consumes, and trades two goods: a skill-based good, $S$, which requires skilled labor to produce, and a basic good, $U$, produced using unskilled labor. Both goods are produced under perfect competition with constant returns to scale technologies. Let good $S$ be the economy’s natural export good. Designating $U$ as numéraire, the domestic relative price of good $S$ then is given by $p \equiv \frac{p_w}{\tau}$, where $p_w$ represents the exogenous world relative price of the skill-based good and $\tau$ is defined as one plus the ad-valorem tariff on the imported basic good. We assume that any tariff revenue is rebated uniformly across agents within an economy.

The home country is populated by a continuum of heterogeneous agents. Individuals live for two periods; thus at any point in time, two generations, the ‘young’ and the ‘old’, comprise the total population; the population of each generation is normalized to one. We refer to the generation that is young at time $t$ as ‘generation $t$’ hereafter. Within each generation individual agents differ in their inherent ability levels, $a$, assumed to be distributed continuously over the unit interval with cumulative distribution function $F(a)$ and corresponding density function $f(a)$. Agent $a = 0$ is the least able of her generation, and agent $a = 1$ the most able. Agents have rational expectations, and borrowing and lending are ruled out.\(^3\)

Every agent is endowed with one unit of labor in each period of life and is born unskilled. When young, each individual may choose whether to acquire human capital via costly education. Schooling takes time, and so the cost of human capital is the foregone income that could have been earned working in the unskilled sector if not for time in the

\(^3\)Uncertainty over future policy outcomes would introduce additional policy hysteresis via the uncertainty-driven status quo bias mechanism in Fernandez andRodrik (1991).

\(^4\)Introducing an independent savings channel (for instance, through international financial markets at a fixed world interest rate) will not change the qualitative results of our analysis.
classroom. There are no additional pecuniary costs of education, and education yields no return until the second period of life, when it manifests as human capital. Agents may allocate anywhere from none to all of their per-period (unit) labor endowment to schooling. Denoting unskilled labor allocation by \( l \), and duration of education by \( e \), the within-period time constraint is:

\[
l + e = 1.
\]  

(2.1)

Education is an investment: the cost is borne during youth, while the benefits accrue in the future. Thus, in this simple two-period overlapping generations framework the old have no incentive to acquire additional education in the second period of life. Our simple structure is thus effectively an extreme case of skill ‘stickiness’: older workers will optimally retain the same skill set they acquired in youth. When we generalize the model in a later section, older workers may find it optimal to acquire additional skills later in life, thus reducing (but not eliminating) skill stickiness. What matters for our key mechanism and results is simply that older workers face higher adjustment costs than younger workers, all else equal.

The technology for basic good production is deliberately simple: one unit of unskilled labor produces one unit of the basic (numéraire) good regardless of the worker’s inherent ability level, so that the unskilled wage is normalized to one. Producing the skill-based good requires human capital, \( h \). Let an individual’s output of the skill-based good, \( x^s(h) \), be strictly increasing in her human capital level at a constant rate, so that:

\[
x^s_h(h) > 0 \quad x^s_{hh}(h) = 0.
\]  

(2.2)

A type-a worker’s human capital in the second stage of life is strictly increasing both on her innate ability, \( a \), and the extent of education she acquired when young, \( e(a) \). We assume, crucially, that education and inherent ability are complementary in realized human capital, and that the human capital return to education is strictly concave.\(^5\) Our assumptions over human capital accumulation are summarized as follows:

\(^5\)The complementarity assumption generates the single crossing condition necessary to ensure that higher ability workers self-select into higher education levels, while concavity yields the second order condition for individuals’ optimal education decisions.
Assumption 1

\[
\begin{align*}
\frac{\partial h(a,e)}{\partial a} &> 0; \quad \frac{\partial h(a,e)}{\partial e} > 0; \\
\frac{\partial^2 h(a,e)}{\partial a \partial e} &> 0; \quad \frac{\partial^2 h(a,e)}{\partial e^2} < 0.
\end{align*}
\] (2.3) (2.4)

Education and Production. Each agent chooses her education level to maximize her lifetime indirect utility. Preferences are identical across individuals and functionally separable across time. Let each agent’s lifetime utility function be given by:

\[
u(x^y, x^o_U) + \beta u(x^o_U, x^o_s),
\] (2.5)

where \(\beta > 0\) represents the intertemporal discount factor, \(x^y(x^o)\) denotes the individual’s consumption of good \(S(U)\) when she is young, and \(x^o(x^o)\) her consumption of good \(S(U)\) when old. It proves analytically convenient to adopt homotheticity, so that the intratemporal indirect utility function may be written as \(v(p, I) \equiv v(p)I\), where, \(I\) denotes current nominal income. A key advantage of this functional form is that it allows us to focus on the skill acquisition decision by abstracting from consumption smoothing.\(^6\)

Recall that all agents are born unskilled, and that the unskilled wage is normalized to one. The nominal earnings for a young worker of generation \(t\) are therefore given by his time in the unskilled labor force, or equivalently one less his chosen education level. Adding in the per-capita tariff revenue rebate, \(R_t(\tau_t) \equiv \frac{1}{2}(\tau_t - 1)M^u_t\), (where \(M^u_t\) denotes the volume of basic good imports at time \(t\)), total nominal income for the young worker at time \(t\) is then: \(I^y_t(a) = l(a) + R_t = 1 - e(a) + R_t\). For notational convenience, we interpret earnings in the second period of life as the unskilled wage for the full unit labor endowment, regardless of education level, plus any additional earnings from skilled good production that accrues to acquired human capital, plus tariff revenue. For the young worker of generation \(t\), his anticipated income in the second period of life is: \(I^o_{t+1}(a) = 1 + x^s(h(a, e(a)))p_{t+1} + R_{t+1}\). One can interpret \(x^s(\cdot)p\) as the skill premium paid to workers, \(\text{Under constant marginal utility of income, agents' skill acquisition decisions are orthogonal to savings and wealth. Note that the presence of a perfect credit market would also silence the effect of a consumption smoothing motive on education decisions.}\)

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which is increasing (multiplicatively) in human capital and the relative price of the skill-based good.\textsuperscript{7}

Given current and expected prices, the opportunity cost of education, and the future returns to human capital, every agent \(a\) of each generation \(t\) agent chooses her optimal level of education to solve:

\[
\max_e v(p_t, I_t^p(e)) + \beta v(p_{t+1}, I_{t+1}^p(h(a, e), p_{t+1})), \text{ or} \tag{2.6}
\]

\[
\max_e v(p_t)[1 - e + R_t] + \beta v(p_{t+1})[1 + x^s(h(a, e))p_{t+1} + R_{t+1}], \tag{2.7}
\]

which has the associated first order condition:\textsuperscript{8}

\[
\beta x^s \frac{\partial h(a, e)}{\partial e} p_{t+1} = \frac{v_{p_t}}{v_{p_{t+1}}}. \tag{2.8}
\]

Solving yields the optimal education level as a function of ability type, current, and future prices:

\[
e(a; p_t, p_{t+1}) = h_e^{-1}\left( a, \frac{v_{p_t}}{v_{p_{t+1}}} \frac{1}{\beta p_{t+1} x^s_h} \right). \tag{2.9}
\]

where \(h_e^{-1}(\cdot)\) indicates the inverse of the first derivative of \(h(a, e)\) with respect to \(e\).

Our assumptions over human capital formation, \(h(a, e)\), ensure existence and uniqueness of the optimal education function, \(e(a; p_t, p_{t+1})\).\textsuperscript{9} Moreover,

\textbf{Lemma 2.1} \textit{The optimal education choice, \(e(a; p_t, p_{t+1})\), is strictly increasing in ability level, \(a\), the discount factor, \(\beta\), and the current and future relative price of the skill based good, \(p_t\) and \(p_{t+1}\).}

The proofs follow directly from the first order condition and Assumption 1 (see the appendix). Intuitively, an agent’s optimal education level increases with her inherent ability

\textsuperscript{7}Another more literal interpretation would be to allow only the initial unskilled labor allocation, \(l(a)\), to be used in unskilled production in the second period of life, so that \(I^p(a) = 1 - e + x^s(h(a, e))p + R\). The model’s results are qualitatively equivalent under either set up.

\textsuperscript{8}In a slight abuse of notation, we let \(v_{p_t} \equiv v(p_t)\) and \(v_{p_{t+1}} \equiv v(p_{t+1})\).

\textsuperscript{9}Specifically, the strict monotonicity and concavity of \(h(a, e)\) in \(e\) guarantees both the invertability of \(h_e\) with respect to \(e\) (existence), and strict inequality for the second order condition of (2.6) (uniqueness).
due to the assumed complementarity between education and $a$. The more an agent values the future relative to the present, i.e. the greater is $\beta$, the greater her incentive to invest in education today. Likewise, the greater the anticipated return to human capital via a higher relative price of the skill based good, the higher the optimal education level. Note that (uniform) tariff revenue rebate will not influence agents’ skill acquisition decisions under our constant marginal utility of income assumption.

Aggregating across all agents of both generations at a given time $t$ yields the output of each good, $q^u_t$ and $q^s_t$. Recall that young agents provide unskilled labor only when not in school, while all older agents regardless of ability or education are assumed to produce one unit of unskilled output in addition to any skilled-good output derived from acquired human capital. It proves helpful to annotate the optimal education functions for the younger and older cohorts coexisting at time $t$ by $e^y_t \equiv e(p_t, p_{t+1})$ and $e^o_{t-1} \equiv e(p_{t-1}, p_t)$, respectively. The following lemma summarizes the equilibrium outcome of the model developed so far, taking prices as exogenous.

**Economic Equilibrium.** As a function of an exogenous price sequence, the quantities of each good produced in every period $t$ are given by:

\[
q^u_t = q^u(p_t, p_{t+1}) = \left(1 - \int_0^1 e^y_t(a; p_t, p_{t+1})f(a)da\right) + 1, \\
q^s_t = q^s(p_{t-1}, p_t) = 0 + \int_0^1 x^s(h(a, e^o_{t-1}(a; p_{t-1}, p_t)))f(a)da,
\]

where,

\[
e_t = e(a; p_t, p_{t+1}) = h^{-1}_e\left(a, \frac{v_{p_t}}{v_{p_{t+1}}(\beta_{p_{t+1}}x_h^s)} \right) \quad \forall a, t.
\]

Notice that unskilled output depends on current and future prices (via the young cohort’s education choices), whereas skilled output depends on past and current prices via the older generation’s previous education decisions.

Solving for the economic steady state is straightforward. For a given sequence of world prices, the economic equilibrium outcome is determined uniquely by the last period, current,
and next-period prices; thus, if the world price is constant, and the tariff is fixed (and this is understood by voters), an economic steady state is reached. We formalize the steady state as a function of the tariff, the policy instrument at the center of the remaining analysis:

**Economic Steady State.** The steady state economic equilibrium under a constant tariff level \( \tau \) is characterized by a constant skill composition across generations and a constant level of production in each sector given by:

\[
q^u(\tau) = \left(1 - \int_0^1 e(a; \tau)f(a)da\right) + 1,
\]

\[
q^s(\tau) = \int_0^1 x^s(h(a, e(a; \tau)))f(a)da,
\]

\[
e(a; \tau) = h_e^{-1}\left(a, \frac{\tau}{\beta p w x_h^s}\right).
\]

Finally, note that in our small open economy setting, national income is maximized under the free trade economic steady state; i.e. (2.14)-(2.16) evaluated at \( \tau = 1 \).

### 2.2 The Political Process

We model the political process as a direct democracy over trade policy, in which only the old generation holds suffrage rights. At the beginning of each period, voters choose the current period’s trade policy, which subsequently determines the price level and real return to human capital for that period. The vote each period takes place before (young) agents decide on skill acquisition and before production and consumption occurs. The diagram below illustrates the within-period sequencing.

Trade policy is determined by majority vote. Every agent votes for her most preferred tariff policy, \( \tau \in [1, \tau^P] \), where \( \tau^P \) denotes the prohibitive tariff level (and hence a return to

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\[\text{We follow the literature in assuming that only the old vote. We do this to simplify analysis. See Blanchard and Willmann (2011) and Hassler, Storesletten, and Zilibotti (2003) for a models in which both the young and old generations have suffrage rights. In the former model, voting interests overlap across generations, as they would here, but a binary referendum framework keeps the model tractable; in the latter, young side universally with the old poor in taxing the old rich, again, ensuring tractability.}\]
autarky).\footnote{As is customary in such models, the median voter, hereafter denoted by superscript $M$, is decisive. Finally, we restrict attention to sincere (and implicitly compulsory) voting to rule out nuisance equilibria. There is no bureaucratic or time cost of changing tariff regimes.}

To simplify exposition, our formal definition of a political equilibrium incorporates two observations: first, we note that the equilibrium policy rule – the mapping from the state of the world to the implemented tariff – is synonymous with the median voter’s most preferred tariff policy. Moreover, because the median voter at time $t$ is a member of the older cohort (generation $t - 1$), her most preferred trade policy is independent of future trade policy;\footnote{Our small open economy assumption means that today’s local prices are determined by only today’s tariff and world price; young education decisions (which do depend on future prices) are thus immaterial to older voters.} the trade policy outcome at time $t$ is therefore decided by the generation $t - 1$ median voter’s education decision, $e_t^M \equiv e_{t-1}(a^M)$, which is the relevant state variable at time $t$. Second, we recall that each generation’s educational decision rule, as a function of ability type, is determined by current and expected prices under rational expectations according to (2.9).

**Definition 2.1 Political Equilibrium.** A Markov perfect political equilibrium is defined
by the tariff policy rule $T: [0, 1] \rightarrow [1, \tau^P]$ s.t. $\tau_t = T(e^M_t)$ and the individual education decision rule for every agent $a$, $\xi(a): [1, \tau^P] \rightarrow [0, 1]$ where $e_t(a) = \xi(\tau_t; a)$ $\forall a$, such that $\forall t$:

1. $T(e^M_t) = \arg \max_{\tau_t} V^o(\tau_t; a^M, e^M_t) = v(p_t(\tau_t))[1 + x^\kappa(h(a^M, e^M_t))p_t(\tau_t) + R(\tau_t)]$ and
2. $\xi(\tau_t; a) = h_t^{-1}\left(a, \left(\frac{\nu^e_t \tau_{t+1}}{\nu^w_{t+1} p^w x^w_h}\right)\right)$, s.t. $\tau_t = T(e^M_t)$ and $\tau_{t+1} = T(e^M_{t+1})$.

where $e^M_t = e_{t-1}(a^M)$ and $V^o(\cdot)$ denotes indirect utility of an older voter in the second period of life.

The first condition requires that the policy rule maximizes the indirect utility of the (older) median voter. The second condition requires that individuals’ skill acquisition strategies are optimal under the rational expectation that current and future equilibrium tariffs will follow the equilibrium.

A political steady state is an economic steady state in which the status quo policy is maintained endogenously under the existing political process. Thus, a political steady state is given by (2.14) - (2.16) under any tariff regime in which the electorate maintains the previous period’s tariff policy. Formally:

**Definition 2.2 Political Steady State.** A political steady state is reached when $\tau_t \equiv T(e^M_t) = \tau_{t-1} \forall t$. A political steady state can be summarized by the steady state education level of the median voter and concomitant policy outcome:

$$\tilde{e}^M = e^M(\tilde{\tau}) = h_t^{-1}\left(a^M, \left(\frac{\tilde{\tau}}{\beta p^w x^w_h}\right)\right) \quad (2.17)$$

$$\tilde{\tau} = T(\tilde{e}^M) = \arg \max_{\tilde{\tau}} V^o(\tilde{\tau}; a^M, \tilde{e}^M). \quad (2.18)$$

**Political Preferences.** The question now becomes, how does the median voter vote? And how do her voting preferences change with her innate ability level, education, and the terms of trade embodied in $p^w$?

Consider first the trade policy preference of any given voter at time $t$. Recall that only the old vote, so that all voters’ education levels are already decided when they cast
their ballots. As a function of ability level, $a$, and (previously set) education level, $e_{t-1}(a)$, each voter’s most preferred trade policy at time $t$ is the given implicitly by

$$\tau^0(a; e_{t-1}(a)) = \arg \max_{\tau_t} V^0(p_t, I_t(a, e_{t-1})) \quad \text{s.t.}$$

$$p_t = \frac{p^w_t}{\tau_t}, \quad \text{and}$$

$$I_t(a) = 1 + x^s(h(a, e_{t-1}(a)))p_t + R(\tau_t).$$

(2.19)

(2.20)

(2.21)

using Roy’s identity, the first order condition can be written:

$$V_{\tau_t} = v_I \left\{ \left[ x^s_t(a) - d^s_t(a) \right] \frac{dp_t}{d\tau_t} + \frac{dR_t}{d\tau_t} \right\} = 0,$$

(2.22)

where $\frac{dp_t}{d\tau_t} < 0$ and $\Omega^s_t(a)$ represents agent $a$’s individual balance of trade in the skill-based good, $S$. $R(\tau)$ is concave in $\tau$ – reflecting strictly increasing tariff revenue gains starting from free trade, with diminishing returns as the tariff rises above the revenue-maximizing level. Notice that higher ability agents are greater net sellers of the skill based good: high $a$ individuals both produce more $x^s$ for any given level of education (because $h_a(a, e) >$) and optimally acquire more education (because $e_a(a; \cdot) > 0$) which further increases their human capital, and thus their net sales of the skill based good. Under our assumption of homothetic preferences, we have that:

**Lemma 2.2** $\Omega^s_t(a)$ is strictly increasing in $a$.

See the appendix for the formal proof.

Starting from free trade, $\frac{dR_t}{d\tau_t} > 0$, and so agent $a$ prefers a positive tariff only if $\Omega^s_t(a)$ is sufficiently small – that is, if agent $a$ is either a net buyer or sufficiently small net seller of the skill intensive good:

$$V_{\tau_t} \geq 0 \iff \frac{dR_t}{d\tau_t} \geq \Omega^s_t(a) \left( -\frac{dp_t}{d\tau_t} \right).$$

(2.23)

Only large net sellers of the skill based good, those with $\Omega^s_t(a) > 0$ prefer free trade (or, strictly speaking, an import subsidy). This makes sense – high ability, high education agents are net sellers of the skill-based good, and thus stand the most to gain from freer trade.
Lower ability or lower education agents, who are net sellers of the basic good, necessarily oppose freer trade as it reduces their real income levels. Taking the total derivative of the first order condition yields the following key results over trade policy preferences:

**Proposition 2.1** The individually optimal tariff level, \( \tau_t(a; e_{t-1}(a)) \) is decreasing in ability level, \( a \), and (sunk) educational attainment, \( e_{t-1}(a) \).

**Proof.** Take the total derivative of the first order condition in (2.22) with respect to \( \tau \) and the relevant argument (\( a \) for the first statement; \( e_{t-1} \) for the second).

**Corollary 2.2** The equilibrium tariff at time \( t \), \( \tau_t = T(e_t^M) = T(e_{t-1}(a^M)) \) is strictly decreasing in the generation \( t-1 \) median voter’s (sunk) educational attainment, \( e_{t-1}(a^M) \).

**Steady State Properties.** We now have that the equilibrium tariff is decreasing in the median voter’s education level (corollary 2.2), just as the median voter’s education level is decreasing in the equilibrium tariff (from lemma 2.1). A unique stable steady state exists, therefore, if and only if the steady state education function, \( e^M(\tilde{\tau}) \), crosses the tariff function, \( \tau(\tilde{e}^M) \), once (and only once) from above over the support of \( e^M \in [0, 1] \). The following graph illustrates.

Notice that starting from any point in the space the economy will gradually converge to the steady state. Starting from a high tariff like point A, gradually increasing education will eventually drive the tariff downward; starting from an artificially high education level like point B, increasing levels of protection will drive education back down to the steady state level. For the remainder of the paper, we assume regularity conditions sufficient to ensure a unique, stable steady state. The precise technical conditions are outlined in the appendix.

**Assumption 2** Regularity conditions hold such that an unique steady state exists.

From here it is straightforward to evaluate how the steady state tariff and education levels depend on exogenous factors including the terms of trade, distribution of ability
levels (which manifest in the median voter’s type, $a^M$), discount factor, technology embodied in $x^*(\cdot)$ or the process of human capital accumulation $h(\cdot)$. While such steady state comparisons are themselves interesting and instructive, the focus of this paper on political transition dynamics, and we proceed immediately to study the dynamic response to shocks.

### 2.3 Policy Responses to Exogenous Shocks

We are now positioned to tackle the question posed at the beginning of the paper: how does a democracy, with inherent adjustment costs and intergenerational frictions, respond to exogenous macroeconomic shocks? For the remainder of the section, we consider the effect of a sharp, unanticipated change in the country’s terms-of-trade.

We make two critical assumptions, both of which we argue reflect salient features of the current economic climate in the industrialized world: first, we assume that the shock to the terms of trade marks an aggregate terms of trade *improvement* for the country as a whole – in keeping with the recent decline in the relative prices of less skill-intensive products increasingly produced by the developing world. Second, we assume that the median voter’s
real income is declining with the relative price of the skill-based good. That is, while the terms of trade shock is good for the economy over all, it is bad for the median voter (at least in the short run). Put another way, our starting assumption is that the majority of the gains from increasing trade and openness are concentrated among the elite, highest-a, individuals in the country. Perhaps (and hopefully) this is not the case in reality, but recent political rhetoric certainly suggests our framework to be the relevant starting point.

2.3.1 An unanticipated increase in $p^w$

We begin by tracing the effect of a permanent increase in the country’s terms of trade, $p^w$, on the steady state education and tariff levels. It is intuitive, and straightforward to show, that the equilibrium education level of the median voter (and all agents, for that matter) will increase, holding the tariff level fixed: the returns to education are strictly increasing in the country’s terms of trade, so an increase in $p^w$ will necessarily induce every agent to acquire greater human capital. That is,

**Lemma 2.3** The median-voter steady state education locus, $e^M(\tau)$ shifts right in $\{e^M, \tau\}$ space with an increase in $p^w$; i.e. $\frac{\partial e^M(\tau, p^w)}{\partial p^w} > 0$.

The effect on the optimal tariff locus is determined by the relative ability level of the median voter – for a high ability, highly educated median voter, an increase in the terms-of-trade will sharpen her free-trade preference. Conversely, for a lower ability, less educated worker with $\Omega(a, e(a)) < 0$, an increase in the relative price of the skill intensive good will harden his protectionist stance. Thus, an increase in the terms of trade, holding education levels fixed will increase the dispersion of political preferences among the electorate. (Over time, however, education will adjust and may lead political preferences to converge again.)

**Lemma 2.4** If the median voter is a net-seller of the basic good in the initial steady state, so that $\tilde{\Omega}(a^m, e(a^M)) \leq 0$, the steady state equilibrium tariff locus, $\tau(e^M)$ shifts up in $\{e^M, \tau\}$ space with an increase in $p^w$; i.e. $\frac{\partial \tau(e^M, p^w)}{\partial p^w} > 0$. 

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Figure 2 illustrates this shift in the two steady state loci. Starting from an initial steady state at \((\tilde{e}^M, \tilde{\tau})\), both the tariff policy function, \(\tau(e^M)\) and the education function \(e^M(\tau)\) shift up/rightward. Notice that the new steady state median voter education level and tariff are depend crucially on the relative changes in the two loci. The rightward shift in the education function would tend to push the new tariff down the the education level up, as shown. If, however, the tariff locus shifts up more than the education locus, it is possible (though rather unlikely) that the new steady state would entail a higher tariff and lower median education level.

![Figure 3: Steady State Response to \(p^w \uparrow\)](image)

Because we are interested in the potential for political overshooting, we we focus on the case in which the new steady state education level is higher, and tariff level is lower, than the original steady state. Transition dynamics for the alternative case are mechanically analogous but less interesting.

Figure 3 offers a sense of the transition dynamics, though of course these are steady state loci, derived under the steady state assumption of constant tariffs and education levels. At the the time of the unanticipated shock, which we’ll denote time \(T\), the time \(t\) median voter’s education level is already fixed, at \(\tilde{e}^M = e(a^M, \tilde{\tau}, \tilde{\tau})\). If she could immediately adjust
her education level, she would acquire more skills and vote in a lower tariff. But because her human capital is fixed, she is more protectionist than before the terms of trade shock, and so she will vote for an increase in protection and the time $t$ tariff jumps. The magnitude of the jump in protection at time $t$ depends crucially on $\Omega(a^M, \tilde{e}^M)$. The greater the median voter’s relative interest in the basic sector, the greater her protectionist response to the (ironically) improved terms of trade. Under very general conditions, however, the spike in the tariff level will be insufficient to fully offset the increase in $p^w$, leading to an increase (though tempered by the tariff) in the domestic price; i.e. $p_T > p_{t-1}$.

By Lemma 2.1, we know that this increase in the current tariff will lead to an increase in the educational attainment of agents born at time $T$. The median ability agent at time $T$ will in turn decide trade policy at time $T + 1$. Because she will be more educated than her predecessor, she will vote for a lower tariff, which will in turn increase the time $T + 1$ domestic price, and hence educational attainment by the generation $T + 1$ median voter – this process is understood by all according to rational expectations, and will progress until the new steady state is reached. The following figure illustrates the time path of the tariff response to the increase in $p^w$.

![Figure 4: Time Path of Tariff Response to $p^w \uparrow$](image-url)
Recall that the new steady state tariff level may be higher or lower than the original steady state – but in either case, we have demonstrated the potential for “political overshooting”: an immediate surge in protectionism following an exogenous terms to trade shock, followed by a gradual decline in tariffs as the new steady state tariff level is reached. It is noteworthy that this political “overshooting”, which at first glance seems to introduce volatility into the system (and indeed it does in the policy response) – is in practice acting as a shock absorber for the overall economy. The dramatic political response tempers the shift in local prices – in effect, giving the country’s constituents to adjust gradually to the new macroeconomic conditions. The following time path for the local price adjustment demonstrates.

![Figure 5: Time Path of Local Price Response to $p^w \uparrow$.](image)

Interpreted this more favorable light, political overshooting takes on the more encouraging role as economic shock absorber. But is political overshooting always innocuous? The short answer seems to be ‘no’. Political overshooting, slows adjustment over time, and thus entails real efficiency losses. The economy would be better off, over all, if it immediately shifted to the new steady state, simply compensating the time $T$ older generation for their losses at the time of the shock. Short of such a dramatic (and politically infeasible) transfer
scheme, effective and efficiency improving public policy would reduce the adjustment costs and time lags inherent in the system. In the simple model above, individuals are completely unable (or rather, have no incentive) to adjust their human capital levels in the second period of life. If instead older agents were able to increase education levels with relative ease, transition to the new steady state would be faster and thus more efficient. Important recent empirical work by Autor, Dorn, and Hanson (2012) highlights the very real adjustment costs to trade. The theoretical model presented here voices additional support for the importance of their findings for understanding not just the short run costs of global shocks, but also the influence of costly adjustment and worker stickiness on subsequent transition dynamics.

3 Concluding Remarks

We use a simple, generalizable model to highlight the practical importance of adjustment costs in shaping political responses to macroeconomic shocks. Because policy adjustment is virtually immediate, while real adjustment is both slow and costly, it is obvious, natural, and even efficient, for policy to serve as an economy’s “shock absorber.” But in a democracy, whether and to what extent the buffer mechanism is used depends both on the distributional consequences of the shock in question and the extent of political enfranchisement. When the majority suffer the consequences of a macroeconomic shock, as often appears to be the case, populist pressure demands that the buffer be used. As long as the majority vote, policy will react, potentially sharply, leading to political overshooting. If, however, those who are most hurt by the shock are also political disenfranchised, voting outcomes may not reflect majority preferences, and the shock absorber may be left unused. In that sense, political overshooting may signal simultaneously healthy democracy and widespread economic losses in the case of a negative macroeconomic shock, such as a recession or exogenous deterioration in the majority’s terms of trade.
References


