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Article

Political economy

NBER Reporter

Provided in Cooperation with:

National Bureau of Economic Research (NBER), Cambridge, Mass.

Suggested Citation: Alesina, Alberto (2013) : Political economy, NBER Reporter, National Bureau of Economic Research (NBER), Cambridge, MA, Iss. 2, pp. 1-7

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NBER Reporter

NATIONAL BUREAU OF ECONOMIC RESEARCH

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2013 Number 2

Program Report

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Political Economy

Alberto Alesina*

The NBER's Political Economy Program was created in 2006 and has flourished and expanded in a variety of directions since then, reflecting the rapidly growing interest of the profession in this area. Early on, this field was focused on issues that could be strictly defined at the connection of politics and economics. For instance, widely studied issues included the effect of elections on the economy and vice versa (political business cycles); the effect of corruption and inefficient bureaucracies; the role of the quality of institutions for long-term development; and the effects of lobbying pressures. Of course, these topics are still at the core of the field, but the most remarkable development in this area is the extension of political economics, broadly defined, to new areas. For example, many authors have studied the role of culture in determining economic choices, and the relationship between culture and institutional development. This topic has been so active that the program now has a group specifically focusing on it, directed by Alberto Bisin of New York University and Paola Giuliano of University of California, Los Angeles. Other "new" or especially active topics include: the role of the press and the determinants of its (lack of) freedom; the effects of ethnic and religious fragmentation with both new measurements and new implications for economic choices; exploration of "behavioral" (that is psychologically driven rather than rationally driven) effects applied to political action; the study of the determinants of wars; and the analysis of potential gender and race discrimination.

Political economy has even expanded methodologically. In addition to "standard" theory and regression analysis, we have seen the use of randomized trials which are common in development economics, as well as experiments in labs; new survey data have been collected; and historical research on original sources has been quite common. The coverage in terms of countries also has been very broad: from Afghanistan to Russia, China, Africa, Europe, and of course the United States. One common theme links

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this literature together, however: that in order to understand the world around us, we need to go beyond the assumption of “homo economicus” maximizing his welfare in isolation in an institution-free world.

Given the size and diversity of the work produced by this group, it is impossible to review every paper or even every topic touched upon. I therefore select a few of the main themes, with an apology to all the authors whose work I have not mentioned in this report.

Diversity

Diversity (measured by ethnicity, language, religion, genetic makeup, and birthplace) can have positive or negative effects. On the one hand, diversity may increase productivity because of the complementarity of different skills. On the other hand, it may bring about lack of communication, difficulty in running a polity, conflict, or even civil wars. One may think of a sort of inverted U-curve: too little or too much diversity may be “bad” while an intermediate level may be productive. Research by Quamrul Ashraf and Oded Galor¹, and Johann Harnoss, Hillel Rapoport, and me², implies this point. The former authors measure diversity in terms of genetic makeup and argue that more successful countries historically have been those with an intermediate level of diversity. The latter work measures diversity by birthplace and shows that some diversity is positively correlated with development and productivity in a cross-section of countries.

The negative effects of diversity are especially obvious in the case of Africa. In that continent, former colonizers left behind illogical borders, which split or merge various ethnicities in ways that have nothing to do with the aspiration of local populations. The result has been failed states, slow development, civil wars, and more. Many papers have documented various aspects of this phenomenon (Stelios Michalopoulos and Elias Papaioannou³, and William Easterly, Janina Matuszeski, and me⁴). As Nathan Nunn and Leonard Wantchekon⁵ point out, slave trade in Africa has increased mistrust among competing ethnic groups. Raphael Franck and Ilia Rainer⁶ have also studied favoritism and mistrust among African ethnic groups. Patrick Francois, Rainer, and Francesco Trebbi⁷ study the allocation of political power among ethnic groups, providing a carefully constructed new

dataset, while Robin Burgess et al.⁸ document ethnic-based politics in Kenya.

Ethnic and religious diversity is not unique to Africa. Abhijit Banerjee and Rohini Pande⁹, and Kaivan Munshi and Mark Rosenzweig¹⁰ document the negative effect of politics based upon ethnic identity in India. Christian Dippel¹¹ discusses the effects of forced cohabitation of different tribes in Native American reservations.

Diversity may have different effects in different scenarios. One additional critical variable is the level of segregation. Ekaterina Zhuravskaya and I¹² present a new dataset on segregation in all countries in the world, and show that the latter is negatively related to trust and the quality of institutions. Elizabeth Ananat and Ebonya Washington¹³ show that in the United States, racial segregation has a negative effect on the efficacy of black representatives.

Another dimension that interacts with ethnic fragmentation is income inequality. Michalopoulos, Papaioannou, and I¹⁴ provide a new measure of income differences across ethnicities in all countries and find a strong negative correlation between this variable and development. That is, the negative effects of ethnic diversity are exacerbated when they are correlated with income differences. A case in point is of course the United States, where racial tensions are exacerbated because poverty is higher among minorities.

An important and policy relevant question is what happens when individuals of different ethnic groups are forced to interact more closely than they would normally do. Yann Algan et al.¹⁵ use random allocations in Parisian housing complexes to show that more diverse condominiums are more poorly run and show more decay and less concern for public goods. David Clingingsmith, Asim Ijaz Khwaja, and Michael Kremer¹⁶ study the Muslim pilgrimage to Mecca, using the fact that in Pakistan some pilgrims are randomly chosen for support for the trips, while others are left out. By means of interviews before and after the pilgrimage, they show striking results: those who

go to Mecca show more understanding after the trip and more openness to other cultures which they met there, but no decrease in hostility towards non-Muslims. Eliana La Ferrara et al.¹⁷ study random assignment in dorms in a South African University. Bisin et al.¹⁸ study how minorities may “fight” integration to preserve their identity. Jon Eguia¹⁹ discusses how discrimination may foster or reduce assimilation of minorities.

Culture

The NBER’s “Economics of Culture and Institutions” meetings began in 2010. Papers presented at these meetings have covered a broad range of topics related to the persistence of culture, its evolution over time, its interaction with institutions, and its macroeconomic implications.

In order to be relevant, cultural traits have to be reasonably persistent over time. Luigi Guiso, Paola Sapienza, and Luigi Zingales²⁰ study the historical origin of differences in social capital in Italy, tracing it back to differences in the culture of independence fostered by the free city-states experience in the North of Italy at the turn of the first millennium. Nico Voigtländer and Hans-Joachim Voth²¹ find continuity of Anti-Semitism at the local level over more than half a millennium. Alesina, Giuliano, Nunn, and I²² link differences in agricultural technologies of pre-industrial societies to actual differences in female labor force participation, and more generally to beliefs about the role of women in the society. David Atkin²³ shows how culture can be relevant in shaping nutrition patterns among Indian immigrants.

Culture is not exogenous; its interaction with institutions is particularly relevant. Differences in cultural organizations (the presence of the clan versus the city) are at the origin of differences in social, moral, and institutional developments in China versus Europe. Avner Greif and Guido Tabellini²⁴ argue that in China, clans were the locus of cooperation among kin, motivated by limited morality and informal institutions. In Europe, cities became the locus of cooperation among

non-kin motivated by generalized morality and formal institutions. The institutional differences in turn reinforced the original organizational forms. These effects persist today. Daron Acemoglu and Matthew Jackson²⁵ study the interaction between history and “cooperation” in a more general way. The authors first characterize the (extreme) case under which history completely drives equilibrium, leading to social norms of high or low cooperation. In intermediate cases, the impact of history is potentially countered by leaders, whose actions are visible to future agents. Leaders can influence expectations of future agents and overturn social norms of low cooperation. These authors further show that, in equilibrium and not completely driven by history, there is a pattern of “reversion” to the original initial state of low/high cooperation. The interaction between culture and institutions can give rise to different waves of democratization. Davide Ticchi, Thierry Verdier, and Andrea Vindigni²⁶ develop a model in which parents invest resources in order to transmit their own political values to their children.

Many papers have investigated the relevance of the family in the transmission of culture (as in the paper by Bisin and Verdier²⁷). Recent developments in the literature show how differences in teaching practices can help and reinforce the transmission of cultural values. Algan, Pierre Cahuc, and Andrei Shleifer²⁸ show that teaching practices (such as teachers lecturing versus students working on projects together) exert a substantial influence on student’s beliefs about cooperation, both with each other and with teachers. In developing countries, institutions like microfinance are relevant in building up social capital. Benjamin Feigenberg, Erica Marie Field, and Pande²⁹ exploit random variation in the meeting frequency of microfinance groups during their first loan cycle to show that more frequent meeting is associated with long-run increases in social contact and lower default.

Cultural differences broadly defined can have important macroeconomic impacts: intergenerational differences

in the transmission of risk preferences influence the probability of the younger generation to become entrepreneurial. Matthias Doepke and Fabrizio Zilibotti³⁰ show that this has strong implications for economic growth because risk-taking entrepreneurs are essential for endogenous technological innovation. Ashraf and Galor³¹ argue that variations in the interplay between cultural assimilation and cultural diffusion have played a significant role in giving rise to differential patterns of economic development across the globe. Societies that were geographically vulnerable to cultural diffusion benefited from enhanced assimilation, lower cultural diversity, and thus more intense accumulation of society-specific human capital, becoming competitive during the agricultural stage of development.

Culture, as measured by differences in social capital, also can improve aggregate productivity through facilitating greater firm decentralization. Nicholas Bloom and Raffaella Sadun³² show that firms located in high trust regions are more likely to decentralize, even after controlling for country dummies.

Institutions, Institutional Change, and Human Capital

The discussion about cultural and institutional development is related in part to an active debate regarding whether “institutions” cause long-term development or whether human capital and culture (as we saw above) are the true driving forces, so that “good” institutions could not have a significant effect without human capital. In the last several years, Acemoglu and James Robinson (alone and with coauthors) have made a strong argument in favor on the institutionalism view. For example, their paper (with Davide Cantoni and Simon Johnson³³) describes the effects of the institutional reform imposed by Napoleonic invasions in central Europe. By comparing regions that were or were not invaded by Napoleon, they are able to study the effects of exogenously imposed institutional change. They find that the new and improved institutions for commerce

and economic freedom created a positive effect, although after a long delay. Torsten Persson and Tabellini³⁴ argue that the weak result linking democracy to growth is due to a poor definition of the former. They show that a measure of “democratic capital”, that is how long in the past a country has been a democracy, is positively correlated with growth.

On the human capital side, Edward Glaeser, Giacomo Ponzetto, and Shleifer³⁵ argue that for a democracy to function, it needs participation of its citizens. The latter can come about only with a certain level of human capital. Thus democracy needs education. Nicola Gennaioli et al.³⁶ argue that different regional development is explained most strongly by different levels of human capital, holding constant national institutions. Wantchekon, Natalijia Novta, and Marko Klansja³⁷ suggest that what led to development in certain parts of colonial Africa were not initial institutions brought by colonialists, but the diffusion of human capital. Using data on China, Gerard Padro-i-Miquel, Nancy Qian, and Yang Yao³⁸ argue that some minimum level of ethnic homogeneity is necessary for democratic institutions to work properly. The importance of information to make democracy work is emphasized by a field experiment in India by Banerjee et al.³⁹ Filipe Campante and Davin Chor⁴⁰ show that when human capital and education become inconsistent with the level of political freedom, insurgencies erupt, as the Arab Spring has shown. On the other hand, Leonardo Bursztyl and Lucas Coffman⁴¹ document the difficulty of building human capital via public policies in poor regions of Brazil.

Obviously, neither institutions nor human capital are fundamentally exogenous: something else has to explain why certain countries acquired good institutions and/or good human capital. So, a different and perhaps better way of posing the question is, which one moves more slowly: institutional change, human capital accumulation, or — to refer to the previous discussion — cultural traits? And, what forces explain such slower or faster evolutions?

Politics and Elections in the United States

Obviously a central topic in the area of political economics remains the study of elections, their determinants and consequences. Most, but not all, of the papers in this area have been about U.S. elections.

David Rothschild and Justin Wolfers⁴² examine the prediction of the outcomes of Presidential elections in the United States. Normally, forecasts are based on the answers to the question: “Who will you vote for?” These authors show that a better predictor of elections is the answer to the question: “Who do you think is going to win the election?” The reason is simple but powerful: the second question prompts the respondent to think about how other voters besides him will vote. Brian Knight and Nathan Schiff⁴³ document the effect of “momentum” in the dynamics of primary election in the United States — a point also raised in a different context by Yosh Halberstam and Pablo Montagnes⁴⁴. Adam Merovitz and Kenneth Shotts⁴⁵ study the role of signaling in elections.

Seth Stephens-Davidowitz⁴⁶ measures the role of “racism” in the share of votes received by President Obama. He proposes a new measure of “racism” based upon a Google search for racial slurs in different voting districts, and finds a significant effect on President Obama’s share of votes. Thus, race appears to matter in American elections. The effect of race on U.S. elections also is documented by Ananat and Washington⁴⁷, and Elizabeth Cascio and Washington study the effect of the Voting Rights Act on state funds.⁴⁸

Paola Conconi et al.⁴⁹ study the effect of votes on gun control regulation in cases of close elections, showing that congressmen are more likely to vote pro-gun when they face close races. In terms of their efficacy, state-based gun laws are evaluated by Knight⁵⁰, who shows that the traffic of guns circumvents state prohibitions. Conconi, Giovanni Facchini, and Maurizio Zanardi⁵¹ study electoral incentives on voting for-or-against Trade Reforms in the U.S. Congress. Marianne Bertrand, Matilde Bombardini, and

Trebbi⁵² investigate the function of lobbying in the United States, and Gergely Ujhelyi⁵³ studies the working of state bureaucracies.

The recent financial crisis has revived interest in the political economy of financial markets. For instance, Sumit Agarwal et al.⁵⁴ study the inconsistent behavior of regulators, which has increased confusion in markets because state-versus-federal regulations have not been well coordinated. Deniz Igan, Prachi Mishra, and Thierry Tresselt⁵⁵ also investigate lobbying during the financial crisis.

Conclusion

Other topics covered in the Political Economy Program include the role of the press in determining political outcomes and the determination of press freedom⁵⁶; the determinants of international and civil wars⁵⁷; the effect of corruption and public procurements⁵⁸; and the political economy of fiscal policy in the context of the European crisis⁵⁹; gender issues⁶⁰. In summary, the field of Political Economy, and the NBER Program in this field, are both thriving.

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Research Summaries

What Determines International Wages and Prices?

Mario Crucini*

Introduction

Wages and salaries are by far the predominant source of purchasing power for all but the wealthiest individuals in society. The real wage -- that is, the ratio of one's nominal wage to the unit cost of a basket of goods and services one chooses to consume -- is thus strongly positively associated with the health and welfare of individuals and their families. When goods and labor markets are perfectly competitive, and devoid of barriers to trade or factor mobility, identical goods or workers should command the same market price no matter where the good is sold or the worker is employed. That absence of barriers to trade and factor mobility ensures that arbitrage in goods and labor markets maintains

equality of prices and wages.

As it turns out, even within countries, identical workers are not necessarily paid the same nominal wage, nor do they face common market prices of goods and services and consume identical consumption baskets. Therefore, considerable research has been devoted to measuring wage and prices differences and exploring the broader economic implications of those differences.

My collaborative empirical and theoretical research focuses on retail prices of individual goods and services in local currency units (as opposed to index numbers that comprise the subindexes of the CPI) and on the use of cities as the spatial unit of account (as opposed to national averages). The cross-sectional differences in price deviations by good and location allow us to identify more of the underlying microeconomic structure of commodity and labor markets and to sustain a richer and more empirically robust class of economic theories.

Long-run Wage and Price Dispersion, the "Penn-Effect"

My early work with Christopher Telmer and Marios Zachariadis studies retail prices of thousands of goods and services across European capital cities at five-year intervals between 1975 and 1990.¹ The underlying data for international price comparisons for this period come from Eurostat, the statistical agency of the European Union, which coordinated the price survey and asked each National Statistical Agency (NSA) to match the exact brand, make, and model of each item across cities. The Eurostat approach was intended to depart from the method used by NSAs to construct domestic CPI indexes, whereby market prices are weighted to reflect domestic consumption patterns. The CPI methodology violates the premise of identical baskets needed to assess the purchasing power parity hypothesis — that is, equality of the cost of a common and broad basket of retail goods and services across coun-

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tries. The Eurostat methodology satisfies the research criteria.

Average price difference across goods, relative to the EU mean price, ranged from a high of 21.9 percent for Denmark to a low of -25.4 percent for Portugal in 1990. In other words, if Danes shopped in Portugal, they would save 47.3 percent of their expenditure relative to shopping at home. Conversely, if these price differences reflect arbitrage costs in goods markets, then the costs would need to be enormous relative to shipping costs.

After adjusting for differences in the Value Added Tax (VAT), the gap drops to 39.5 percent. We attribute part of the large remaining price level difference across Denmark and Portugal to the fact that they are at opposite ends of the EU income distribution, Denmark with the second highest per capita income after Luxembourg, and Portugal with the lowest (the theoretical rationale for this correlation is elaborated below).

We also indirectly examine the role of trade costs using an index of tradability, finding that goods and services that enter to a greater extent into EU trade volumes relative to production volumes tend to have lower geographic price dispersion. For example, going from the least traded sector (such as a haircut) to the most traded sector (unleaded gasoline), EU price dispersion drops from 43 percent to 12 percent.

The strong positive correlation between income levels and price levels is known as the “Penn Effect” in acknowledgement of the seminal work of Irving Kravis, Alan Heston, and Robert Summers who initiated the International Comparison of Prices Program (ICP) in the 1960s at the University of Pennsylvania and first documented the correlation.

Hakan Yilmazkuday and I conducted the first systematic investigation of the “Penn Effect,” integrated across microeconomic and macroeconomic levels.² Figure 1 presents a scatterplot of prices of many individual goods and services versus a single wage

rate (hourly wage paid to domestic help) in more than 100 capital cities of the world. Each dot represents the price of a single retail good and hourly wage for domestic help in a particular city. All the prices and wages are expressed in percentage deviations from their worldwide averages and then averaged over the years 1990 to 2005 to focus on the long-run differences associated with the “Penn Effect.” The vertical lines reflect that fact that one city wage measure is paired with the entire price distribution of that same city. The open circle is the consumption expenditure weighted average price deviation for that city. These data come from the Economist Intelligence Unit Worldwide Cost of Living Survey, which includes the familiar Big Mac prices and approximately 300 other retail prices.

The slope of the estimated line through the scatter is 0.54, which means a doubling of the nominal wage is associated with only about a 50 percent increase in the price of the basket of goods. Alternatively, a doubling of the nominal wage is associated with a 50

percent increase in the real wage, or real purchasing power. Why is this?

In an earlier joint paper, we developed a model of trade across cities with each city possessing a manufacturing and retail sector. We show that the slope coefficient in this regression identifies the average (across goods in the price survey) cost share of local (retail) inputs in the production of final consumer goods and services.³ The economic logic of this is straightforward and more general than the specific model we articulate.

The same argument helps us to understand the heterogeneity across goods, once it is recognized that retail items have different cost shares of local and traded inputs. For example, we would expect haircuts and wages of domestic help to be perfectly correlated, a slope of one in the Figure, because arbitrage across these two low skilled occupations keeps the relative wage across them equalized in each location, and there are no traded inputs of consequence in the provision of haircuts. At the opposite extreme, if the

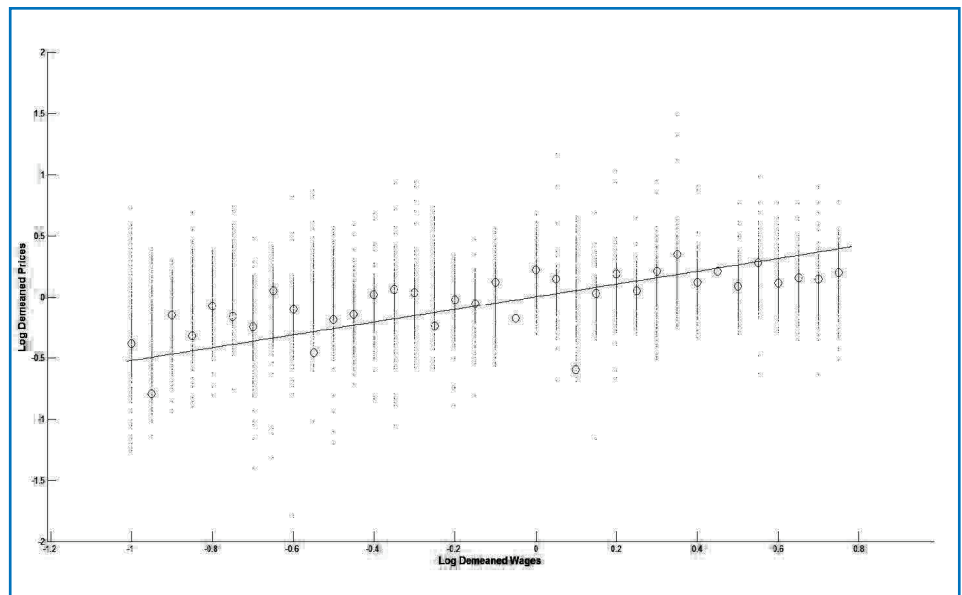


Figure 1 – Long run deviations from the Law of One Price and Purchasing Power Parity. Each point is the average (over the years 1990 to 2005) of the deviation of the price of a good or service from the world average. The open circles are consumption expenditure weighted averages of these deviations across goods (PPP). The estimated line through the scatter has a slope of 0.54. Source: Crucini and Yilmazkuday (2013), see endnote 2.

item is purely traded, involving no local inputs, then the correlation of the price with local wages should be zero. That is, while barriers to trade would generate price deviations across locations, these are not expected to be correlated with wages across these locations. In practice there are no retail items satisfying the strict definition, involving no cost from the manufacturer to the final consumer beyond a shipping cost. Gasoline sold at the retail level comes closest: it has a cost share of local inputs of about 0.19 based on U.S. National Income and Product Accounts data, giving rise to a modest positive slope for this highly traded commodity.

According to our model, what is not explained by differences in local input costs across cities can be attributed to trade costs, estimated as a function of distance and a border-effect, as in the paper by Charles Engel and John Rogers.⁴ For the typical retail item, trade costs contribute to distribution costs comparably to international price deviations, while varying in relative importance as we move from gasoline to haircuts as described earlier. In contrast, after aggregation to the price level, local costs account for the lion's share of international price dispersion, because trade costs largely average out across goods.

This evidence suggests that in the long-run, the efficiency gains brought about by international trade in goods are broadly shared and reduce the cost of traded inputs globally. In contrast, the difference in the distribution and retailing costs of those goods is largely born by consumers in the location of the final sale.

Stepping a bit beyond the existing analysis, the fact that the share of services in consumption is growing relative to goods suggests that markets actually may be becoming more segmented over time despite significant reductions in official and natural barriers to trade in goods. This makes the study of the prices and efficiencies of services — including education, medicine, infrastructure, and distribution services — even more compelling going forward.

Time-Series Variation in Relative Wages and Prices

The long-run deviations depicted in Figure 1 are only part of the story. The time-series variation around these long-run averages is economically significant and remains poorly understood. To appreciate this, it is instructive to engage in a thought experiment and some casual empiricism. Since the collapse of the Bretton Woods system of fixed nominal exchange rates, most national currencies are traded in centralized financial markets. The relative value of currencies or nominal exchange rates varies continuously over time. The magnitudes of the daily changes are not trivial; changes of a single percentage point in a single day are not uncommon. Also, retail prices typically remain fixed for days, weeks, or even months, depending on the item. Because the nominal exchange rate is used to convert domestic and foreign prices into comparable units, it must be true that changes in the nominal

exchange rate translate into changes in real exchange rates, the relative prices of goods and services when expressed in common currency. The same is true of relative wages. The implications of these changes in international relative prices and relative wages often depend on their duration or, put differently, how persistent the deviations are.

While it is true that few, if any, international retail prices respond immediately to developments in foreign exchange markets, it is instructive to examine how international relative prices fluctuate over time. For example, we can contrast a highly traded good, such as an apple, with a non-traded service, such as a haircut (Figure 2). The lines depicted in these charts are price of apples and haircuts in common currency units relative to the mean across locations. The figures focus on U.S.-Canada city pairs from the EIU data.

Obviously, the Law of One Price (LOP) fails in both of these markets. There are price deviations across these markets at each point in time and on

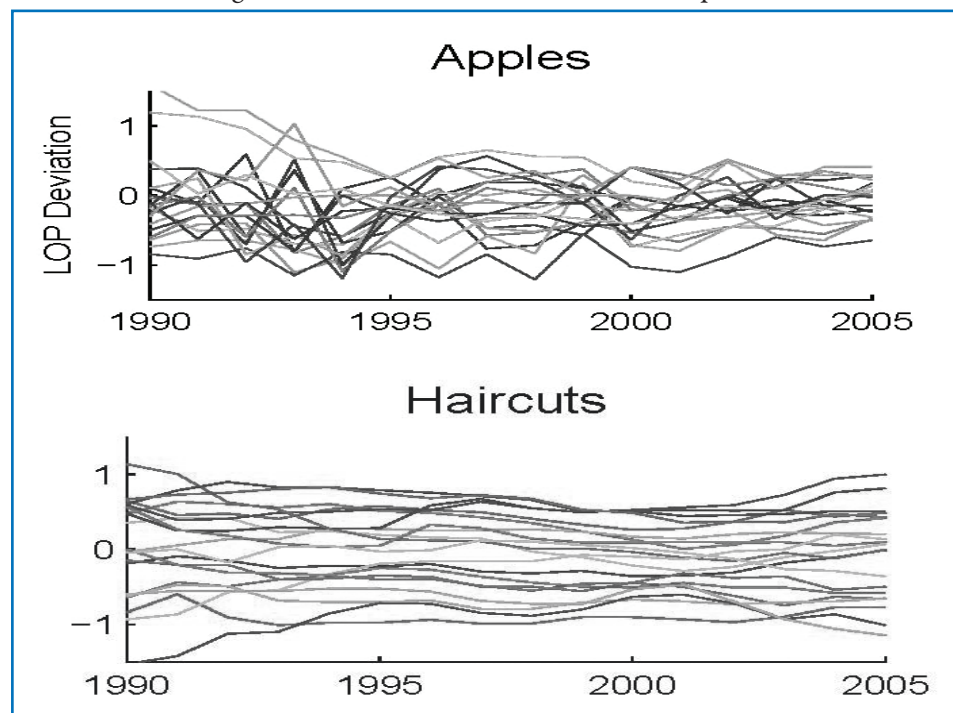


Figure 2 – Common currency relative prices of apples and haircuts, annually from 1990 to 2005. Each line is the price of an apple or haircut in a particular North American city relative to the North American average price of an apple or haircut. Source: Crucini and Telmer (2012).⁵

average over time (that is, in the long run). The deviations of apple prices across the cities of North America appear both more volatile and less persistent than the haircut prices. That is, when haircut prices are found to be high in one city relative to another in a particular year, one should expect this to be true on average over time. In contrast, the lines in the apple figure cross each other and the zero line indicating changes in the ranking of markets in terms of relative apple prices. In this sense, the relative price of apples is less predictable than that of haircuts, and one way to summarize predictability is by measuring persistence over time (does a high relative price today lead one to expect a high relative price in the future?). The higher persistence of price deviations in the case of haircuts relative to apples is consistent with the greater arbitrage costs in the case of haircuts than apples.

Mototsugu Shintani and I estimate good-specific persistence of LOP deviations for more than 250 goods and services (including apples and haircuts) across hundreds of international city pairs, including city pairs within the same country.⁶ For OECD city pairs, the median half-life of LOP deviations is 19 months, well below the Purchasing Price Parity (PPP) consensus range of three to five years in studies using aggregate CPI data. Dividing the sample into goods and services, the median half-life is 24 months for services and 18 months for goods. These findings are broadly consistent with the contrast provided by apples and haircuts in Figure 2.

Starting in the 1960s, international macroeconomists adopted a two-sector trade model with one sector featuring non-traded services and the other traded goods. The prices of goods were treated as satisfying the LOP; PPP deviations were assumed to arise only from non-traded services. These assumptions were based more on intuition than hard measurement of relative prices and they collapsed under scrutiny by Charles Engel when he claimed to have shown that non-traded goods accounted for

none of the variability in relative price levels.⁷ Subsequent to this finding, virtually all macroeconomic models of nominal price level adjustment embody the assumption that all goods adjust to nominal exchange rates with a lag and at the same rate. In other words, when the dollar depreciates relative to the Euro by 10 percent over the course of a month, all goods are assumed to become more expensive in the United States relative to Europe, whether they are traded or not.

In joint work with Anthony Landry, I revisit Engel's variance decomposition using microeconomic data and show the similarity of real exchange rate behavior across traded and non-traded sub-indexes of the CPI is more a reflection of the inadequacies of the CPI data for the purpose at hand than deficiencies of the underlying economic theory.⁸ Just as my work with Yilmazkuday finds long-run international price dispersion is rising in the cost share of non-traded inputs, my work with Landry finds that the contribution of local costs to the time-series variability of international relative prices is rising in this same cost share. Continuing with our earlier example, in moving from gasoline to haircuts, the contribution of local inputs (significantly, relative wage costs in retail) to time-series variability of the relative price of the final good increases from 30 percent to 91 percent. As Engel acknowledges, the CPI sub-indexes are poorly suited to identifying these differences. For example, the so-called traded category, food, includes both groceries and restaurant meals. According to U.S. NIPA data, the cost share of local inputs is about 0.30 for groceries and 0.75 for restaurant meals. Averaging the two sub-indexes to construct a food price sub-index completely obscures this difference. Not surprisingly, what results is a relative price that is driven roughly equally by local and traded input relative prices.

Having established heterogeneity in the variance of relative prices in the cross-section, I explore the structural sources of variability with coauthors

Mototsugu Shintani and Takayuki Tsuruga.⁹ In particular, we weigh in on a long-standing debate originating with Michael Mussa who emphasized the role of sticky prices and nominal shocks in accounting for real exchange rate variability and Alan Stockman who emphasized flexible prices and real shocks. Using a Calvo time-dependent pricing framework to encompass the two approaches, we demonstrate that the variance of real exchange rates is increasing in the frequency of price changes in the presence of real shocks and decreasing in the frequency of price changes in the presence of nominal shocks, exactly as Mussa and Stockman had argued. Given the observed frequency of price changes in the microeconomic data, our theoretical model predicts a real exchange rate volatility curve. The empirical shape the curve takes in practice depends on the relative importance of real and nominal shocks across goods.

Consider our two stark empirical examples to elucidate the thrust of the debate. Gasoline prices are not nominally rigid. For this reason, nominal exchange rate changes pass through quickly to the retail prices of gasoline. The same is true of the response of gasoline prices to changes in world demand and supply of oil. However, the composition of energy differs across locations, even within countries, so the real exchange rate for utilities will be volatile and persistent as the relative prices of different fuels changes. For example, as the United States increases its production of natural gas relative to crude petroleum, the relative price of utilities across regions changes, based on differences in regional energy composition (the Northeast relies more on heating oil and the West relies more on natural gas, for example). Now consider a haircut: haircut prices typically are posted on menus that change infrequently. Consequently, the relative price of haircuts across locations within a country is very stable in local currency. This implies that in the presence of floating nominal exchange rates,

the international relative price of haircuts will move closely with the nominal exchange rate and thus be dominated by nominal shocks.

Exploiting a cross-section of 66 sectors across the United States and Austria, Belgium, France, and Spain, we estimate what we call the “exchange rate volatility curve,” which relates the conditional variance of real exchange rates to the infrequency of observed price changes, sector-by-sector. The curve is mostly downward sloping reflecting the dominance of real shocks in accounting for the variance of the international relative prices of most goods. At the one-month horizon, the role of nominal shocks is 40.6 percent when all goods and country pairs are pooled. However, the value drops to less than 15 percent at a horizon of one year.

How integrated are international markets? The answer depends on the market in question, the locations under examination, and the historical period. There are also some important interactions, such as the fact that retail goods by their very nature are combinations of traded goods and local services. Market integration ranges from largely com-

plete in the case of primary commodities, such as oil, to barely begun, as in the cases of education and medical care. My research points to the necessity of microeconomic price data at the level of cities to address both microeconomic and macroeconomic facets of wage and price determination. The Center for International Price Research has a large and growing number of archives of international price data, posted along with references to papers that use them.¹⁰

¹ M. J. Crucini, C. I. Telmer, and M. Zachariadis, “Understanding European Real Exchange Rates,” *American Economic Review*, Vol. 95(3) (June 2005), pp. 724–38.

² M. J. Crucini and H. Yilmazkuday, “Understanding Long-run Price Dispersion,” NBER Working Paper No. 18811, February 2013.

³ M. J. Crucini and H. Yilmazkuday, “A Model of International Cities: Implications for Real Exchange Rates,” NBER Working Paper No. 14834, April 2009.

⁴ C. Engel and J. Rogers, “How Wide Is

the Border?” *The American Economic Review*, 86(5) (1996) pp. 1112–25.

⁵ M. J. Crucini and C. Telmer, “Microeconomic Sources of Real Exchange Rate Variability,” NBER Working Paper No. 17978, April 2012.

⁶ M. J. Crucini and M. Shintani, “Persistence in Law-of-One-Price Deviations: Evidence from Micro-Data,” *Journal of Monetary Economics*, 55:3 (April 2008), pp. 629–44.

⁷ C. Engel, “Accounting for U.S. Real Exchange Rates,” *Journal of Political Economy*, 107(3), pp. 507–38.

⁸ M. J. Crucini and A. Landry, “Accounting for Real Exchange Rates Using Micro-data,” NBER Working Paper No. 17812, February 2012.

⁹ M. J. Crucini, M. Shintani, and T. Tsuruga, “Do Sticky Prices Increase Real Exchange Rate Volatility at the Sector Level?” NBER Working Paper No. 16081, June 2010, and forthcoming in *the European Economic Review*.

¹⁰ The main web page for the Center for International Price Research is: <http://www.vanderbilt.edu/econ/cipr/menus> direct the visitor to data archives, papers and conference announcements.

Subsidies for Health Products

Pascaline Dupas*

Adoption of health products could lessen the burden of infectious disease in developing countries. In a series of studies using experimental data from Kenya, my colleagues and I have explored the role of subsidies in both short- and long-run adoption of such products, and studied how subsidies might be targeted.

Full Subsidies Increase Adoption in Both the Short and Long Run

Three studies examine the role of subsidies in the adoption of preventative health technologies. Subsidies for such products can be justified in two ways: first, because the diseases they prevent are often infectious, these technologies generate public health benefits. Second, people may be more likely to know the health effectiveness of a product if they or others around them have had an opportunity to try it out cheaply in the past.

For subsidies to successfully generate such health and learning effects, households need to make effective use of the products they receive at a highly subsidized price. However, they may not do so for two reasons. First, households that are unwilling to pay a high monetary price for a product also may be unwilling to pay the non-monetary costs associated with daily use of the product, or may not actually need the product at all. In other words, indiscriminate subsidies may undermine the screening or allocative effect of prices. Second, subsidies could reduce the potential for psychological effects associated with paying for a product, such as a “sunk cost” effect in which people, having paid for a product, feel compelled to use it.

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In a first study, Jessica Cohen and I use a two-stage randomized design to estimate the distinct roles of the screening and psychological sunk-cost effects in the use of long-lasting anti-malarial bed nets in rural Kenya.¹ These nets cost \$7, and they prevent bites from malaria-carrying mosquitoes while sleeping. We randomize the price at which prenatal clinics offered nets to pregnant women, who are particularly vulnerable to malaria. The clinics charged either nothing (free distribution), or 15, 30, or 60 U.S. cents. A random subset of women who had purchased a net for either 30 or 60 cents subsequently received a surprise rebate. We find that the rate at which pregnant women used the net (measured through home observation visits two months later) was relatively high (60 percent) and was completely independent of the price they paid for the net, either initially or after the surprise rebate. In other words, there is no evidence of either a screening or sunk-cost effect of prices in that context. On the other hand, our take-up results show that demand is very sensitive to price: the likelihood that pregnant women acquired a net fell from 99 to 39 percent when price increased from zero to 60 cents. Thus the effect of the subsidy on coverage, and hence its potential for public health outcomes, decreases very rapidly as the subsidy level declines.

In a second study conducted on a sample of households with school-aged children, also in Kenya, I find that demand becomes slightly less price sensitive if subsidies are in the form of vouchers that households have three months to redeem at local retail shops. Overall price remains the primary driver of demand, with the purchase rate dropping from 73 percent when the price is \$0.60 to around 33 percent when the price reaches \$1.50 (still an 80 percent subsidy) and to 6 percent when the price reaches \$3.50 (corresponding to a 50 per-

cent subsidy). Various marketing strategies (for example, making the morbidity burden or treatment costs salient, targeting mothers, or eliciting verbal commitments to invest in the product) fail to change the slope of the demand curve.² Here again, the price paid does not matter for usage. In fact, home observation visits show that the usage of bed nets acquired through a subsidized voucher was extremely high, rising from 60 percent at a three-month follow-up to over 90 percent after one year, and thus across all price groups, including recipients of fully subsidized net.

The results observed for bed nets do not appear highly specific. Nava Ashraf, James Berry, and Jesse Shapiro study the use of water purification products in Zambia; their two-stage design preceded the one I use with Cohen, and they find no evidence of use-inducing sunk-cost effects. However, they do find some evidence of a screening effect of prices.³ Jennifer Meredith, Jonathan Robinson, Sarah Walker, and Bruce Wydick work with three products in four countries—rubber shoes to prevent worm infections, soap, and vitamins in Kenya, Uganda, Guatemala, and India—and find that demand is very sensitive to price in all contexts. Neither health information nor gender targeting helps increase demand at higher prices, but people use the products no matter the price they paid.⁴

Given these results, and the fact that mass distribution is cheaper than setting up a partial subsidy scheme through vouchers, full subsidies appear necessary if one wants to see adoption of bed nets to reach the coverage levels targeted by the international community. But how long can subsidies be in place? Can a once-off subsidy be enough to trigger learning and to generate sustained adoption? Or is there a risk that people are unwilling to pay for a product they once received for free? This could hap-

pen if people, when they see a product being introduced for free, come to feel entitled to receive this product for free (that is, they would “anchor” around the subsidized price). To gauge the relative importance of these effects, I look at the long-run effects of temporary subsidies on adoption of these products.⁵ That study had two phases: in phase 1, taking data from study 2 described above, households were randomly assigned a price for a bed net, ranging from zero to \$3.80. In phase 2 a year later, all households faced the same price of \$2.30. By comparing the take-up rate of the second, uniformly-priced bed net across phase-1 price groups, I can test whether being exposed to a large or full subsidy in Phase 1 (which, as discussed above, considerably increases adoption in Phase 1) reduces or enhances willingness to pay for the bed net a year later. I find that it enhances it, suggesting the presence of a positive learning effect which dominates any potential anchoring effect. Interestingly, the learning effect trickles down to others in the community: households facing a positive price in the first year are more likely to purchase a bed net when the density of households around them who received a free or highly subsidized bed net is greater. Once bed net ownership is widespread, though, the transmission risk starts to decrease and the returns to private investments decrease: accordingly, those who have more subsidized neighbors in year one are less likely to invest in year two.

When Prices regain their Allocative Role: Medical Treatment

The studies discussed above find that price was not a good targeting mechanism to allocate malaria prevention tools (bed nets), and in fact that higher prices prevent positive spillovers on disease transmission associated with large bed net coverage. But in a study with Cohen and Simone Schaner using experimental data from the same region of Kenya, we find that price can be (to some extent)

used as a targeting mechanism to allocate malaria treatment.⁶ Targeting of malaria treatment is very important because of the negative spillovers that overuse of such treatments generates: it can delay or preclude proper treatment for the true cause of illness, waste scarce resources for malaria control, and may contribute to drug resistance among malaria parasites, making treatment of malaria harder in the long-run.

Price can be effective at targeting treatment when it's not effective at targeting prevention, because demand for treatment appears much less price-sensitive (especially among the poor) than demand for prevention. What's more, conditional on experiencing malaria-type symptoms, adults are much less likely to be malaria-positive than children. As with most treatments, though, the price per anti-malarial dose for adults (who need to take more pills) is higher than the price for children. Consequently, at a given price per pill, children (the key target for the subsidy) are on a flatter portion of the demand curve.

In addition to furthering our understanding of how price can be used to target health products in the developing world, a fourth study makes two contributions: 1) it highlights the trade-off inherent to subsidies for medications in environments with weak health system governance (which prevents conditioning the subsidy on a formal diagnostic); and 2) it points out that bundling subsidies for medications with subsidies for diagnostic tests has the potential to improve welfare impacts.

When Price is not an Effective Allocating Tool, what Allocation Mechanism can be used?

Two studies with Debopam Bhattacharya concern the question of how to efficiently allocate subsidized products. When budgets are such that only a small fraction of a target population can receive a given subsidy, but returns to the subsidy are heterogeneous across households (for example, some

households can afford the product without the subsidy but others cannot), the eligibility rule used to decide who will receive the subsidy can have an important effect on the overall benefit arising from the subsidy program. We first consider the problem of allocating a fixed amount of treatment resources to a target population with the aim of maximizing the mean population outcome, and the dual problem of estimating the minimum cost of achieving a given mean outcome in the population by efficient targeting of the treatment.⁷ We set-up an econometric framework for studying this problem and apply it to the design of welfare-maximizing allocation of subsidies for bed nets. Using the same data as in study 2 described above, we estimate that a government that can afford to distribute bed net subsidies to only 50 percent of its target population can, if using an allocation rule based on multiple covariates, increase bed net coverage by 17 to 20 percentage points relative to random allocation.

Bhattacharya, Shin Kanaya, and I then develop a method for estimating the predicted aggregate effect of a given subsidy-targeting rule, taking into account the spillover effects that one household's subsidization has on neighboring households' outcomes; and for estimating the error incurred in prediction due to ignoring the spillovers.⁸ A key requirement of the method we propose is the availability of data to estimate the magnitude and shape of spillovers. In our application, we (here again) exploit data from one of the experimental Kenya studies discussed above, in which a subsidy for anti-malarial bed nets was assigned randomly across households. We show that ignoring treatment externalities in the estimation of aggregate policy impacts can yield large bias and, importantly, that the sign of this bias cannot be inferred solely from the sign of the externality. For example, when individual bed net use is increasing in neighborhood subsidy rates, as in our application, intuitive reasoning might suggest that ignoring this externality would lead to underestimation of the aggregate impact of