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The Harvard College Economist

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The Harvard Undergraduate
Journal of Economics

Featuring

The Massachusetts Hospital Market

Chile's Neo-liberal Restructuring

Non-Optimal Investment by Venture Capitalists

The Market Transition

Travel Time and Monetarization in Rural Peru

And



An Interview with Professor Jeffrey G. Williamson

The Harvard College Economist

Thank You

This edition of *The Harvard College Economist* would not have been possible without the assistance of a number of people. First, we would like to thank Professors Richard Caves and Jeffrey Williamson for their continued guidance.

We would also like to send a special thank you to Professor Williamson for his interview, especially on short notice.

Finally, thanks to Anita Mortimer, Patty Boudrot and the Economics Department staff, BFS Publishing, and Andrew Lamb.

THE HARVARD COLLEGE ECONOMIST

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** These papers are abbreviated versions of submitted theses. To view these and all papers in their entirety, please visit our website at www.hcs.harvard.edu/~hce.*

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Editors' Note

Welcome to our second issue of the *Harvard College Economist*. Revived last year, the journal returns with an even greater selection of articles. We are excited to share the academic talents of our fellow undergraduate economists.

Unlike other economics journals, the *Harvard College Economist* is written entirely by undergraduates. In an effort to increase the diversity of papers, we held an open submissions process. As a result, we received a number of fine economics papers written for courses and for outside research. Unfortunately, we could only publish a handful of articles. In our selection process, we chose the papers that we believed were of the highest quality and of universal interest. We would like to thank all of our contributors for their hard work.

In keeping with tradition, this issue features an interview with a prominent Harvard economist. We were fortunate to interview Laird Bell Professor of Economics Jeffrey G. Williamson, who served as Director of Undergraduate Studies in Economics this year. We spoke with him about several popular issues involving globalization.

As we look toward the next issue, we hope to receive an even greater number of submissions from all students. For more information regarding details of submissions, please visit our web site at www.hcs.harvard.edu/~hce, e-mail us at hce@hcs.harvard.edu, or come to the informational meeting in the fall. We are always looking for bright people to write, format, and edit the *Harvard College Economist* and we encourage all students interested in any aspect of the publication to contact us.

Finally, our hope is that the journal becomes a staple of the Harvard undergraduate community. Please do not hesitate to offer suggestions for future issues.

Sincerely,

Matthew Rosenberg
Editor-In-Chief

Adam Taub
President

On Globalization: An Interview with Professor Jeffrey Williamson

Jeffrey G. Williamson is Laird Bell Professor of Economics and Director of Undergraduate Studies in Economics.

HCE: *The recent tariff hikes, such as those on steel and Canadian softwood, have strained relations between the U.S. and its major trading partners. Do you think that we are on the verge of a globalization backlash similar to that witnessed prior to the First World War?*

JGW: No. There is obviously the threat — illustrated by vociferous street demonstrations before September 11th — that there might be a repetition of the de-globalization we saw in the decades before the First World War and then even worse between 1914 and 1945. But things are very different now than they were prior to World War I. Countries have better safety nets to catch those that are damaged by globalization's short-run dislocation impact. Although globalization is usually good for a country's long run economic performance, in the short run it displaces

vulnerable firms and individuals, so having a safety net minimizes the pain and maximizes the speed of adjustment to a new global equilibrium. We didn't have much of this support prior to World War I. By "we", I mean, of course, what we now call the OECD and its rich industrialized country members. But in a sense it is the OECD members that matter. It is true that many of the less fortunate countries that are just starting modern development cannot afford and have not had much experience with systems designed to ease the impact of globalization; that's something countries develop when they become richer. On the other hand, if backlash effects do appear, they are likely to have a much bigger impact if they are initiated by the OECD, just as they were by European and United States leadership in the 1930s. Thus, the globalization backlash that matters most is that which might happen in the OECD. That's not to say that things don't matter in less-developed countries with whom we trade; of course they do. It could be that backlash effects as they exist now in Africa and Latin America might become a se-

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rious global problem in the near future. But much of the world's trade and factor flows involve the OECD, so that's where our attention should be focused. In which case, one hopes that history is a very imperfect guide!

HCE: *The Heckscher-Ohlin model of trade is based on factor endowments: it predicts that a country will export products which use domestically abundant inputs and import products whose inputs are relatively scarce. In light of empirical evidence, is this model still valid for determining which goods a country trades?*

JGW: Anybody who has had any exposure to international economics — and thus to this famous idea that won Ohlin a Nobel Prize — will realize that there hasn't been much modern evidence to support the Heckscher-Ohlin model. How is it possible that 50 years of empirical evidence seems to shoot down this model, yet it still flies high, almost as durable as it always was? The answer is that the model is so plausible and so useful in thinking about trade problems that no economist would think about throwing it away simply because the evidence is inconsistent with it. I know this statement sounds dreadfully anti-

scientific, but a number of theorists believe that we just haven't been clever enough to figure out how to map the complexities of the today's real world onto our models, that is, figuring out ways to retain Heckscher-Ohlin thinking, but in a different guise. We just haven't figured out how to do that yet. I don't think the model has been destroyed, but users beware: the world is simply too complex for this model in its current form. Indeed, when this model is confronted with evidence from a less complex era prior to 1914, it works just fine. Heckscher and Ohlin were writing around the time of World War I, and they were motivated by the period from the 1870s to World War I. Thus, when today's economic historians go back to test the Heckscher-Ohlin propositions with better numbers, more sophisticated econometrics, sharper models, and clearer thinking, we find that they were absolutely right: their model works. But it doesn't work in today's more complex world. To repeat, we haven't yet figured out how to make the model fit today's more complex world. Smart theorists are working on it, and so far the most effective advances have been those that introduce increasing returns. But as soon as a theorist introduces increasing returns, she needs to invoke

imperfect competition, at which point her analytical life becomes a horror since she doesn't yet have very good models that deal with increasing returns and imperfect competition. The new models are simply too clumsy and nowhere near as elegant as the original Heckscher-Ohlin Model-T version. Teachers can't step to a blackboard with the same kind of flourish that the Heckscher-Ohlin Model-T version permits. So we still use the old model, waiting for the new model to arrive in the showroom.

HCE: *One commonly heard argument against globalization is that rich countries are made wealthier by exploiting cheap labor and inputs abroad, thereby perpetuating extremely low standards of living in poor nations. How has globalization affected inequality between wealthy, OECD economies and poorer, less-developed countries over the previous century?*

JGW: That assertion is total nonsense. It is simply not true. The complication is not that poor countries don't gain from trade — they do: cheap labor in poor countries get more and better jobs in those export industries. In fact, it can be said that small poor countries are

likely to gain more than large rich countries from trade. The reason why that conservative statement might hold water is that, after all, poor countries are smaller and have less economic clout. Some critics view this as a bad thing, as vulnerability and weakness, while others view it as a good thing because such countries are able to take world markets and world prices as given, and whatever they supply and demand will have very little impact on the world market. Thus, more exports of soccer balls from Indonesia do not lower the price of soccer balls in world markets, an event which might harm Indonesian entrepreneurs and workers. So, it's not true that poor countries don't gain from going open, at least in the short run. To repeat, at least in the short run. But when we start thinking about the long run, the story gets more complex, and the debates get more intense since we are still fighting over theories of long-run growth. If your theory of long-run growth states that industrialized countries will grow faster, then critics of globalization might have something. In that case, it might well be true that in the long run specialization in primary, non-industrial products — products which offer very little externality spin-offs in technological change and accumulation — may harm

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a country's long-run growth performance. We have no shortage of models that make this argument; they have been around for a long time. In terms of empirical reality, we still don't know which of these models is correct, and, as a result, the policy issue has been a hot potato ever since Alexander Hamilton wrote in favor of protection of US manufactures in the 1790s (when Britain was the rich thug "exploiting" poor United States markets). But note the difference between primary product specialization and specialization in labor-intensive industrial-based manufactures. These two cases demand very different answers. To the extent that today's critics of globalization have labor-intensive manufactured exports from the developing nations in mind, the standard anti-globalization arguments do not apply. To the extent that they have primary product exports in mind, the standard anti-globalization arguments may indeed apply.

HCE: *What role did globalization play in the creation of the gap between Third World and advanced developed countries?*

JGW: If I knew the answer to that question, I would have a Nobel Prize. But

we know this: after the early 1600s — when there were no big economic gaps yet between Western Europe and the rest — the gap between those who eventually became the dominant economic leaders of the world and those who didn't began to widen. With the admittedly crude evidence now available, we can see a widening gap in levels of performance between the leaders of the pack — like Britain, the Netherlands, and France — and the other European countries; and that gap widens dramatically over the 200 years prior to the Industrial Revolution. There is also recent scholarship that documents a rising gap between Asia and Europe at the same time, not just within Europe. Thus today's great gap between rich and poor countries did not start with the Industrial Revolution. Rather, there are more fundamental pre-industrial factors at work like private property rights, effective legal systems, good government, and the role of empires versus competing nation-states. Furthermore, and despite what you were taught in high school, there was no globalization — in the sense of integrating markets through pro-globalization policy, competition in world markets, and/or falling transport costs — prior to the 19th century; there was trade, but no globalization. Since

there was no globalization going on before the Industrial Revolution, how can globalization be the cause? Two conditions changed in the 19th century: the first big globalization boom, and the Industrial Revolution. These made the gap between rich and poor countries bigger. That is, the countries where the industrial revolution arrived late (or not at all) fell farther behind. They didn't fall behind because they had lower incomes associated with going global and/or failing to undergo an industrial revolution, but they didn't undergo a big increase in incomes either, so the gap between poor and rich increased. Lant Pritchett called this "Divergence, Big Time," referring to this period of accelerating gaps just prior to World War I. Did globalization do it? Maybe globalization suppressed long-run growth prospects in the countries that were outside of Europe, or even outside of the European periphery. We don't know for sure. You can argue that it has nothing to do with globalization, or that globalization was not one of the fundamental factors. You can also make that argument that while this may be true, globalization certainly didn't help in the long run. So, until we understand what these fundamental factors were that originally led to the gap, this question can't be an-

swered. These fundamentals are complex, because they are all those forces that we were taught as economists to take as given: the structure of property rights, legal systems, and entrepreneurial behavior. Sociologists used to talk about these ideas, but that kind of thinking used to be too "fuzzy" for formal economists. Now economists are equipped to talk about these issues in a formal way and to apply evidence to test the hypotheses. So in the not too distant future, we will have well-articulated models that incorporate these fundamental issues. Until then, all we know is that it doesn't look like globalization is to blame.

HCE: *The strong dollar of recent years has made the United States a popular destination of foreign capital. Should we be concerned about increased foreign ownership of our factors of production?*

JGW: Well, the answer lies with politics, not economics. If the world wants to invest in the United States we should be very happy with that fact since foreigners are making financial capital cheaper than it would be otherwise. If the US somehow put up a curtain to keep out foreign capital, we would be less

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able to finance our own investment needs (including those Treasury bills financing our debt). That's pretty straightforward. The downside of this story is the fear that these investors can, at any time, pick up their marbles and leave the game. So we have to be willing to take that chance. If a country is going to have wide-open capital markets, and reap all the benefits, like cheap capital from abroad, there always exists the possibility that the capital could turn around and flee anytime. But why should it? This is the strongest economy in the world, even now during a recession. Are there going to be revolutionary events or financial chaos in the US causing capital flight? It's possible, but it seems very unlikely, especially compared with the rest of the world.

HCE: *How has your experience been over the past year as Director of Undergraduate Studies for Economics?*

JGW: I think we have made some great leaps forward. And it's not because I am any better at this job than my predecessors: They were amazingly good and probably a lot better at it than I am. The only advantage I have is age. I am a senior faculty member, and before me, there has never been a Director of Un-

dergraduate Studies in Economics who was a senior faculty member: they were always junior, non-tenured faculty. It's quite common to have senior faculty playing this role in other departments, but not in this one. Why does this fact matter? Can you imagine a junior faculty member going to see a senior faculty member to deal with complaints about his or her teaching? If that junior faculty member wants to remain at Harvard and/or get a good appointment upon departure, it is unlikely; there are obviously no incentives for the junior faculty member to take that risk. A senior faculty member is better able to rattle cages at Littauer, University Hall or even the Houses, to do all the things that should be done to escalate the importance and quality of the undergraduate learning experience in this department. A lot of really fundamental changes have occurred this year that our concentrators can see and are benefiting from: visits by the Director to the Houses, resident tutors serving as our representatives in the Houses, adding the Littauer Satellite advising office, pizza dinners with faculty, better monitoring of the senior honors thesis experience, two faculty available for advising (Professor Francesco Caselli and myself), and so on. In addition, Directors who are se-

nior are more effective in trying to change the culture of attitudes in the department. This is the best Economics Department in the world and everybody here is busy trying to keep it that way: undergraduate concentrators, graduate students, and the faculty are all on a fast track. The Director really has to make a lot of noise to get them to pay attention to issues, or they'll just run right past you. So the culture needs to change, and a junior faculty member would have a very hard time doing that. A senior faculty member can stand up shout "Stop! Pay attention! Here's what we have to do to

improve our undergraduate program, and here's why." And I think enough of my senior colleagues have agreed so that there is now a core of them committed to help make the long-run improvements in our undergraduate program that you deserve. I think this year's changes have all been very positive; I just hope we can keep this momentum in the future. University Hall seems to be quite happy with what has happened this year. I know I feel good about what I have done.

Partners HealthCare: A Case Study of the Massachusetts Hospital Market

Edward Y. H. Chan

Abstract

Catalyzed by soaring expenses and costly new technology, a wave of activity brought hospitals together over the past two decades through mergers and contractual affiliations. From a free-spending era in which fee-for-service service reigned, the emergence and near dominance of managed care has fundamentally changed the nature of the medical care provider market. As the bottom line became increasingly important, hospitals saw mergers as an effective method of cutting costs as well as increasing bargaining power. Employing market power to negotiate higher reimbursement rates with insurers and to attract more patients into the network are two of the primary ways that hospitals can increase their revenues.

I. Introduction

The past quarter century has witnessed concentration in the hospital market at a rate unlike any other in history. The Massachusetts market has been among the most active, with mergers and contractual affiliations bringing together over two-thirds of the 108 hospitals in the state since 1980. The largest deal involved the formation of Partners HealthCare in 1994 from the union of Massachusetts General Hospital and Brigham and Women's Hospital.¹ Bringing together two of the most re-

nowned medical care institutions in the country, the new entity has commonly been referred to as the 800-pound gorilla of Boston's medical care market.²

In order to keep pace, Beth Israel Hospital merged with New England Deaconess and the Pathways Network in 1996, creating CareGroup, a competing network. With nearly twice as many patients,³ Partners has prospered while CareGroup has foundered, losing at least \$50 million annually for the past three fiscal years⁴, including a whopping \$100 million in 1999.⁵ The question in-

evitably arises, why has Partners enjoyed such overwhelming success while CareGroup has not? The situations of Partners and CareGroup provide a superb case study as to why some hospital mergers succeed where others fail.

In trying to understand Partners' flourishing business, we turned directly to the guiding forces behind the networks, conducting interviews with top executives at Partners HealthCare, CareGroup and Boston Medical Center. The main issues they brought up in conversation were premium reimbursement rates from insurers, increased patient volume, case mix, CareGroup's debt load, and cultural issues from the Beth Israel/Deaconess merger. Partners' dominant market power and underlying strategy behind the creation of the networks are most likely accountable for any differences. Subsequently, we looked to the data to seek empirical corroboration for the opinions expressed by the executives.

From the data, we find that there is no statistical difference between the prices paid to Partners and CareGroup, in agreement with what we had learned from the interviews. However, the data do show significantly greater growth rates in terms of patient discharges and discharges across diag-

nosis groups for Partners. Additionally, we find evidence of a higher debt load carried by CareGroup than by Partners. While not readily testable in the data, the clash of cultures within CareGroup was also often cited in the popular press as a reason for the network's problems. These findings reinforce what we learned from the interviews.

In Chapter II, we review the background of Partners and CareGroup. We then explain the methodology we used in examining the trends in pricing and patient volumes in Chapter III. We report the complete results of our analysis in Chapter IV and present our conclusions in Chapter V.

II. Why Has Partners HealthCare Succeeded?

The financial success of Partners raises the question of why the network has prospered in comparison to its chief competitor, CareGroup, which underwent a similar consolidation along the same timeline. Several possibilities merit exploration, given the differences in market power and the manners in which each network grew. We focus our examination on topics suggested during our interviews and look to the data to confirm an answer to the overarching question.

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We began the process by determining the key players with whom it would be important to speak, arranging interviews with executives within the hospitals as well as in the associated physicians networks. These conversations took place over the course of two months with Paul Levy, now President and CEO of CareGroup; Thomas Glynn, COO of Partners; Ellen Zane, President and CEO of Partners Community Healthcare, Inc. (PCHI), the organization responsible for Partners' physician network; Jonathan Niloff, M.D., President of Provider Service Network (PSN), which represents CareGroup's physicians network; Mark Waxman, General Counsel for CareGroup; and Elaine Ullian, President and CEO of Boston Medical Center. Most spoke candidly about the strategy of their network during its development and gave their opinions on reasons for Partners' success and CareGroup's disappointing performance. The leading causes cited were surprisingly similar among the parties interviewed.

There are several ways in which a network of comparable size and stature with Partners HealthCare could exert its power within the market. First, one might expect to see higher prices reimbursed from insurers for Partners

hospitals. One might also expect to see a difference in the growth rate of annual patient admissions when comparing the two networks with the overall market. This trend should also be reflected in a comparison between the big Partners and CareGroup hospitals (Brigham and Women's, Mass. General and Beth Israel/Deaconess) and the market. The effect could come from Partners taking patients away from CareGroup hospitals in downtown Boston or in the suburbs. It could also come from channeling suburban patients away from the outlying satellite hospitals into the downtown hospitals. This variability could be attributed to the different ways in which each network built its relationships with suburban physician groups and satellite hospitals.

A third possible explanation for the superior performance of Partners could be a change in patient case mix, with Partners drawing more high-margin cases than CareGroup. Typically, cardiac bypasses and organ transplants are very lucrative, as opposed to drug treatment or psychiatry, which is not as well reimbursed relative to its cost.

Another issue is the amount of debt carried by each network, a particularly serious problem for CareGroup. Cited commonly in the in-

interviews and in the popular press is the fact that CareGroup has a far greater amount of debt than does Partners. The debt load hurts its bond rating and places a heavy burden on its overall financial health, due to expensive interest payments. Finally, cultural problems surrounding the mergers of the institutions may have led to less efficiently run hospitals and the loss of key medical staff.

III. Analytical Methods

Pricing

A key indicator of Partners's success in the Massachusetts market would be the ability to charge higher prices than competitors for the same procedures. In order to determine if Partners received preferential pricing from insurers, we looked at the median revenue per patient in several common diagnosis related groups (DRGs) across all hospitals. The revenue per patient variable was calculated by multiplying the charge per patient by the hospital's net revenue, then dividing by total charges. The charges per patient data were not used as the sole variable because often a hospital's charges are not good indicators of the actual prices. The charges are often manufactured simply for show with proportional discounts negotiated beforehand in contracts with

the insurers. Only after these discounts are factored in can the true price paid to each hospital be determined. Since the magnitude of these discounts is not publicly known, we judged revenue per patient to be the as the closest possible substitute for the actual amount received by a hospital for each patient.

Although it might seem strange to charge a price and then give subsequent discounts, the practice can be beneficial for the hospital. A world-famous hospital like Mass. General often attracts wealthy international patients who travel to the United States to receive medical care. These private individuals might receive a bill for the full amount of the listed charge, simply because they have no American health insurance and are more willing to pay the full price. For the vast majority of patients, however, the list price is not a good indicator of the true price per procedure for any given hospital.

Our regression has the revenue per DRG as the dependent variable with independent variables of *bigpart* (a dummy which equals 1 for Brigham and Women's or MGH), *bigcare* (dummy which equals 1 for BI/D), *yr97*, *yr98*, *yr99* (dummies for the individual years) as well as the interaction terms between *bigpart* and *bigcare* and the year dum-

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mies (*bigpart97*, *bigpart98*, *bigpart99*, *bigcare97*, *bigcare98*, *bigcare99*) (see Eq. 1). In most cases, we use only the large Partners and CareGroup hospitals because they constitute the bulk of the cases in the network and they approximate the way their networks move. In the case of DRG 371 (caesarian section), we use *partners* and *caregroup* as variables instead of the *bigpart* and *bigcare* dummies because there were no data available for Mass. General, removing a significant number of observations from the already slim data set. These variables equal one when the hospital is part of the Partners or CareGroup network. Also, the *yr98* variable is not included in cases in which the big hospital dummies are used because the revenue data were not available for any of the large hospitals in 1998, for whatever reason.

Patient Volume

An examination of patient vol-

umes and flows over from 1996 to 1999 involves many factors. In order to determine if the Partners and CareGroup hospitals had different numbers of discharges compared with the rest of the market, we regressed the number of hospital discharges (*hosdis*) against dummy variables for Partners (*partners*), CareGroup (*caregroup*), the years of the data (*yr97*, *yr98*, *yr99*) and interaction terms between the hospital dummies and the year dummies (*part97*, *part98*, *part99*, *care97*, *care98*, *care99*) (see Eq. 2).

We performed the same analysis again for the big Partners hospitals (*bigpart*) and the big CareGroup hospitals (*bigcare*), similarly regressing hospital discharges against dummies for big hospitals, year and interaction terms (*bigpart97*, *bigpart98*, *bigpart99*, *bigcare97*, *bigcare98*, *bigcare99*) (see Eq. 3).

Furthermore, we calculated the

(Eq.1)

$$\text{medrev} = \alpha_i + \beta_1 * \text{bigpart} + \beta_2 * \text{bigcare} + \beta_3 * \text{yr97} - \beta_5 * \text{bigpart 97} + \beta_6 * \text{bigpart} + \beta_7 * \text{bigcare 97} + \beta_8 * b$$

(Eq. 2)

$$\text{hosdis} = \alpha_i + \beta_1 * \text{partners} + \beta_2 * \text{caregroup} + \beta_3 * \text{yr97} - \beta_5 * \text{yr99} + \beta_6 * \text{part 97} + \beta_7 * \text{part 98} + \beta_8 * \text{part 99} + \beta_9 - \beta_{10} * \text{care 98} + \beta_{11} * \text{care 99} + \epsilon_i$$

distribution of Boston ZIP codes as an indicator of each network's success at attracting patients within the city. We looked at the top 40 ZIP codes for each hospital in the Partners and CareGroup networks and calculated the number of patients who came from Boston area ZIP codes (see appendix for list of Boston ZIP codes). We consider the rest to be from the suburbs. Using this number, we were also able to calculate whether the overall trend was for new patients to come from the city or from beyond. Along the same lines, we also explored the flows of patients within the network, leaving open the possibility that the downtown hospitals were prospering at the expense of the smaller affiliates within their own networks.

Other considerations

We performed an analysis of the case mixes using the DRGs that we compiled. Some of the specified DRGs

are very expensive and are performed only at top teaching institutions, whereas others are simple and fairly common. Sophisticated surgeries cost the hospital more, but are generally more lucrative overall. Cardiac procedures tend to be highly profitable for hospitals, according to Huckman.⁶ Levy argued that obstetrics cases are also profitable in the long run because even though hospitals may lose money on the individual patient, the patient loyalty that childbirth establishes is worth a great deal in future business.⁷

Coronary bypass without cardiac catheterization (DRG 107), for example, had a median charge of \$38,165 per patient in 1999; in contrast, neonatal care for normal birthweight babies without complication costs an average of \$1,165 per patient in the same year. Each of the five DRGs we examined could be considered profitable. We looked to see if there were any trends

(Eq. 3)

$$hosdis = \alpha_i + \beta_1 * bigpart + \beta_2 * bigcare + \beta_3 * yr97 + \beta_4 * yr98 + \beta_5 * bigpart97 + \beta_6 * bigpart98 + \beta_7 * bigpart99 + \beta_8 * bigcare97 + \beta_9 * bigcare98 + \beta_{10} * bigcare99 + \epsilon_i$$

(Eq. 4)

$$DRGdis = \alpha_i + \beta_1 * bigpart + \beta_2 * bigcare + \beta_3 * yr97 + \beta_4 * yr98 + \beta_5 * bigpart97 + \beta_6 * bigpart98 + \beta_7 * bigpart99 + \beta_8 * bigcare97 + \beta_9 * bigcare98 + \beta_{10} * bigcare99 + \epsilon_i$$

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for a given hospital to gain these high-profit patients over our sample time period. We regressed the number of discharges for each DRG by the *bigpart*, *bigcare*, year and interaction variables (see Eq. 4).

In considering the debt load carried by individual hospitals, we use interest expenses divided by revenues as a proxy for the relative impact that debt has on a hospital's finances and its ability to make interest payments. The data for interest expenses was available only for 1999.

Finally, the proposition that cultural issues from the BI/D merger are responsible for the difference between the networks is unverifiable. Only if none of the other possibilities held true would this answer appear feasible. The evidence of cultural problems comes from both the popular press and our interviews, so while it may have existed and played a role in hampering the development of CareGroup, its impact was likely more psychological than financial.

IV. Results

Prices

The regressions of revenue per patient produced inconclusive results when applied to the five DRGs in question. In most cases, the Partners data

were insignificant, but the CareGroup variables were occasionally significant. Overall, the regressions did not demonstrate increasing revenue levels per patient, as one might have expected from a firm with the market power enjoyed by Partners HealthCare. Even more surprising is the finding that for some procedures, CareGroup revenues may actually be gaining revenue at a faster rate than Partners' and making up for an initial disadvantage. This finding is consistent with the opinions of the executives we interviewed who stated that the two hospital groups received comparable prices.

For coronary bypass, the interaction terms *bigpart99*, *bigcare97* and *bigcare99* are significant at a 95% confidence interval, but *bigpart97* was not significant (Table A-3). *Bigpart99* had an interaction coefficient of 6511, with $t = 2.34$, suggesting that the revenues earned by big Partners hospitals in 1999 were \$6,500 above the state average. In comparison, *bigcare99* has a coefficient of 8772 ($t = 3.94$). *Bigcare97* has a coefficient of 13128 ($t = 4.10$), substantially higher than the corresponding value for Partners. This suggests that for the years in question, CareGroup actually experienced revenue growth of greater magnitude for coronary by-

passes than Partners did. While this trend may seem surprising, the data confirms the hypothesis. From the raw figures we see that it appears as if the Beth Israel/Deaconess begins at a lower level than its competition, but increases more from 1996 to 1999 (Table 2).

Heart failure and shock (DRG 127) give a slightly different result as only *bigcare97* and *bigcare99* are statistically significant. Their coefficients of 2854 ($t = 8.50$) and 1021 ($t = 2.15$), respectively, indicate that the revenues that the Beth Israel received for heart failure patients increased substantially more than the average for those years. In contrast, the Partners hospitals have negative, but statistically insignificant, coefficients. The negative coefficient of *bigcare* (-2320 , $t = -10.86$), suggests

that the BI/D started off at a disadvantage in 1996. But when combined with the gains made in 1997 and 1999, it has basically pulled even with the Partners hospitals, as seen in Table 3 on the next page. The 49% increase in revenues per patient dwarfs the flat and negative changes by the Partners hospitals, as well as the 7% increase in Massachusetts overall. That *yr99* is also significant with a coefficient of 1090 ($t = 2.29$) only means that revenues gained in 1999 marked a significant change from the year before, but that fact has no relevance to our analysis.

For caesarian sections (DRG 371), we chose to use *partners* and *caregroup* as the independent variables rather than *bigpart* and *bigcare* because Mass. General did not have data

Table 2: Revenues per patient by hospital by year for DRG 107

	1996	1997	1998	1999	% change
BETH ISRAEL DEACONESS	24763.19	35059.33	-	33160.62	0.3391
BRIGHAM AND WOMEN'S	25527.72	26785.92	-	31809.97	0.2461
MASS. GENERAL	28089.82	29687.41	-	34080.02	0.2133
MA median revenue	27468.49	27615.31	-	30267.02	0.1019

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for this diagnosis group (Table A-5). From the raw data below, it appears that the percentage change in revenue between CareGroup and Partners hospitals are quite close to equal over the four-year period, with the revenue level of

Partners being slightly higher. This rough observation is borne out in the regression, in which none of the interaction terms are statistically significantly different from zero and their coefficients appear to be moving in roughly the same

Table 3: Revenue per patient by hospital by year for DRG 127

	1996	1997	1998	1999	% change
BETH ISRAEL DEACONESS	4297.86	7350.34	-	6408.67	0.4911
BRIGHAM AND WOMEN'S	5730.37	5231.57	-	5382.45	-0.0607
MASS. GENERAL	7179.4	7678.34	-	7270.34	0.0127
MA median revenue	6353.82	6631.26	6404.67	6812.05	0.0721

Table 4: Revenue per patient by hospital by year for DRG 371

	1996	1997	1998	1999	% change
BETH ISRAEL DEACONESS	5615.32	8822.55	-	6911.05	0.2307
MT. AUBURN HOSPITAL	5844.52	6348.21	6482.29	6331.30	0.0833
BRIGHAM AND WOMEN'S	5795.10	6085.49	-	7165.75	0.2365
NEWTON-WELLESLEY	6661.65	6505.15	6982.13	7561.23	0.1350
MA median revenue	6457.55	6505.15	6482.29	7574.45	0.1730

manner (except in 1997). The only significant statistic in the regression is the -1608 coefficient on *caregroup* ($t = -2.85$), which supports the notion that the CareGroup hospitals started with lower average revenues than both Partners (-1109.6, $t = -1.72$) and the Massachusetts median.

Vaginal delivery without complications (DRG 373) is another example of what appears to be a strong trend: CareGroup hospital starts lower, but revenues grow annually until it catches up with the Partners hospital. In 1996, Beth Israel generates slightly less than the state average in revenue per delivery (*bigcare* = -426.7, $t = -2.05$), but quickly closes the gap, with a median revenue of \$5,277 in 1997

(*bigcare97* = 1878, $t = 6.39$) (Table A-6). In the overall picture, the revenue at the BI increased 37% compared to the state median of 17.6%, placing it between the growth rates for the big Partners hospitals (BWH = 52.6%, MGH = 25.9%). Although the revenue data is not statistically significant at 95% confidence intervals (*bigpart97* = 579.15, $t = 0.54$; *bigpart99* = 541.05, $t = 0.51$; *bigcare99* = 414.62, $t = 0.92$), the positive coefficients indicate that the BI/D is exceeding the average for other hospitals with vaginal delivery in their top 20 DRGs.

The situation with neonatal care for babies with normal birth weight (DRG 629) is similar to that of heart failure and, to a lesser degree, coronary

Table 5: Revenue per patient by hospital by year for DRG 373

	1996	1997	1998	1999	% change
BETH ISRAEL DEACONESS	3352.21	5276.78	-	4596.73	0.3713
BRIGHAM AND WOMEN'S	2835.37	3472.55	-	4327.17	0.5261
MASS. GENERAL	4832.22	5446.23	-	6082.33	0.2587
MA median revenue	3648.91	3827.68	3683.43	4290.025	0.1757

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bypass. From the numbers below (Table 6), it would appear as if the BI/D began at a deficit relative to the Partners hospitals, and that each had lower revenue per patient than the state average. While Beth Israel's revenues jumped in 1997 and remained there through 1999, almost doubling the state's rate of growth (53% vs. 27%), the Partners hospitals stagnated, not even able to keep pace with other hospitals within the state. These observations are clearly reflected in the regression (Table A-7). Both hospitals begin at levels below the state average (*bigpart* = -277.2, *t* = -4.26; *bigcare* = -447.5, *t* = -8.11) and only the CareGroup interaction term in 1997 (*bigcare97* = 369.5, *t* = 4.45) is significant. The Partners terms have negative

coefficients but are insignificant at 95% confidence levels.

According to these results, there is no conclusive evidence that Partners is receiving higher or faster growing prices from insurers than CareGroup. However, there is also evidence that CareGroup's revenues per patient may be increasing more quickly and leveling the originally uneven playing field. In a few cases such as coronary bypass, heart failure and neonatal care, it seemed that Partners and CareGroup prices were moving in opposite directions with Partners losing ground overall, although the coefficients were rarely statistically significant. The finding that there is no real difference between the prices given to the two networks is in agreement with our executive interviews. Through our

Table 6: Revenue per patient by patient by year for DRG 629

	1996	1997	1998	1999	% change
BETH ISRAEL DEACONESS	705.57	1106.04	-	1079.19	0.5295
BRIGHAM AND WOMEN'S	828.72	805.98	-	864.00	0.0426
MASS. GENERAL	923.04	964.75	-	1044.25	0.1313
MA median revenue	1053.62	1133.61	1234.43	1341.16	0.2729

analysis, we can eliminate preferential pricing as the primary reason for Partners HealthCare success.

ZIP codes

Discharges at Partners have grown at a far higher pace than the Massachusetts market overall, as illustrated by the performance of Brigham and Women's and Mass. General (see Table A-1 in the appendix). As mentioned before, MGH has gained 5,000 patients between 1996 and 1999 while the Brigham's patient discharges have increased by 5,300. The rates are even more striking when taking into consideration that the CareGroup hospitals have dramatically underperformed the state median, with discharges falling slightly in a growing market.

As previously mentioned, we must be careful when attempting to draw conclusions from a discharge total made only from the top 40 ZIP codes. A number of ZIP codes and patients could disappear from the top 40 simply because the distribution of the hospital changed.

This analysis is useful when comparing changes within the top 40 ZIP codes to the changes in the overall number of discharges. As an example, it appears from the top 40 ZIPs that CareGroup is losing patients at a rate of 10% (over 4,200 patients), but we know

from Table A-1 that CareGroup has only suffered a drop of about 1,100 patients. This tells us that the 4,200 patient drop in the top 40 ZIP codes is, in fact, a product of CareGroup's drawing patients from a wider range of ZIP codes while losing many from the areas in which they had been strong. While CareGroup is getting beaten on its home turf, it is making up for some of its losses by getting patients elsewhere.

Meanwhile, Partners has only demonstrated a slight increase in the top 40 (1.58%, almost 1,100 patients) from 1996 to 1999, but from Table A-1 we know that the network has actually gained 9,000 patients overall, an increase of 7.84%. This result indicates that while Partners is getting new patients from areas in which they were already strong, most of the increase in volume is coming from other ZIP codes outside their top 40, a testament to their successful network building. This point appears to be a key to Partners' success: not only does it retain and develop its core patient base, it brings patients in from peripheral areas.

When looking at the flagship hospitals, we see that the BI/Deaconess has lost a total of about 3,000 patients from its top 40 ZIP codes, a drop of 15%. Compared with a total decline

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of less than 800 discharges, this huge hit to the top 40 leads us to believe that Beth Israel is losing a great deal of patients within its core area. This comes while Mass General has gained approximately 3,000 (an 18.1% increase) of a total 5,000 patients from its top 40. The Brigham, in contrast, has picked up 300 patients (a 1.4% gain) from their biggest ZIP codes, a tiny portion of the hospital's total gain of 5,300 patients (see Table A-1).

This presents Massachusetts General and Brigham and Women's as slightly different cases within Partners HealthCare. Mass General has seen most of its gain from ZIP codes in which it had already been drawing most of its patients, coupled with some growth from non-top 40 ZIP codes. On the other hand, Brigham and Women's has enjoyed tremendous growth from outside its top 40 ZIP codes while maintaining the number of patients in its top 40. The Brigham retained most of the same ZIP codes within its top 40 from 1996 to 1999, keeping the number of discharges fairly constant throughout. This leads us to believe that the 5,000 additional patients discharged by the Brigham are coming from a multitude of non-top 40 ZIP codes, leading to many new ZIP codes, but not so many from

any one area that it changes the top 40 significantly.

As for the satellite CareGroup hospitals, the Deaconess-Waltham Hospital lost almost 579 patients from its top 40, but saw a decline of just over 122 overall. Of the Partners satellites, Newton-Wellesley experienced something similar, shedding 2,185 patients from its top 40 but losing only 1,403 total from all ZIP codes. One possible explanation is that Brigham and Women's, in part of its massive suburban expansion, picked up Newton-Wellesley's losses as members of the same network.

The question becomes, from where are these patients coming and to where are they going? Is CareGroup holding its own in Boston while hemorrhaging patients in the suburbs? Are they losing them across the board? Where are Partners' strongest gains? The top 40 ZIP code data can be broken down further into Boston and non-Boston ZIP codes. For our purposes, we will call non-Boston ZIP codes "suburban." (Table A-8).

The two big Partners hospitals have experienced very different patient flows. Massachusetts General has seen a total top 40 increase of 18.1% (~3,000 patients), about an equal per-

centage of which has come from Boston, 17.1% (836 patients), as from the suburbs, 18.6% (2,198 patients). In contrast, BWH has had a much smaller increase in patients (296) in its top 40, representing only 1.4% growth. Of these 296 patients, almost all have come from the Boston ZIP codes (292), but as we saw above, an enormous number of discharges (almost 5,000) come from outside the top 40 ZIP codes. For the BI/D, the distribution of its 3,000 patient decline has been proportionally more heavy from the suburbs. The hospital has lost 2,204 patients (-19.8%) from suburban ZIP codes while losing only 872 patients (9.3%) from Boston ZIP codes within its top 40.

The satellite hospitals that draw modest numbers of patients from Boston ZIP codes include New England Baptist and Mount Auburn for CareGroup and Faulkner and Newton-Wellesley for Partners. In the Baptist, of the roughly 550 patients they lost (-22%) from 1996-1999, the distribution is fairly even with a loss of 200 within the Boston ZIPs (-21.8%) and a loss of 250 from the suburbs (-22.2%). Mount Auburn made a modest gain of 200 patients (1.9%) with almost the entire amount coming from suburban ZIP codes.

Faulkner and Newton-Wellesley joined Partners within eight days of one another in 1998, but only Newton-Wellesley demonstrated a change in patient discharges, suffering a severe drop-off between 1997 and 1998. Newton-Wellesley lost just under 2,000 patients from its top 40 ZIP codes between 1996 and 1999, but most of them came between '97 and '98 from the suburbs (2,206 patients). Although the hospital only had 360 Boston patients to start, it suffered its most precipitous decline the year before it merged with Partners, between 1996 and 1997. Newton-Wellesley's patient flows eventually leveled off in 1999 at 159 patients, less than half the number it had before. As one of the longest suburban holdouts, Newton-Wellesley felt a great deal of pressure to merge with one of the developing networks and had to fight off an expansion by the downtown hospitals into the suburbs. Often they would open new satellite branches nearby or make affiliations with neighboring physician groups. One might suppose that the drastic drop in Boston patients and the subsequent fall in suburban patients were factors that led to their decision to merge.

Hospitals such as the Deaconess-Waltham, Deaconess Nashoba,

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Deaconess Glover and North Shore Medical Center have not drawn any significant numbers of patients from the Boston area so conclusions regarding their distribution of patients are not possible other than to say that they deal exclusively in non-Boston ZIP codes.

From the analysis of Tables 7 and A-1, we have some evidence to suggest that the CareGroup hospitals are losing large numbers of patients from areas in which they had previously drawn heavily. With major losses coming from

the top 40 ZIP codes and the suburbs, the Beth Israel/Deaconess has seen its core patient base dwindle. At Partners, the patient gains appear to be divided: Mass. General builds upon its core patient base and the Brigham extends its coverage greatly while maintaining its base. MGH has gained patients in Boston and the suburbs as parts of its top 40 ZIP codes. Brigham and Women's has experienced very little change within its top 40 and rapid growth in areas in which it was not as strong before.

Table 7: Total Discharges from the Top 40 ZIP Codes

	1996	1997	1998	1999	% change
<i>CareGroup</i>					
BI/DEACONESS MED CTR	20485	20048	18882	17409	-15.02%
DEACONESS-GLOVER	2076	2221	1985	1873	-9.78%
DEACONESS-NASHOBA	1965	1829	1863	1976	0.56%
DEACONESS-WALTHAM	5814	5672	5265	5235	-9.96%
MOUNT AUBURN HOSPITAL	9343	9494	9361	9521	1.91%
NEW ENGLAND BAPTIST	2504	2260	2070	1952	-22.04%
total CareGroup	42187	41524	39426	37966	-10.01%
<i>Partners</i>					
BRIGHAM & WOMEN'S	21192	21116	21589	21488	1.40%
FAULKNER HOSPITAL	5131	4926	5151	4936	-3.80%
MASS GENERAL HOSPITAL	16698	18204	18741	19726	18.13%
NEWTON-WELLESLEY	12369	12447	10208	10184	-17.67%
NORTH SHORE MED CENT	12872	13396	13184	13006	1.04%
total Partners	68262	70089	68873	69340	1.58%

For the satellite hospitals located in Boston (New England Baptist and Faulkner hospital), the percentage of total patient discharges represented by the top 10 ZIP codes decreases much more than for the larger hospitals within their network (Table 8). The Baptist falls 26.4% and Faulkner decreases 16.3%. A possible explanation for this is that once the hospitals joined the network, they began losing Boston area patients to their larger affiliates, evening out the distribution which was previously concentrated on Boston ZIP codes.

Baptist became part of CareGroup in 1994 as a result of its previous merger with New England Deaconess, then part of the Pathways Network. The Baptist shows steady decline from 1996-1999. The Faulkner hospital joined Partners in 1998 and we see an immediate 15% decline in the

percentage of total patients represented by the top 10 ZIP codes between 1998 and 1999, whereas the percentage had been fairly constant in the two years before.

Case Mix

We regress discharges by DRG in order to show an overall trend of Partners hospitals gaining more patients across all DRGs. The regression for coronary bypass (DRG 107) shows that the big CareGroup hospitals started with a higher number of procedures performed than Partners did, with coefficients of 120 and 101 respectively for the *bigcare* and *bigpart* dummies ($t = 16.95, t = 3.77$). While the number of discharges is decreasing with time (-14%) (Table 9), we see a generally positive trend within the Partners interaction terms and a negative one in those of

Table 8: Percentage of total discharges represented by top 10 ZIP codes

	1996	1997	1998	1999	% change
BI/DEACONESS MED CTR	23.21	21.91	20.40	20.05	-13.63
NEW ENGLAND BAPTIST	21.59	20.74	17.25	15.89	-26.38
BRIGHAM & WOMEN'S	22.87	21.90	21.79	21.03	-8.05
MASS. GENERAL	25.75	28.57	28.49	28.54	10.83
FAULKNER HOSPITAL	66.16	64.23	64.95	55.36	-16.32

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CareGroup, although most of the t-values are not statistically significant (Table A-11).

Only two of the six interaction terms are significant at 95% confidence (*bigpart98* = 128.5, $t = 2.26$ and *bigcare97* = -220.5, $t = -19.5$), but the signs are constant within networks (i.e. *bigpart97* and *bigpart99* also had positive t -values). For example, the Partners interaction terms were all positive while the CareGroup terms were all negative. This indicates a general trend towards an above average number of discharges for big Partners hospitals in each year period, although not necessarily a significant one. Similarly,

CareGroup interaction terms were negative, with the only reliable value in 1998. The year dummies show that lower numbers of coronary bypasses are performed when compared with 1996, with drops of 35 in 1997, 87 in 1998 and 56 in 1999. From this we can conclude that while CareGroup started with more discharges for this DRG, the trends in discharges are moving in opposite directions. Partners is gaining coronary bypass patients while CareGroup is losing them.

When looking at the regression for neonatal care (DRG 629), the dummies for the big Partners and CareGroup hospitals are once again significant (Table

Table 9: Discharges for Coronary Bypass (DRG 107)

	1996	1997	1998	1999	% change
BI/DEACONESS MED CTR	413	157	301	309	-0.2518
BRIGHAM & WOMEN'S	366	460	481	394	0.0765
MASS. GENERAL	422	414	390	378	-0.1042
MA total	2853	2743	2485	2452	-0.1406

Table 10: Discharges for Neonatal Care (DRG 629)

	1996	1997	1998	1999	% change
BI/DEACONESS MED CTR	4580	4429	4459	4243	-0.0736
BRIGHAM & WOMEN'S	6970	7230	7770	8281	0.1881
MASS. GENERAL	1172	1708	1989	2298	0.9608
MA total	70932	71047	72034	71489	0.00785

A-12). While the CareGroup coefficient is positive (3524, $t = 24.24$) and greater than that of Partners (3016, $t = 1.4$), the interaction terms have coefficients of the same sign much like with the coronary bypass example. *Bigpart97* (384, $t = 0.13$), *bigpart98* (748, $t = 0.25$) and *bigpart99* (1154, $t = 0.38$) each have a positive coefficient but a t -value too low to conclude with confidence that the values are correct. Similarly, the *bigcare* interactions have steadily declining coefficients that are not statistically significant.

Heart failure and shock (DRG 127) holds roughly the same results as in the previous examples. The *bigcare* dummy has a higher coefficient (355.2, $t = 22.57$) than *bigpart* does (186.7, $t = 8.05$) (Table A-13). While the *bigpart* interactions for 1997-1999 are all positive but insignificant, the *bigcare* interactions begin as positive (*bigcare97* = 50.7, $t = 2.11$) but then turn negative

(*bigcare99* = -48.4, $t = -2.13$) within two years. This analysis would appear to be reinforced by the raw numbers (Table 11). Overall in Massachusetts, the number of discharges for heart failure has fallen 3% (570 patients), matching the decline of the BI/D's discharges (8%, 47 patients). In contrast, the Brigham and the General have both gained 15% (69 and 64 patients, respectively). This continues the trend of CareGroup hospitals starting with a slightly higher number of discharges, then progressively losing that advantage over the four-year period.

Vaginal delivery without complications (DRG 373) continues the same pattern as with the other DRGs in question. The Beth Israel/Deaconess begins with a higher average number of discharges than the Brigham and Mass. General (*bigcare* = 2104, $t = 24.49$; *bigpart* = 1809, $t = 1.35$) and there is a general increase in Partners patients

Table 11: Discharges for Heart Failure and Shock (DRG 127)

	1996	1997	1998	1999	% change
BI/DEACONESS MED CTR	583	644	614	536	-0.0806
BRIGHAM & WOMEN'S	391	388	445	450	0.1509
MASS. GENERAL HOSPITAL	438	486	484	502	0.1461
MA total	19274	19615	19993	18704	-0.0296

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combined with a general decrease in CareGroup patients, although the t-values are insignificant, again (Table A-14). Although the market as a whole experience minimal upward movement, CareGroup had no change with a 5.9% loss by the BI/D while Partners gained 17%, led by a 20% increase from BWH and a whopping 119% jump in discharges by MGH (Table 12).

We see an across-the-board increase in discharges from the large Partners hospitals relative to CareGroup

and the state figures, although few of the coefficients are statistically significant with 95% confidence. This indicates a growth in the number of high profit procedures conducted by Partners hospitals.

Debt

From our calculation of the interest expense/ net revenues for 1999, we see that the ratio is higher on the whole for the CareGroup network than it is for Partners network (7.56 vs. 6.62), but

Table 12: Discharges for Vaginal Delivery (DRG 373)

	1996	1997	1998	1999	change (%)
BI/DEACONESS MED CTR	2768	2803	2777	2605	-0.05889
CareGroup	3640	3708	3780	3640	0.0000
BRIGHAM & WOMEN'S	4299	4506	5030	5157	0.1996
MASS. GENERAL	647	1122	1277	1417	1.1901
Partners	8178	8966	9343	9585	0.1720
MA total	44359	45365	45549	44896	0.01210

Table 13: Debt Load

	Capital Expenditures	Net inpatient Revenue	Interest ex. Revenue
BI/DEACONESS MED CTR	27701866	328275736	8.439%
CareGroup	34115606	451545553	7.555%
BRIGHAM AND WOMEN'S	29296615	434285913	6.746%
MASS. GENERAL	28240134	473192585	5.968%
Partners	70107846	1058998272	6.620%
MA total 1999 hospitals (median)			4.825%

both are higher than the median for all Massachusetts hospitals on the year (4.83) (Table 13). As mentioned in the data section, the ratios for the networks are possibly a better indication of the true nature than the individual numbers. However, if we choose to assume that the individual numbers are accurate, we can look at the numbers for Beth Israel/Deaconess, the institution to which the popular press and those we interviewed attribute the bulk of the debt problems. The ratio for the BI/D is very high compared to that of the Brigham and MGH. Although interest expense numbers for the two hospitals are about even, both the BWH and MGH have significantly higher inpatient revenues than the BI/D does. These numbers would lend credence to the popular theory that the CareGroup network is being bogged down financially by its high debt load.

V. Conclusion

On the whole, the guidance provided by the executives we interviewed would appear to be a true representation of the real situation. The analysis demonstrates that Partners HealthCare owes a large part of its success to increased patient volume, likely a result of a recognizable brand name and financially sound network building with

physician groups. The data clearly demonstrates the Partners' much higher growth rate of discharges, for the flagship hospitals and for the network.

By comparing top 40 ZIP code discharge data to total hospital discharge data, we get the sense that Brigham and Women's and Massachusetts General Hospitals are doing a good job of preserving their core patient areas while also succeeding at expanding their networks. Beth Israel/Deaconess, on the other hand, is rapidly losing patients from its top 40 and replacing them elsewhere, indicating that it is losing the battle for patients in areas in which it once succeeded. Not only does Partners get more patients from downtown and the suburbs, this appears to manifest itself across DRGs with Partners discharging high-profit patients at a greater rate than CareGroup.

In accordance with the interviews but somewhat surprising theoretically, the pricing data failed to demonstrate any significant evidence of preferred prices received by Partners over CareGroup. Overall, the levels of revenue per patient were not different for the Partners hospitals or the big Partners hospitals.

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Endnotes

¹ A timeline of Partners and CareGroup mergers is provided in the Appendix.

² Paul Levy interview.

³ In fiscal year 1999, Partners had 123,225 patients discharged to CareGroup's 65,217. Refer to Table 1.

⁴ Kowalczyk, Liz. "500-700 Layoffs for Beth Israel in Effort to Avert Sale." Boston Globe. Jan. 8, 2002: A1.

⁵ Wilmsen, Steven. "Hospitals See Liver Centers as Way to a Cash Transplant." Boston Globe. Dec. 31, 1999: D1.

⁶ Huckman 8

⁷ Levy interview.

Chile's Neo-liberal Restructuring: 1973-1988

James Meeks

Abstract

This paper looks at the political economy of Chile, specifically focusing on the radical neo-liberal reforms that took place between 1973 and 1982 under the government of a military dictatorship. The paper takes a theoretical approach to explain how the military government chose an economic package, and concludes that, despite early economic instability and a severe debt crisis in 1982, the thorough trade liberalization introduced by General Pinochet was the underlying factor that spurred Chile's 15-year economic expansion under the subsequent democratic government.

I. Introduction

The extreme turbulence and innovation in the political economy of Chile over the past three decades has attracted the attention of economic historians and foreign governments around the world. After thirty-five years of Import Substitution Industrialization (ISI) orthodoxy, Chile has seen radical shifts from the far left socialist administration of Salvador Allende to the far right military dictatorship of Augusto Pinochet, to the present day democratic center-left ruling coalition of the *Concertación de los Partidos de la Democracia* (CPD).

Such political change brought with it fundamental shifts in the Chilean economy as well. In a 1973 bloody coup, the military under the leadership

of General Pinochet disposed of democratically elected Allende and spent the next decade trying to dismantle not only the socialist reforms of Allende, but also the basic structure of the ISI political economy. Engineered by University of Chicago trained academics (the so-called "Chicago Boys"), the radical neo-liberal policies based on government non-intervention and trade liberalization made Chile a veritable laboratory for unrestricted market forces. Only after the international debt crisis of 1982, when political and economic pressures forced more state intervention, did the Pinochet regime attempt to mitigate certain market forces. Overall, however, this grand ideological experiment in textbook neo-classical economics has in-

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spired great debate in both policy circles and the academic literature.

II. The Debate

On one hand, Chile has far surpassed the rest of its Southern Cone neighbors in economic growth over the past decade, with GDP increasing an average of 8.3% a year between 1988 and 1998.¹ As a recent World Bank report states: “Chile is widely recognized as having the most open, stable, and liberalized economy in Latin America, with a market-based economic system in which the private sector is the engine of growth and the public sector plays only a guiding and supportive role by setting the ground rules, compensating for major imbalances, and maintaining macro-

economic stability.”² Productivity gains, low inflation and high output growth have made Chile the only country in Latin America with investment grade rating among US banks. This success was well received by other Latin American LDCs: by the late 1980s, the “Chilean Orthodoxy” was accepted as the model for stabilization and structural reforms in Bolivia, Mexico, Argentina, Peru, Colombia and Brazil.³

But, as some economists would suggest, perhaps the Chilean Orthodoxy was too quickly accepted. At the time when other South American nations began appropriating some of the neo-liberal policies pioneered under the Pinochet regime, the long-term macro-economic success of such reforms was

Table⁴
Chile: Evolution of Growth and Exports

	Growth of Exports	Growth of GDP	Total Excluding Copper)
1960-1970	4.2%	5.6%	4.6%
1971-1973	0.5%	-4.4%	-11.9%
1974-1981	3.7%	12.0%	20.9%
1982-1989	2.4%	6.5%	8.2%
1990-1995	6.7%	9.0%	9.8%

**note: 1960-70: ISI orthodoxy under Frei; 1971-73 socialist Allende administration; 1974-81 pre-crisis radical neo-liberal era under Pinochet regime; 1982-89 increased state intervention under Pinochet regime; 1990-95 democratic center-left coalition.*

less than clear. In the military government's fifteen year rule, GDP grew only by an average of 3% a year, 25 per cent less than average annual growth rate at the end of the ISI years between 1960 and 1970 (see Table 1), and half the growth rate being experienced by the LDCs of East Asia at the same time. In fact, the two depressions experienced during the Pinochet years (1975 and 1982) had negative GDP growth rates of -13.3% and -14% respectively, far worse than anything experienced under the unstable Allende years. Indeed, Chile's recent economic success has been almost entirely experienced under the more moderate policies of the democratic coalition administrations since 1988.

If the center left democratic coalition of the 1990s met much greater success in spurring GDP growth than the Pinochet regime did under its fifteen-year rule, why was the neo-liberal orthodoxy held with such regard? I hope to suggest in this paper that GDP statistics are not adequate indicators in attempting to understand the Chilean economy between the years of 1973 and 1988. Amid the great turbulence of volatile growth rates, fluctuating unemployment and unstable inflation, an overly sensitized Chilean economy was in fact

enduring great structural change in these fifteen years, change that created a market foundation that enabled long term growth far beyond the years of the Pinochet regime.

Were the social and economic costs of this volatile era worth the structural benefits? In a paper of such a length I am unprepared to say; in fact, the stabilization measures taken by the military regime in the late '70s could provide a case study for the devastating effects excessive market exposure can cause to the financial market of a Lesser Developed Nation. Yet, amidst many heterogeneous policy failures, one pillar of the neo-liberal reform package has, more than anything else, created an engine of sustainable growth for the Chilean economy: the shift from primarily copper-based exports to a more diversified and dynamic export market. The trade liberalization and export promotion and product diversification carried out throughout the rule of the military regime, and continued by the following democratic administrations, has been the greatest success of the neo-liberal experiment.

In short, despite of (or, in some cases, because of) mismanaged liberalization policies, the basic market diversification that developed out of trade

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reform enabled Chile to move away from its reliance on copper exports as the sole source of foreign revenue. The efficient exploitation of its comparative advantages in the world market created export led growth in productive industries untapped in the ISI years. Although there was a significant lag between export and GDP growth, the new vibrant market, with increasing diversification and stability, must be seen as contingent for the economic success of the 1990s.

III. Political Theory and Practice

So much has the Chilean experience affected the psyche of political economic theory over the past two decades that contemporary theorists find themselves combating the general assumptions that seem to have developed from the Pinochet years and similar parallels in the autocratic East Asian NICs. Haggard and Webb address the argument that authoritarian regimes might be more successful at initiating reforms than democratic ones insofar as authoritarian regimes can override interest-group demands and general rent-seeking behavior.⁵ Certainly the Pinochet regime saw itself in this role. After decades of what it perceived as the rentier economy of the ISI days, the regime took great

pains to establish itself as an autonomous actor ensuring the public good: in 1977 Minister Pablo Baraona proudly declared “We have never consulted the agrarian producers for the adoption of any measure. Our decisions are not negotiated, and the government will not allow any pressure during the implementation of its policies.”⁶ Haggard and Webbs’ response is that this argument makes an ungrounded assumption that any such leader would be enlightened, a benevolent social planner invested in the welfare of his country. They point out the numerous examples of countries such as Albania, Iran, Myanmar and Romania, in which policy mistakes were so egregious and self-serving that only a dictator could have sustained them.

The rational choice theorist Mancur Olson, undaunted by the historical examples put forth by Haggard and Webb, posits that an autocrat is most inclined to maximize the wealth of the country if he thinks he is a “stationary bandit,” that is, if he assumes that he will be entitled to the wealth of the nation for an extended period of time. Olson argues that if an autocrat “has no reason to consider the future output of the society at all, his incentives are those of a roving bandit,”⁷ leading him to maximize his access to the nation’s wealth in

the short period of time in which he has access to it, most often by employing unsustainable short-term growth mechanisms. When actors do live out such rational-choice decisions, Olson's argument seem prescient: when the Radical Party in Argentina saw its chances for reelection slipping in the mid 1980s, the government dramatically increased public expenditures to earn popular and interest-group support, inevitably sending Argentina into a hyper-inflationary tailspin, with CPI increasing 1000% a year. Despite the historical reality that voters punish rather than reward unsustainable policy even if they accrue immediate benefits, political regimes in the 1970s and 80s often made their 'rational' choices in terms of such short-term calculations.

I propose that we consider Pinochet and the military regime between the years of 1975 and 1982 in light of Olson's "stationary bandit" theory. After successfully playing off of Chile's strong military and constitutional traditions, General Pinochet was able to ride the popular coup to power, and solidify his position by fostering military loyalty, upper and middle class support, and a climate of political fear induced by political violence and repression. By 1975, Pinochet had "centralized

[power] to an unusual degree⁸" even by the standards set by other dictators throughout Latin America. After two years of political consolidation, Pinochet assumed that he would retain the office for life, and certainly was willing to fight for it. Although many military and civil opponents seriously challenged him, Pinochet's willingness to engage in brinkmanship in order to retain power secured his authority.⁹ Because he felt (and asserted) his tight control on the reigns of power, Pinochet began his economic restructuring plan as a secure bandit, and enforced political reforms with this mentality for the first eight years of its tenure. He brought in the team of economists known as the Chicago Boys because he was "impressed by the coherence and logic of economic models and the emphasis on the general welfare of society, one sharply opposed to the Marxist tradition but also opposed to the politics of patronage and populist appeals."¹⁰ Pinochet leveraged his established position to give "the team considerable latitude¹¹" insofar as the team assured him that their policies would further his reign by establishing a sound economy underneath him.

The economic policies reflected this political security. Neo-liberal reforms were seen as the opposite of the

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'quick-fix' scenario offered by populist public expenditures: a severe cut in public expenditures (public sector deficit declined from 30% of GDP in 1973 to 5.4% in 1974¹²) and a general decline in state intervention (selling of public land, privatization of public banks, elimination of all non-tariff barriers to trade) would lead to short-term disruptions, yet would in the long-term provide a healthier macro-economic environment. Because of the political isolation of the autocratic economic policy makers, the Pinochet regime was able to present stabilization measures as "painful but necessary"¹³ without having to worry about the inherent unpopularity that such measures generate in the short-run. In order to convince businesses that they need to adjust from ISI subsidies and domestic production to export markets under new trade liberalization measures, the government must establish at least a perception of commitment to its policy reforms; Pedro Arraigada suggests that "Stability of macroeconomic policy, and of the exchange rate policy in particular, is the most important exogenous factor determining whether the firm will become involved in exports."¹⁴

Yet, here we must proceed with caution. While Olson's normative theory is applicable to Pinochet's justification

for the radical neo-liberal reforms of the '70s, his positive assumptions that such a 'stationary bandit' would produce the most effective reform falls short. The rational-choice model assumes that well-heeded self-interest will somehow beget the most effective policy choices, yet sound motivation should not be confused with prudent means. While liberalization of Chile's trade and financial markets was much needed, the speed and severity at which it was carried out threw the economy into a tailspin by 1982. Reducing the average tariff from 97% to 10% by 1978 caused a huge inflow of imports at a rate with which the export market could not catch up its terms of trade; imports had to be financed with foreign capital, and Chile's foreign debt grew to 20% of its GDP in 1979.¹⁵ When the international debt crisis hit in 1982, Chile's GDP shrank by 13%, setting the economy back almost three years in economic growth.

With the economic and social upheaval of 1982-84, Pinochet saw his status as a 'stationary bandit' in great danger, and had to adjust appropriately. As his only chance for political survival was to build support among the business elite, Pinochet opened his government to the influence of the powerful coalition, the Confederation of Produc-

tion and Commerce (CPC), which was made up of leaders from the mining, agriculture and manufacturing sectors. Purging the ideologically driven Chicago Boys, Pinochet appointed members of the CPC as advisors to the Minister of Finance, where the coalition took a major role in defining the 1984 bailout package that involved a moderation of the neo-liberal policies of the '70s: export subsidies, debt conversion to stimulate new production activities for export of specific goods, active participation of the state in providing market information, and forestry subsidies.

Given the success of the reforms in returning the economy to 6.7% growth in 1984 and maintaining positive growth throughout the end of the regime, we must revisit the assumption addressed by Haggard and Webb that interest groups are inherently rent seekers. Eduardo Silva, in a somewhat Marxist tradition, looks to the business coalitions as the guiding force in affecting state policy. Silva suggests that economic "policy requires carriers"¹⁶: while the state has the jurisdiction in policy creation, businesses are the sole means to policy implementation. Without the input and perspective of the industries that actually have to compete in the sectors that the state wishes to reform, policy

measures become uninformed and overly theoretical without the desired result of effectiveness. Thus, when the autocrat isolated from rent-seekers, he is also isolated from the businesses that are the engines of the economic growth he wishes to inspire.

Interestingly, the composition of the businesses important enough to have influence over state decision-making process in 1984 was different than that of ten years early. The inefficient *hacendados* owners and the heavily subsidized industries of the ISI days collapsed or sold out if they were unable to compete in the increasingly competitive market of the '70s. One of the immediate legacies of the extreme neo-liberal policies of the pre-crisis period was the creation of a severe weeding-out environment: according to Carlo Pietrobelli, "in this period of abrupt policy changes, structural transformations and changing external conditions, the rate of firm mortality was high. The successful exporters are, in a way, the last survivors of a harsh competitive selection."¹⁷ These successful exporters held great influence in the CPC by 1984.

It was these efficient producers who survived the un-mitigated exposure to international markets that were the businesses most primed to benefit from

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a sound macro-economic reform package in 1982-83. All of the inefficient producers from the ISI days that relied on rent-seeking behavior to maintain profits either increased efficiency or failed in the late '70s, leaving primarily those firms that had more interest in stabilizing the economy and return to the profitability levels of before the crisis, rather than just leveraging their policy influence to accrue short-term rents from the state. Hence, we could revise the traditional model that all business interest-groups are naturally inclined to rent-seek from the state (the model that enabled the intellectual downfall of the ISI theory) with a new model: those firms that survived in an effectively unregulated, unprotected market are inclined to advise the state to address broad market failures rather than return to the pre-liberalization days of subsidies and strict regulation. While there were certainly rents being taken (the forest industry was significantly subsidized), they were within the bounds sustainable by the market without crippling distortions. Because the rents were a limited part of the reforms, the macroeconomic policies were able to jumpstart the economy for the subsequent fifteen years of growth.

IV. Economic Theory and Practice

At the heart of the neo-liberal reforms of the 70's was the belief that state intervention created inelasticity in the efficient allocation of resources within the economy. The reduction of government spending, the redistribution of lands taken by the state under the Allende regime, the near elimination of tariff and non-tariff restrictions, and the de-regulation of the financial markets were all attempts to let the market sort out and reward those industries with a comparative advantage in international trade, without the state deciding which sectors should be artificially propped up. The pendulum swung heavily from the era of extreme government intervention under Allende, where internal and external imbalance resulted from a public sector deficit that increased from 6.7% of GDP in 1970 to 30.5% of GDP by 1973 with inflation at 650% a year despite price controls, to the practically complete removal of the State under Pinochet.

The immediate result of the reforms was a dramatic rise in imports. As these imports were flooding the domestic market, another phenomenon hit Chile in a way that, I hope to suggest, changed the make up of the Chilean

economy for the next 25 years: the world price of copper plummeted. In 1973, copper made up 81% of Chile's exports,¹⁸ thus, when world copper consumption fell by 25% by 1975,¹⁹ Chile was left without its major source of foreign capital to pay for the foreign goods. The short run phenomenon, as mentioned earlier, was an unsustainable increase in foreign debt. The long run effect, however, was a jolt to the Chilean non-copper exports, which grew on average a remarkable 20% between 1975 and 1981, and hovering around 10% post-crisis to present day (see Table 1).

Perhaps drawing off of the Chilean model, Rudiger Dornbush suggests that "together, deregulation and trade reform can shake an economy out of a slow-growth trap, toward an acceleration of growth which then develops its own dynamics and financing."²⁰ Looking at the rates of export growth in Chile, it would be hard not to consider the country a model of "export-led" growth rather than "growth-led" exports,²¹ especially when we observe in Table 1 that GDP growth did not fully catch up with export growth for another decade and a half. Yet, more interesting than the simple growth of exports is, in my opinion, the diversification of the entire export market in Chile in the face of former

dependency on the copper market alone.

Chile has greater copper reserves than any other nation, holding 23% of all potential copper in the world.²² In 1972, President Allende nationalized all of the nation's copper mines so that, once Pinochet combined the eight biggest producers into the state run CODELCO, the Chilean government received total rent on the industry which, in 1997, contributed to 7% of GDP.²³ Given the great importance of copper to the Chilean government, it is surprising that in the mid-'70s the state encouraged non-copper exports to such a degree.

According to Michael Shafer, the leading sector in which an economy interacts with the world market will fundamentally affect the state's ability to spur growth. Shafer describes what he calls a "high/high sector," such as mining copper or drilling oil, which are marked by high capital intensity, high economies of scale, and high production inflexibility. Shafer argues that when such sectors dominate a nation's export market, then the leaders of the sectors, being the main source of state revenue, have incredible influence on the state's actions. Such actors are empowered to rent-seek and urge the state to restrict

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market forces in the form of federal subsidies and regulation, thus preventing greater competition in potentially more productive sectors. Restructuring, which Shafer describes as the “state-led effort to reallocate resources and reorient economic activity by reducing a country’s vulnerability to the risk associated with its current leading export sector, or to seize greater or safer opportunities presented in other sectors” is greatly discouraged in countries marked by a high/high sector.²⁴

Even in the face of such free market dogma advocated by the Pinochet regime, one cannot underestimate the power of this tenacious brand of rent-seeking behavior. Shafer’s theoretical market has been the only explanation I have found for why, when almost every aspect of the Chilean economy was radically liberalized, the Pinochet regime not only refused to privatize the copper mines that were taken over by the state under Allende, but took action to consolidate the eight mines for greater control and manageability. The influence that the copper industry had on the state did not go unnoticed by the business community: as one businessman stated in 1979, “I won’t ever go into exports, because as soon as the copper price goes up the whole

effort to promote exports will halt.”²⁵

Yet, in order to stabilize economic growth, Chile needed to move away from this high/high sector dominance in ways I will explain below.

I would argue that the dramatic tariff reduction and trade liberalization policies combined with the fortuitous timing of the world copper price crash enabled state and market forces to encourage a diversification of export production in order to pay for capital account balances. By the time copper prices rebounded to sustainable heights, the six years of rapid export growth that had already transpired ensured the firms a significant place for their influence in shaping the state’s export policies. These firms then continued to spur Chile’s “export-led growth” despite the 1982 crisis, and through the late eighties and early nineties.

V. Copper Exports

Given the abundance of reserves located in the Andean highlands, copper will always have a major role in Chile’s economy. For the most part, copper is something that the developing world has, and the developed world needs,²⁶ and the importance copper has in basic infrastructure development enables an ever-present market. Yet, this

market fluctuates as much as that for any other mineral, and, given the growing market for substitutes, such as optic-fiber, the copper market is ever more vulnerable to instability.

Despite the inherent market volatility of copper, the Pinochet regime refused to take measures to cushion its producers from price fluctuations. In the early '80s, Chile refused to enter the developing world's copper cartel, CIPEC. Not surprisingly, Chile believed that other nations were not producing at a level of efficiency that CODELCO had reached, and thus attempted to undercut the market at cheaper prices. Because Chile was producing more than a quarter of the world's supply of copper at the time, CIPEC never materialized as a political force, leaving Chile in the same position: "the excessive reliance on the market mechanisms to counteract fluctuation of the copper prices failed to counteract vulnerability."²⁷

Even though copper no longer makes up the majority of Chile's exports, the volume of production still greatly influences Chile. Antonio Spilimbergo posits that world copper prices play an important role in short-term fluctuations and probably influence the long-term growth of the Chilean

economy: In three out of four copper price cycles between 1987 and 1998, GDP growth peaked one or two quarters after the copper price cycle peaked.²⁸ In all three cases, the percentage change in the price of copper (on average around 30% in between the peak and trough of one cycle) was roughly equivalent to the percentage change in GDP. If this national volatility effect is the case when copper makes up 43% of all Chilean exports, one wonders what a similar study would find when copper made up 81% of all exports in 1974.

This volatility has an even greater impact on other export producers within the Chilean economy. Spilimbergo found a linkage between Chile's real exchange rate and the copper cycle, insofar as during copper booms, consumption of imported durable goods significantly increases, explaining the 'excess volatility' of consumption over the cycle.²⁹ Thus, the price of copper can crowd out the real exchange rate for other goods intended for the export market despite their internal cost mechanisms. As Agosin points out, "export markets are limitless, *provided* that countries' shares in the markets of the importing countries do not become too large. In other words,

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in order for the export-led growth to be sustained on the demand side, the exporting country must continue to be 'small' in world markets. This requires the ongoing diversification of exports³⁰.' In order for Chile to succeed in promoting different and varied goods for the export market, it needed to grow the nascent exporting firms during a time in which the price of copper was depressed. When we look at rapid growth of non-copper exports over the last 25 years, we must focus on the genesis from 1975-1982, for it was during those six years in which exports exploded with 20% growth a year as copper's share of the export market was cut in half.

The momentum of non-copper export growth that began in the '70s was so strong that, while Chilean copper hovered around 45% of total exports ever since 1981, its share in the world market went from 15.1%³¹ to 34% in 1997, with twice as much market share as the next nation.³² Copper sales grew 40% from (US\$2997.1 million to US\$4168.7 million) between 1980 and 1988,³³ and another 130% between 1988 and 1997.³⁴ Now we shall look at the industries that were keeping pace with such growth.

VI. Export Diversification: Agriculture, Fishing, and Forestry

In the trade liberalization days, both market security and comparative advantage issues played a part in inducing producers to focus on new natural resource exports. According to Shanti Chakravarty, agricultural goods experienced much less price volatility than copper, and thus capital lending, which was oriented towards much more stable product profitability in the wake of the turbulent years prior, tended to favor such production.³⁵ The focus on more inelastic goods such as apples and grapes created a more stable market. This, combined with the fact that Chile had only to compete with Argentina and Greece for supplying the majority of the developed world with fresh fruit in the winter,³⁶ created a distinct comparative advantage for Chilean producers.

According to Carter, Barham and Mesbah, proponents of agricultural exports "stress the macroeconomic benefits, which include rising foreign-exchange earnings, diversification of exports, and more efficient use of resources."³⁷ If we are to include forestry and fishing under the broad category of agricultural production, we can see that this theory supports the Chilean model.

Agricultural and forestry exports grew from US\$99.3 million in '74 to US\$610 million in 1981 (1981 dollars),³⁸ accounting for the lion's share of Chile's overall non-copper export growth in that time period. Even despite the 1982 depression, fruit continued to grow at 17% yearly throughout the early '80s, and fish exports (mostly salmon and sea-bass) at around 14%, shooting up to 27% a year after the crisis.³⁹ Altogether, non-traditional exports practically doubled between 1980 and 1988 with sales increasing from US\$1195.1 to US\$2037.5 million despite the general economic losses of 1982-83. Total current dollar value of agro-forestry exports in 1990 was ten times that in 1974.

This rapid market reorientation was not just a response to trade liberalization, but also extensive land reform carried out by the Pinochet government. Returning arable land to private ownership, the military government allowed the market to put pressure on landowners to produce. According to Lovell Jarvis, "a corollary to the free market approach was that government should not provide special assistance to the reform sector. The land reform sector should be distributed as private parcels to individual producers, who should be forced to prove themselves or sell their land to

others."⁴⁰ This practice enabled a large degree of land re-allocation as the market cleared inefficient producers: 57% of the original 48,000 beneficiaries of land reform sold their land, while at the same time total area devoted to fruit crops nearly tripled between 1974 and 1990.⁴¹

Despite such favorable statistics, Carter, Barham and Mesbah conclude that in the first stages of this period, real wages did not grow with export revenues, suggesting that perhaps GDP distribution was not responding to the macro-economic indicators. This is most likely the result of the loss of manual labor in favor of technology transfers and economies of scale. The World Bank Development Report shows that Chile's percentage of labor force in agriculture dropped from 47% in 1965 to 31% in 1980, which may account the loss of small farms and individual landowners seeking employment in urban areas. During this period, I think it is important to note that significant readjustment is taking place in the Chilean countryside, the greatest aspect being the reallocation of land. What we can observe is that those producers that thrived during the late 70's, continued to grow, consolidating their holdings and increasing productivity.

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Yet, during the financial crisis, these sectors were hit hard: agricultural GDP dropped 2.1% in 1982 and 3.6% in 1983. Total cultivated area decreased from a historical average of 1,200,000 hectares to 860,000.⁴² While the mis-managed financial policies of the Pinochet regime caused the decline, it is important to note that the growth rate of world exports became negative during the period from 1981-1985, with an average annual decrease of 1 per cent.⁴³ Yet few nations seemed to be as hard hit as Chile.

Pinochet was forced to respond, introducing more reasonable policies that addressed market failures and externalities with moderately more state intervention. Protective tariffs were doubled to 20% and subsidies were introduced to the forestry industries and specific agricultural producers. Maria Cruz explains that “when the Pinochet regime noted that export revenues were being addressed overwhelmingly towards food imports, a decision to diversify the sources of foreign exchange generation and savings was taken. Price stability and profitability were guaranteed to producers of some basic foodstuffs by establishing price bands.”⁴⁴ I would like to modify her language, and suggest not so much that the Pinochet

regime ‘noted’ this export revenue imbalance, but that the issue was brought to the regime by the business coalitions. It was the CPC and other business elites that directly influenced the reform packages of 1982 and 1983. Yet, because those regimes that survived the land reallocation were the ones influencing the government, the subsequent subsidies were not sunk costs, but acted as a successful prime to a well-prepared and efficient pump. Indeed, average yields in basic foodstuffs increased substantially after 1984; in eight out of 14 foodstuffs, yields increased between 50 and 70 per cent from 1980 to 1986.⁴⁵ In fact, the growth of more traditional agricultural products such as wheat, sugar and oilseeds helped usher Chile through crisis back to its remarkable 15-year trend of positive growth.

VII. Conclusions

Although initial consideration of GDP growth is disparaging, the neo-liberal policies of the Pinochet years caused quite significant structural changes in the economy, the benefits of which were not fully appreciated in GDP figures until ten to fifteen years later. Yet, during the time period, positive change was understood to be happening by many involved: more stable inflation and frequent (if not con-

stant) growth rates for the most part defined the Pinochet years. Were it not for fiscal mismanagement and over exposure to international markets that marked poor policy choices in the late '70s, overall GDP growth would have been much higher.⁴⁶

Yet did such reforms have to come at the cost of social disruptions, wild economic fluctuations and political oppression? I think few could argue that it did. Export and GDP growth rates did not filter down to the majority of the population until the center-left democratic coalition introduced more social and distributive programs: public spending on education increased by 150%, on health 120%, and on housing 55%, all programs that suffered serious neglect under the Pinochet regime. The democratic government has been able to sustain and further the macro-economic policies begun in the '70s – the universal tariff was reduced to 6% under Eduardo Frei in 1998 – while establishing more moderate social programs. Indeed, the past decade under the democratic government has seen economic growth far surpassing anything experienced under the military government (table 1).

The question to be asked, however, is whether such thorough economic

restructuring as occurred in the 70's could have been possible under a democratic regime? The politicians today such as president Ricardo Lagos who encourage trade growth were those who were bitterly opposed to the Pinochet regime and the dismantling of the ISI state twenty years ago. Evidence has shown that the market allocation of resources in agriculture and forestry was far more effective in creating trade growth than state policies had been before 1973. The ability for producers to orient themselves toward an export market during the copper depression diversified Chile's export profile enough to eventually maintain greater balance of trade stability and export-led growth. Also, the elimination of inefficient and rent-seeking producers in the 1970s motivated the remaining influential business leaders to encourage sound macro-economic policy during the crisis of 1982-83.

In all, however, these reforms could have been enacted far more prudently. Tariff reductions and trade liberalization could have been enacted more gradually so as to allow time for ISI manufacturers to readjust to the new climate; as a result of the over-aggressive policies, the vast majority of Chile's industrial sector collapsed, reversing the

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thirty year capital accumulation that occurred prior. Also, the Pinochet regime could have opened its policy consultation to the more efficient business leaders earlier; the influence of the academic and overly ideological Chicago Boys created uninformed policy that ultimately cost Chile four to five years of growth vis a vis the financial crisis. Most importantly, however, are the limitations placed on natural resource exploitation: the small land area of Chile limits future entrepreneurial pioneering. New intellectual and industrial frontiers will have to be explored beyond the natural resource glut that Chile is now beginning to face.

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² World Bank Country Report: Chile 2000

³ Rodrik, Dani, "Understanding Policy Reform," 59

⁴ Agosin, Manuel "Trade and Growth in Chile" 82

⁵ Haggard, Stephan and Webb, Steven "What Do We Know About the Political Economy of Economic Policy Reform?" 71

⁶ Silva, Patricio "Landowners and the State: Beyond Agrarian Reform and Counter-reform" quoting *La Tercera*,

July 29, 1977.

⁷ Olson, Mancur "Dictatorship, Democracy, and Development" *American Political Science Review*, 571

⁸ Drake, Paul and Jaksic, Ivan *The Struggle for Democracy in Chile*, 22

⁹ Drake and Jaksic recount that Pinochet ordered General Gustavo Leigh, the head of the Air Force, to retire when he criticized the Pinochet regime in a foreign newspaper. When Leigh refused, Pinochet declared that he would forcibly remove Leigh, despite his support from the Air Force. Effectively, Pinochet threatened to challenge the Air Force with his military supporters were they to carry through in their support of Leigh. The Air Force, or course, backed down at the thought of battling the other branches of its own Armed Forces. *Ibid* 38

¹⁰ *Ibid* 56

¹¹ *Ibid*

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⁴⁵ *ibid*

⁴⁶ Corbo, Vittorio “Public Finance, Trade, and Development: The Chilean Experience”

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Feeling Tipsy: Non-Optimal Investment By Venture Capitalists In Markets That Face Increasing Returns To Scale

Josh Passman

Abstract

While initial public offerings typically underperform the market, young Internet financial service companies showed exceptionally poor performance in 1999 and 2000. Part of this decline may be explained by conventional economic factors, but some of it may be linked to the unconventional cost structure found in this type of firm. Instead of facing decreasing returns to scale, these companies may have increasing returns to scale with a declining rate of increase that asymptotes toward zero. If this relationship holds, we should expect to see several atypical results including positive feedback, “tipping,” and perhaps unanticipated poor earnings. As a result, inefficient firms may receive funding, arbitrage opportunities may open, and many conventional economic rules may not apply, even when players act rationally.

I. Introduction

In the flurry of initial public offering activity during 1999, E-Loan, an Internet mortgage broker, attracted a great deal of stock market attention. The value of its shares climbed rapidly in July after its IPO, but over the next year, it declined precipitously by 96% over the next 10 months. This remarkable underperformance after IPO was not unique to E-Loan: In fact, almost all of the Internet-based financial service companies like Mortgage.com, Ameritrade, and E*Trade fell over 75% within a year

of their highs of the summer of 1999. Since most IPOs tend to underperform the market in the years following their issue, perhaps some of the Internet financial service industry’s record could be expected. Yet this notably poor performance requires some additional explanation. Why did this type of company suffer, when others prospered? Undoubtedly, many of the answers to this question are elusive or represent market psychology, but at least some appear to be structural. Young financial service companies might face a particu-

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lar type of cost function that is different from that of many other industries (although not necessarily from all other industries). Instead of having decreasing returns to scale as they grow, they might face initial economic losses with increasing returns, where the rate of increase gradually declines to zero. In the long run, marginal costs are essentially constant, so constant returns to scale set in, as they do in most commodity industries, and economic profits climb to zero. The implications of this abnormal cost structure lead to several interesting results, including positive feedback, “tipping” (to be defined later in this paper), and temporarily poor earnings, which, if unanticipated by the stock market, might explain the severe degree of underperformance. Even more surprising, inefficient firms may receive funding, arbitrage opportunities may open, and many conventional economic rules may not apply, even when players act rationally.

II. Underperformance

Since the stocks of Internet Financial Service firms performed poorly in late 1999 and 2000, it is important to determine if this decline can be explained by conventional theories of IPO pricing. Jay Ritter notes that IPOs on

average tend to underperform the market by 5.6% per year in the first five years after going public, so perhaps some of the Financial Service decline can be explained by his research (11).¹ His analysis finds that “the underperformance is concentrated among firms that went public in heavy-volume years, and for younger firms,” both of which apply to the Internet firms (11). As such, theories like the divergence of opinion hypothesis, wherein ebullient investors bid highly under uncertainty before much information is known, might explain their initially high stock prices, although it is unclear why financial service investors would be any more irrationally exuberant than other investors (14). Another theory, that companies going public during high volume periods will be overvalued, might also apply, but it fails to explain why companies in other sectors going public at the same time did not perform as poorly (15). Other explanations, like the impresario hypothesis, which relies on investment banks underpricing shares so that there is the illusion of excess demand, do not clearly apply to financial service companies (14). First, the Internet Financial Service firms tended to be backed by the most reputable investment banks, which Ritter shows

empirically helps long term performance (11). Second, because these firms are currently valued at less than their IPO value, the apparent underpricing may actually be an overpricing. Thus, while many conventional explanations for long run IPO underperformance do help us understand some of the possible causes for extreme financial service underperformance, they seem insufficient to explain the entirety of its magnitude.

Since general market explanations fail, it would be instructive to examine any causes that might exclusively affect the Internet Financial Service industry. First, inspection of the potential revenue stream is in order. This industry is essentially a commodity sector: one company is as good as another, and there are essentially no transaction costs in choosing between web sites. For example, few consumers would prefer a checking account at Netbank as opposed to Telebank if services and interest rates are similar (which they are). Similarly, most customers would only be highly committed to applying for a mortgage at E-loan if the rates at mortgagebot.com and other sites were substantially higher. Furthermore, since Internet Financial Services are essentially equivalent to brick-and-mortar

companies, they must also compete with the established firms, which enjoy the advantage of reputation. Essentially, these Internet firms should not expect to garner monopoly profits unless they develop attractive technologies that no other firms can match.

Aside from the rather conventional revenue structure, the industry's unusual cost structure should be examined. Fixed costs are relatively high, because processing financial data requires a large labor base, extensive computer systems, and relatively large offices to house employees and paper records. Yet it is marginal costs that behave unpredictably. While most companies face either decreasing returns to scale because of decreasing returns to capital or constant returns to scale (expansion by building more factories allows many companies to escape decreasing returns to capital), financial services face temporary increasing returns. Marginal costs might start out high for many reasons. Since effective processing and marketing of such complicated products is very difficult, a steep learning curve may allow new firms to become better as time or experience mounts. Financial services also require customer trust, which requires reputation. Having a longer company history

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or having conducted more transactions should improve reputation and reduce marketing expenses at the margin. Since financial services face a low demand for variety, economies of scale on the demand side are likely (Shapiro and Varian, 1988). Finally, since financial service processing requires many people networked together, supply-side network externalities may occur.² As a result of these phenomena, we would expect increasing returns to scale with financial service startups and firms in any other industry with similar costs.

Unfortunately for financial service companies, increasing returns to scale has bounds. Most secrets of production will be found relatively early, and fewer and fewer new tricks will be left. Thus, the learning curve will only allow decreasing costs temporarily. Reputational advantages can only go so far: few customers would feel that Citibank is substantially safer than Bank One because it is larger or has a better history. Third, since there is some financial product differentiation, demand side economies of scale only work to a limited extent.³ Finally, the benefits of supply side network externalities subside rapidly after the most important or largest connections have been made (Passman; Krugman, "Networks").

Empirically, we notice many of these effects. A moderately large and established mortgage bank like the Marshall & Ilsley Corporation can process applications at approximately the same cost as a very large mortgage company, like Countrywide, but upstarts like E-loan spend as much as seven times more.⁴

III. Stock of Business model for Temporary Increasing returns to Scale

A firm competing in an industry with constant returns to scale after a period of decreasing marginal costs (as the amount of business conducted increases) would face a marginal cost curve similar to the following decreasing, asymptotic function:

$$MC(n) = \frac{d}{n^g} + c$$

Where:

c = cost of the marginal unit at efficient scale; when $MC=c$, there are no economic profits.

c+d = cost of the first unit produced

n = number of units produced

MC = marginal costs

g measures the curvature of the cost curves. Specifically,

$$\frac{dMC}{dn} = -gn^{-(g-1)}$$

measures the slope of the marginal cost curve, or the declining rate of decrease in MC, where $g > 0$.

Anti-differentiating MC in terms of n gives a generalized cost curve:

Total Costs,

$$TC = \left(\frac{d}{1-g}\right)n^{(1-g)} + cn + FC$$

where FC = fixed costs

This cost structure suggests that in the long run, $MC=c$, where there is no economic profit and an accounting profit of “ a .” A young firm, which is defined as having a low “ n ,” will face marginal costs that are higher than marginal revenue, using either economic or accounting costs. Thus, it will require investment from venture capitalists or the public, with the former being most likely in the earliest stages. We might further assume that a firm facing this cost structure becomes viable, or self-perpetuating, once it shows no accounting losses.⁵ While marginal capital will not earn a high return at this point, since costs will decline in the future, at least all debts can be paid out of revenue, so a firm in this situation is not in danger of bankruptcy. I will define this point as the “tipping” point.⁶

When $MC=c+a$, accounting profits are zero.

$$c+a = \frac{d}{n^{*g}} + c$$

$$n^* = \left(\frac{d}{a}\right)^{\frac{1}{g}}$$

Once n^* goods have been sold, the firm “tips” toward independent viability.

To reach this tipping point, the firm needs to attain the following amount of cash inflow:

$$TC^* = CASH = \left(\frac{d}{1-g}\right)\left(\frac{d}{a}\right)^{\frac{1-g}{g}} + c\left(\frac{d}{a}\right)^{\frac{1}{g}} + FC$$

Since the firm earns $(c+a)n^*$ dollars in revenue, the net VC investment required to bring this company to accounting profitability is:

$$VCINVEST = \left(\frac{d}{1-g}\right)\left(\frac{d}{a}\right)^{\frac{1-g}{g}} + c\left(\frac{d}{a}\right)^{\frac{1}{g}} + FC - (c+a)n^*$$

$$VCINVEST = \left(\frac{d}{1-g}\right)\left(\frac{d}{a}\right)^{\frac{1-g}{g}} + a\left(\frac{d}{a}\right)^{\frac{1}{g}} + FC$$

Since the patenting of business models is not a common strategy for financial services, we must consider that other companies may enter the market. Specifically, brick-and-mortar companies, which might mobilize their reputation and efficient cost structure, could enter the market and reach accounting profitability quickly. Venture capitalists (VCs) would be better off lending to

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brick-and-mortar companies than to startups if brick-and-mortar companies could enter the market more cheaply than could startups. More formally, if $VCINVEST$ is greater than the cost of an existing company developing a product and bringing it to market at accounting profitability, the VC should not invest in the startup. On the other hand, if the startup can reach the tipping point for less than the cost of an established firm, the VC company should invest. A VC might also try to structure an “unfair” deal where it gets a larger risk-adjusted fraction of the profits of a startup than it would get from an established company: if it succeeds, it might desire to invest in a startup with relatively high costs to reach the tipping point.

What do these non-optimal financing decisions imply for stock market valuations? If the public does not understand that the VC may have funded the wrong firm, due to asymmetric information, IPO pricing might be too high. While asymmetric information generally increases risk and decreases the expected value of a company, Ritter’s divergence of opinion hypothesis shows how it might increase stock prices. Second, if the public fundamentally misunderstands the non-obvious implication that VCs would invest imperfectly, they

may systematically overvalue some IPOs, as Paul Gompers and Josh Lerner have found (289-92). Long run underperformance might be explained differently. Even if temporary decreasing cost IPOs are initially priced appropriately, there are reasons they might suffer a long-term slump in stock price. Since they require long periods of negative earnings before becoming profitable, the public might become impatient and unduly punish the stock. An incorrect estimation of the cost curve, where investors wrongly believed the firm would attain profitability earlier, would have the same effect on long-term pricing. With these hypotheses, only in the very long run, once the tipping point is clearly visible, will the value of this type of firm begin to rise with the market or outperform it.

VI. Time Model for Temporary Increasing Returns to Scale

While the amount of business conducted should lead to increasing returns at some level, a firm might also face lower costs as it is in business longer, until it reaches an asymptotic final cost structure with no economic profits. Time in business should affect the learning curve, allow for making favorable long-term adver-

tising and partnership contacts, and help reputation. In this situation, the following cost structure applies:

$$AVC = c + \left(\frac{d}{t^g} \right)$$

where:

c = cost of the marginal unit at efficient scale (when $AVC=MC=c$, there are no economic profits).

c+d = cost of the first unit produced

t = time the company has been in business.

AVC = Average Variable Costs

g measures the curvature of the cost curves. Specifically,

$$\frac{dAVC}{dn} = -gd t^{-(g-1)}$$

measures the slope of the marginal cost curve, or the declining rate of decrease in MC, and $g > 0$.

Total costs up to any time p are obtained by viewing the cost series:

$$TC = \left(c + \frac{d}{1^g} \right) + \left(c + \frac{d}{2^g} \right) + \dots + \left(c + \frac{d}{p^g} \right) + FC$$

$$TC = FC + \sum_{t=0}^p c + \frac{d}{t^g}$$

As in the “stock of business model,” a tipping point, $t=t^*$, should occur when accounting profitability is reached:

$$c + a = c + \left(\frac{d}{t^{*g}} \right)$$

$$t^* = \left(\frac{d}{a} \right)^{\frac{1}{g}}$$

Total costs to reach the tipping point are:

$$TC^* = CASH = FC + \sum_{t=0}^{\left(\frac{d}{a} \right)^{\frac{1}{g}}} c + \frac{d}{t^g}$$

Net VC investment is CASH-Revenue, or:

$$VCINVEST = FC + \sum_{t=0}^{\left(\frac{d}{a} \right)^{\frac{1}{g}}} c + \frac{d}{t^g} - Revenue$$

As with the Stock of Business Model, a VC firm should only invest if it has structured a deal such that it can receive an economic profit or if existing firms need greater investment to reach accounting profitability.⁷

V. Market Failure and Venture Capitalists

A serious implication of both the time and stock models is that VCs might choose to invest in companies with relatively low societal returns. In other words, they might make negative net-present-value decisions because their

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private benefits are higher than society's. When might this happen? As a result of tipping, almost any company can be brought to profitability eventually. A benevolent economic dictator would allow only those companies that can reach the tipping point cheaply to receive funding, but VCs might not have the same incentives.

One possible cause of this incentive misalignment is that VCs are most interested in their own return, not in the long-run return of a company. If managers of a company far from the tipping point are willing to give VCs enough equity to make the investment yield greater than market risk-adjusted returns, the VCs will finance it. The excess money paid to VCs must come from somewhere. It might be a transfer from the profits of the entrepreneurs, who realize that a small return on their idea is better than no return at all if the VCs refuse to fund them. It also might come from the public; should they overvalue the company after IPO, due to asymmetric information, VCs can sell their shares at a premium. While reputational concerns might reduce the latter possibility, they are unlikely to eliminate it entirely, because the problem of a VC bringing non-optimal companies to market is hard to pinpoint. In-

vestors have no way of knowing which companies VCs turned down, so they might not attribute poor long term performance to the financier. In any case, poor long-term performance in one sector (just considering companies that face temporary IRTS) can have so many causes that it is too noisy a measure of VC reputation to be of much use to the public.

VC collusion might also cause non-optimal tipping. In many cases, the best decision for society would be that financiers fund established firms' innovation in temporary IRTS industries. Established firms generally have access to the public capital markets or internally generated funds, both of which can be raised at relatively low cost because of low information asymmetry (Baker and Gompers, 3). VCs demand a larger return, so they will prefer to fund private companies, *ceteris paribus*. One reason young companies will pay higher interest rates is that information asymmetries may allow managers "to increase risk to undesirable levels," so they must compensate for the risk (3). Yet startups might also have to pay higher interest rates if there is collusion in the venture capital market. If there exists an informal cartel that pushes up risk-adjusted interest rates for startups higher than for

established companies, VCs will have an incentive to fund only the startups, regardless of whether they are closer to the tipping point or profitability. Might this cartel exist in the seemingly competitive venture capital market? Ritter notes that “investment bankers rarely compete for business on the basis of offering lower underwriting discounts (or gross spreads),” and the same may be true for VCs (3). Since Ritter shows that firms backed by experienced VCs tend to perform better in the stock market, the market for experienced venture capitalists may have excess demand and thus a price (measured in interest rate) above the competitive equilibrium. A more generalized explanation for lack of competition in venture markets is that a solution other than the short-term Nash equilibrium benefits all VCs. Since VCs play financing games against each other frequently, but only negotiate once with any given entrepreneur, strategy for the iterated game may be to bid less than any company’s true value. This way, interest rates are greater than equilibrium, and all VCs earn economic profits, although there are consequences: public market investment is too low, and venture investment is too high. As a result, the wrong companies may be funded.

VI. Combined Model for Valuation of Startups Facing Temporary Increasing Costs

While I have developed qualitative reasons for venture capitalists investing in non-optimal projects that face temporary decreasing costs (which also might explain some stock underperformance), I have not yet presented a quantitative case. It is useful to start with the cost functions derived in the time and stock models, although each taken individually proves insufficient. Since revenues are presented exogenously in the time model, it is somewhat unsatisfactory, even though its basis, the tendency for a firm’s costs to decrease with time, seems reasonable. Similarly, since the stock of business model does not include time factors, and it does not discount costs, it too leaves something to be desired. Fortunately, it is possible to combine the time model and the stock of business to solve all of these shortcomings. This combined model can be developed further so that it yields a formal discounted valuation model, which can help explain non-optimal VC investment.

c = cost of a marginal unit at efficient scale

n_i = amount of business conducted in

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time period “i”

g = rate of decrease in costs at a given amount of production due to previous stock of production

$d + c$ = cost of first unit of production

t = time period

m = rate of decrease in costs due to the amount of time the firm has been in business

dr = discount rate

As is shown in previous models, marginal costs should decrease decreasingly both with time and with amount of business as they asymptote toward the long run marginal cost. Mathematically,

$$\nabla MC(t, n) = a(t, n)\vec{i} + b(t, n)\vec{j}$$

where $a(t, n) < 0$ and $b(t, n) < 0$, and $da/dt > 0$ and $db/dn > 0$.

A total cost function that fits these requirements follows:

Total Costs until any given time “h” are:

$$TC = \left(\frac{dn 1^{1-g}}{1-g} + cn 1 \right) \left(\frac{1}{1^m} \right) + \left(\frac{dn 2^{1-g}}{1-g} + cn 2 \right) \left(\frac{1}{2^m} \right) + \dots + \left(\frac{dn h^{1-g}}{1-g} + cn h \right) \left(\frac{1}{h^m} \right) + FC$$

Discounting costs, at time h

$$DTC(h, n) = FC + \sum_{i=1, t=1}^h \left(\frac{d}{1-g} \right) \cdot \left(ni^{1-g} + cni \right) \left(\frac{1}{(1+dr)^{t^m}} \right)$$

Discounted revenues must also be calculated to value the firm. They form a series dependent on the amount of business transacted in all given time periods and the number of time periods.

Discounted revenues at time “h” are:

$$DR = (c + a) \left(\frac{n1}{(1+dr)^{1-1}} \right) + (c + a) \left(\frac{n2}{(1+dr)^{2-1}} \right) + \dots + (c + a) \left(\frac{nh}{(1+dr)^{h-1}} \right)$$

$$DR(h, n) = (c + a) \sum_{i=1, t=1}^h \frac{ni}{(1+dr)^{t-1}}$$

Total Discounted Net Present Value of Company is constructed simply by subtracting the discounted value of costs from revenues.

$$TDNPV = \lim_{h \rightarrow \infty} (\sum DR - \sum DC)$$

where DR=Discounted Revenue,
DC=Discounted Cost.

$$TDNPV = -FC + \sum_{i=1, t=1}^{\infty} \left(\frac{1}{(1+dr)^{t-1}} \right) (c+a)ni - \left(\left(\frac{d}{1-g} \right) \right) ni^{1-g}$$

As long as the shape of the multivariable cost function is known and the VC firm can estimate the amount of business conducted per time period, the entrepreneurial firm's net-present-value can be calculated arithmetically.

A VC firm can easily calculate its expected return on investment in a firm with this cost structure. Since accounting profits first occur at h^* when $DR=DC$, solving for the amount of investment required to bring the firm to accounting profitability

$$\sum DC - \sum DR$$

yields net VC investment inflow.

$$ROI = (\text{Discounted Investment inflow}) / (\text{Fraction of company owned by VC} * TDNPV)$$

Assuming $TDNPV \gg \gg 0$, the VC firm will receive a high return on investment if it can convince the entrepreneurs to give it a relatively large share of the company. If, as theory predicts, VCs have some market power, they will be able to take a larger fraction of companies than their investments merit, and they will receive a higher return than the market as a whole yields. Essentially, if venture capitalist ROI in startups exceeds ROI for internal development by an established company, the VC will always back a startup, even if it is farther from accounting profitability. On the other hand, if both the entrepreneurs and the VCs have good information and the VCs do not have market power, they should negotiate agreements where both sides make no economic profits, but only if the startups have potential to reach profitability before their established competitors do.

VII. Acquisitions and Arbitrage Valuation

Thus far, we have only considered the VC's role in spurring or discouraging innovation. As we have seen, in temporary increasing returns to scale industries, too many entrepreneurial firms may be formed, and stock values for these companies will often decline shortly after IPO. Established firms will also desire to enter the new industries, but they will tend to compete disadvantageously for funding and may not be able to build internally, even if it makes economic sense to do so. Since the established firms' superior reputations and cost structures represent opportunities to add value to startups, established firms might wish to consider acquisition. If IPOs and potential IPOs are overvalued, acquisition would not be a viable strategy, unless the quantity of value addition exceeds the quantity of overvaluation. Both empirical evidence and theory suggest that that decreasing cost IPOs are not overvalued in the mid-to-long-term, however, so an arbitrage opportunity exists for established firms: they can buy an innovation relatively cheaply, and just by owning it, increase its net-present-value to be greater than the cost paid. In the combined model

for valuation, after an acquisition, "g" and "m" change such that profitability is reached earlier in terms of both "n" and "t." While perhaps not enough time has passed for brick-and-mortar financial service companies to acquire Internet startups, it will not be surprising if such events do come to pass in the near future. Internet firms will need continued infusions of investment, but they may have difficulty convincing the public markets to lend to them at favorable rates because of path dependence.¹ If the tipping point appears to be far away, investors must coordinate to save the firm: if some investors feel that other investors will not provide enough capital to reach the tipping point, they will not invest; if they feel that other investors will invest, they will too. A negative confidence shock could become a self-fulfilling prophecy that leads to the "bad" equilibrium of bankruptcy, whereas a positive confidence shock could start a virtuous cycle that leads to the "good" equilibrium of profitability. In the case that a negative confidence shock affects an Internet startup, its value will plummet, and an opportunistic brick-and-mortar company could acquire it economically and restart the virtuous cycle.

Brick-and-mortar companies considering acquisition of struggling

Internet rivals should pursue unconventional tactics due to path dependence. Whereas normally the established firm would buy as soon as an arbitrage opportunity opens, a self-fulfilling negative prophecy incentivizes waiting, as market valuation will continue to drop with time. This line of thought leads one to believe that the established firm should wait until stock price falls essentially to zero in order to maximize arbitrage profit, but this conclusion is not quite accurate. As market valuation falls, other arbitrageurs will wish to acquire the struggling company. Direct competitors might value their rival merely for liquidation, since they can directly use its capital, assets, name recognition, and underpriced advertising contracts. Capital, tangible assets, and intangible assets can of course easily be diverted to new operations, and name recognition is captured by the number of customers a site receives not as a result of advertising, all of whom can be diverted to the acquiring company. Internet advertising contracts might be quite valuable, but because of exclusivity and right of first refusal, the only way to gain them might be by buying out the competition.² Thus the arbitrage liquidation value of a firm on the path toward a “bad” equilibrium is:

$$ALV = (\text{real value of contracts} - \text{contract variable costs})/d + (\text{unsolicited traffic})(\text{value/visitor})/d + (\text{market value physical, financial, and intangible assets}) - (\text{market value liabilities}) + (1 - \text{tax rate})(\text{transferable net operating losses})/d$$
, where d is the discount function.

If a brick-and-mortar suitor allows market value to fall below this amount, other companies might immediately buy out the failing firm. A price floor therefore limits potential arbitrage profits from path dependence, but it does not eliminate them completely.

VIII. Conclusion

While increasing returns are not a new concept to economics, as Paul Krugman explains, their importance is generally downplayed due to conceptual difficulties (Krugman, “The Legend of Arthur”). The case of firms with temporary decreasing costs to scale and time, specifically Internet financial service companies, while replete with problems regarding expectations, seems to be a particularly intriguing and soluble example. The market and venture capitalists may fund startups with relatively high costs and refuse to fund established companies with better prospects for perfectly understandable reasons. The resulting IPOs may experience signifi-

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cant underperformance due to conventional economic factors and also due to phenomena unique to increasing returns industries. Long term success appears to be dependent on reaching a tipping point before negative confidence shocks begin a self-fulfilling prophecy of bankruptcy. Fortunately, arbitrage opportunities for established firms might exist where failing companies can be economically acquired and righted toward the profitable equilibrium. If market imperfections allow poor economic decisions to be made, at least the situation is salvageable. Unfortunately, the same cannot be said for the enthusiastic investors in E-loan.

Endnotes

¹ Ritter's long run performance analysis contains far more data than can be gathered from the new Internet Financial Service firms that have been public only one to two years. I admittedly stretch the definition of "long term" by applying Ritter's arguments to them, although their "short term" era has clearly passed.

² For example, mortgage processing requires loan advisors, loan processors, compliance, credit checkers, and service. These people all must communicate on a network, and the larger the network is, the more valuable it is, be-

cause tasks can be distributed to more people.

³ Mortgage companies must offer different term loans, fixed rates, and ARMs. Credit card issuers generally offer several types of affiliate programs, including card design and bonus benefits.

⁴ See SEC filings at <http://quote.yahoo.com>.

⁵ Alternatively, "viable" might be defined as requiring no further capital inflows from the public or venture capitalists.

⁶ "Tipping" is generally used in relation to positive feedback to describe when a market adopts "a single technology or vendor" after reaching a critical mass (Shapiro and Varian, 187). In this case, "tipping" describes a single firm reaching self-sustainability because of positive feedback. This analysis introduces the serious question of path dependence. According to W Brian Arthur, "multiple equilibria" could exist, and the economy's actual outcome may not necessarily arrive at the "best one" (1). Adapted to this discussion, Arthur's argument would suggest that a viable company that will earn future profits (or at least no economic profits) might not develop if it has the bad luck not to reach the tipping point. For example, assuming Mortgage.com would eventually

compete favorably with other mortgage companies, if investors failed to give it enough investment to reach the “tipping” point, it would go out of business. On the other hand, if it raised sufficient capital, it would become a valuable company.

⁷ It is somewhat more difficult to gauge net investment in the time model, because revenue is independent of costs. If a firm conducts much business in its early years, when losses are high, it will require a relatively large amount of VC investment. If the firm conducts the majority of its business later in its life, it will require much less investment. The stock of business model, on the other hand, accrues costs independent of when they occur in the firm’s life.

⁸ This analysis assumes firms went public before showing accounting profitability, as Internet financial services have. If IPOs are already profitable, path dependence due to public sentiment should not occur.

⁹ For example, Yahoo has an exclusive advertising agreement with E-loan. Other companies may wish to pay more than E-loan pays, but they cannot. In general, advertisements for financial service companies on the Internet tend to be underpriced, because demand far exceeds supply. Thus since value is

greater than cost, advertising contracts have arbitrage value. While sites may eventually increase ad costs for financial service firms, contracts may make this process long and difficult.

(Note: Since publication, E-loan’s contract with Yahoo has expired. The dot-com implosion has severely restricted the value of exclusive marketing contracts since mid-2000.)

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The Market Transition: Capital Account Liberalization in Central and Eastern Europe

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Abstract

As the countries of Central and Eastern Europe emerged from the cloak of Communism over a decade ago, one major task for the new governments was to attract capital that had previously been supplied by a central planner. Most of these governments were already preoccupied with serious macroeconomic problems such as unemployment, inflation, and debt overhangs caused by years of poor management and by the shift toward privatization. Therefore, a wide array of capital controls were installed in an attempt to shelter these fragile economies from speculative attack. This paper examines various controls used and empirically analyzes the efficacy of such controls in governing capital flows and instilling confidence in these nascent capital markets amidst economic turmoil.

I. Introduction

Classic economic theory advertises many benefits of unrestricted global capital flows. Unfettered capital will move to international destinations most in need of it by virtue of the return premium. Investors benefit, receiving both a higher return and lower risk through portfolio diversification. Recipients of foreign investment benefit, being able to finance their project at a lower cost of capital. Nevertheless, in 1997, 144 out

of 186 world economies still maintained significant capital controls.¹ Among this group, the economies of Central and Eastern Europe were well represented. Yet these countries have faced a variety of challenges that others have not including privatization, commercialization, and macroeconomic stabilization. Toward achieving these goals, transition policymakers have utilized a variety of different capital controls. This paper will investigate the effectiveness of these

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controls in the transition process and their influence on actual capital flows. Discussion is divided into four stages: I begin with a brief background of worldwide capital liberalization and contemporary arguments for and against capital controls. Next, I examine the macroeconomy and control choices of ten specific countries of Central and Eastern Europe over the past decade. I then review some unforeseen and detrimental effects of controls in these countries. Finally, I incorporate results from empirical work which links controls to capital flows and discuss potential problems with the study.

II. Background

Capital account liberalization has been slow even for macroeconomically stable countries. In 1946, the Bretton Woods agreement became the backbone of the international monetary system. With the agreement for fixed exchange rates, policymakers encountered the policy “trilemma” and were forced to choose between perfect capital mobility and domestic monetary policy efficacy. Hence, many economies chose to insulate domestic interest rates from foreign exposure through the implementation of capital controls. The Bretton Woods

agreement itself condoned the use of such controls: In Article VI, Section 3, it stated that member countries were allowed to impose “such controls as are necessary to regulate international capital movements.”² The collapse of fixed exchange rates in 1973 allowed most world economies a new chance to liberalize cross-border capital movements. The countries emerging from the cloak of Communism in the early 1990s have attempted the same liberalization in roughly one-third the time.

This is not to suggest that the decision to liberalize is unequivocal. There exist many dangers to perfect capital mobility. The principal danger and the primary motive behind the installation of capital controls is the potential for speculation and capital flight. This problem can easily arise when large inflows are too liquid. While long-term capital inflows, such as those provided by foreign direct investment, are exceedingly beneficial in building the capital base of a country, other investments, namely short-term investments with very high liquidity, are exceptionally volatile and can flow out of a country as fast as they flow in. These dangers amplify themselves when macroeconomic stabilization has not been achieved. The IMF Annual Report for 2000 states that

“Countries with serious macroeconomic imbalances, and no credible prospects for correction in the short run...have regularly been unable to address large-scale capital outflows by using capital controls.”³ Capital controls can only mask larger policy or regulatory problems and when substituted for macroeconomic reform, they will only aggravate the problem and open the door to potential crises.

A speculative attack can quickly become a massive capital flight such as occurred in the Asian financial crisis five years ago. From 1996 to 1997, \$105 billion dollars in speculative funds fled East Asia.⁴ However, foreign direct investment, representative of long-term capital flows, remained unchanged. Over the last decade these types of speculative currency attacks have become increasingly commonplace. Many blame the rapid liberalization of capital flows.⁵ Foreign flows of capital into emerging markets have grown dramatically in the last fifteen years, from \$34 billion in 1988 to \$256 billion in 1997.⁶ With these huge movements of capital, the countries of Central and Eastern Europe are especially prone to speculative attacks since their nascent economies are so fragile. This is why, although desperate for capital inflows, many have

erred on the side of precaution and have chosen extensive controls.

A rational approach to capital controls bifurcates flows into short-term and long-term. The typical long-term flow involves foreign direct investment, which by its nature, involves some ongoing interest in the target country. A typical short-term flow may simply involve purchasing equity in a foreign company, equity which can be bought or sold with little planning. The answer to the choice of capital controls seems straightforward: Allow long-term flows but partially or fully prohibit short-term flows, especially outflows. The dangers of this simplified perspective will be discussed later. Many other issues are at play, particularly for the emerging economies of Central and Eastern Europe (CEE). The governments of such economies may be undertaking restructuring projects, the effects of which they would like to be focused within their borders. Additionally, they may be funneling money into infant industries that are too fragile to initially compete with foreign equivalents.

However, there exists a myriad of positive externalities for CEE countries with free access to long-term capital. In their article, “Capital Flows to Eastern Europe and the Former Soviet

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Union,” Hans Peter Lankes and Nicholas Stern discuss various benefits: “These flows bring new methods of business organization, new technologies, and powerful influences on the building of financial, regulatory, and other institutions. They help establish the financial discipline that is crucial to the effective functioning of a market economy. Thus their impact goes far beyond the simple availability of resources.”⁷ Policymakers of Central and Eastern Europe saw these potential benefits of long-term capital, but a critical question arose: How quickly to liberalize? As has already been discussed, opening an economy to international capital flows before the macroeconomic infrastructure has been developed is destabilizing. IMF economist Manuel Guitián states that “Gradual opening softens the inroads of external competition and provides leeway for domestic preparation to confront that competition. But precisely by giving time to adjust, there is no guarantee that the time will be used to prepare for external competition as opposed to continuing to exploit the opportunities of a closed or partially closed economy.”⁸ Hence, the governments of CEE must be efficient with their time, placing all their energy into one task at a time: first reform, then capital mobility.

Most countries of Central and Eastern Europe followed this type of reasoning in formulating the appropriate capital controls. They first proceeded with fundamental reforms such as controlling inflation, paying off debts, managing privatization. All target countries opened up to foreign direct investment first, but beyond this common element, they approached capital account liberalization very differently according to their particular macroeconomic climate. They received similarly diverse capital flow responses. Below, I briefly review the economic issues faced by the ten target CEE countries over the past ten years and some capital controls implemented.⁹

Bulgaria: When the USSR collapsed in 1991, Bulgaria was left with an obsolete industrial base. This was the principal motive behind the country’s immediate desire to attract foreign direct investment. The country technically maintained capital controls on FDI, although this only required registration with the Ministry of Finance and large tax breaks were offered to foreign direct investors. Significant restrictions on foreign portfolio investment existed until 1997.

Czech Republic: Their transition was going well until a financial cri-

ses in 1997. This was caused by worries that the growing current account deficit would soon be unsustainable. The central bank lost \$3 billion in foreign reserves before letting the previously banded fixed exchange rate float. Still, it is considered the least risky country of the ten in which to invest according *Euromoney* magazine. This study will be discussed later. The Czech Republic has retained extensive capital controls over the last 10 years.

Estonia: In 1994, Estonia dramatically reduced its capital controls. Still, it did not attract significant levels of FDI until 1997-98. Estonia was hit rather hard by the Russian financial crisis of 1998.

Lithuania: Also hit hard by the Russian crises of 1998 because of its heavy trade with Russia. Along with Estonia, Lithuania has had very liberal capital restrictions throughout its short history.

Hungary: Began the transition with the highest levels of FDI through proceeds from its rapid direct privatization. Throughout the last decade, Hungary has not had significant controls on foreign direct or portfolio investment. Foreign direct investment surged in 1995, the last year the country offered FDI tax benefits.

Poland: Certainly one of the most economically stable countries over the past decade of reform. Took a very gradual approach to capital account liberalization, still maintaining a complex code of capital controls. Poland (along with Russia) has been one of the largest recipients of capital from foreign portfolio and equity funds.

Romania: Significant exchange controls were imposed in March 1996 to contain the foreign exchange market. When the exchange controls were removed, the exchange rate overshot its equilibrium, indicating that the controls had been effective.

Russian Federation: Russia began a gradual process of liberalizing their capital account early in the 1990s. It opened up significantly to foreign portfolio investment in 1996 when it achieved current account convertibility. Most other capital account transactions required the approval of the central bank. Foreign direct investment saw a surge in 1997 due to large privatizations in telecommunications and oil sectors. In August 1998, the ruble collapsed and Russia defaulted on approximately \$40 billion of ruble bonds. Russia implemented emergency capital controls after losing \$16 billion from capital flight. Because of this and its obscure tax code,

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Russia has since been considered a risky country in which to invest and has seen proportionally low levels of foreign inflows. It has since retained significant capital controls, but in practice, they are not effective.

Slovakia: Has experienced a very difficult transition. Its use of capital controls has resembled the Czech Republic's since their formal separation in 1994.

Slovenia: Suffered capital flight in 1998 in part due to Russia's crisis. Slovenia has recently been opening significantly to foreign investment, removing many strict controls.

Macroeconomic issues clearly play a pivotal role in the international capital game. The use of capital controls to conceal macroeconomic deficiencies will have detrimental effects. Many of these effects are unforeseen to policymakers and run counter to intuitive reasoning. Countries wishing to attain rapid growth and prosperity will naturally want to remain open to capital inflows from abroad without surrendering any of their own domestic capital. Policymakers believe that this is most beneficial to the growth of domestic industry, however these types of restrictions actually handicap growth. By sealing off residents from outside capital

markets, the controls on capital outflows also seal them off from valuable information about the international economy.¹⁰ If a country is indeed worried about the possibility of the flight of domestic capital, it should examine the more fundamental causes.

Beyond injuring domestic industry, controls on outflows of foreign capital and resident capital will repel foreign investment as well. Such controls will negatively affect consumer confidence through signaling. In a recent discussion I had with Professor Richard N. Cooper of Harvard, he stressed the importance of property rights in attracting foreign investment.¹¹ Naturally, a company from country A will only undertake a project in country B only if 1) it foresees a positive net present value and 2) it has guarantees on the repatriation of profits. When a country places controls on the outflow of capital, even resident capital, it implicitly weakens any such guarantees. Richard J. Sweeney of Georgetown explains how this mechanism functions: "Though the government's actions reveal that it currently thinks optimal controls are only on domestic residents, the foreign investor knows that in the future the government may decide the optimal level includes some transactions of foreign in-

vestors."¹² With these types of controls, the little capital they receive will not be able to jump-start fledgling industries.

Deterrents of capital inflows spawned by questions of believability need not be direct such as prohibitions on capital outflows: "In practice repatriation...may require administrative clearance; for example, in many liberalizing countries, the international investor wishing to withdraw capital must satisfy the government that all tax obligations have been met. These administrative issues are subject to abuse to satisfy balance-of-payments or exchange-rate goals."¹³ Deterrent controls may be indirect and even hidden, intertwined in the tax system. This is the case with Russia as Former Treasury Secretary W. Michael Blumenthal explains in his portion of the article "Capital Flows to Eastern Europe." He states that the tax system is so arbitrary, that companies are sometimes slapped with huge corporate tax rates; frequently foreign companies are targeted. This offers a powerful explanation to the proportionally low levels of foreign investment. More generally, we learn that government credibility plays a large role in attracting foreign capital, and that attempting to control outflows can negatively affect inflows.

III. Empirical Work

Working with capital control data, I sought to find the effect of different restrictions on the capital flows in Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania, Poland, Romania, the Russian Federation, Slovakia, and Slovenia. Each year, the IMF publishes the *Annual Report on Exchange Arrangements and Restrictions* in which they describe in detail the restrictions governing various types of capital flows. In order to simplify the testing, I chose three types of transactions: direct investment, portfolio investment, and cross-border bank lending. For the latter two, I documented restrictions on both capital inflows and outflows; for direct investment, I only documented controls on inward (or foreign) direct investment since data on outward direct investment controls were limited.

I included two other indirect controls that I thought were relevant. First, many countries, especially in the first few years of transition, offered tax breaks to foreign direct investment, reducing their tax bills by up to 70%. For many companies, this may have pushed certain projects into a positive net present value. Secondly, I included a dummy variable representing a govern-

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ment guarantee on the repatriation of profits. Unfortunately, as I discussed earlier, a guarantee on paper does not always translate into a guarantee in practice. In Bulgaria and Russia, for instance, foreign investment law provided a loophole which permitted expropriation of foreign direct investments for nationalization through the legal process.¹⁴ It is because of these instances that I included an additional variable measuring country risk. The periodical *Euromoney* publishes a report annually ranking 180 countries on overall risk.¹⁵ This index is standardized across years and measures primarily financial risk, but also includes political risk and risk of default. Partly due to policies discussed above, Russia and Bulgaria receive the lowest average score which translates to the highest investment risk across the eight years.

One way I could have approached the problem of isolating the effects of capital controls on capital flows would be to run 10 separate regressions, one for each country, using net capital flows as the dependent variable and the seven capital control dummies as the independent variables. However, I would have had too few observations, using one per year. For certain countries, data is not available all the way back to 1991, either because

it was not reported or because the country did not exist. Additionally, and more importantly, I would have had too little variation among those samples since each country's capital controls change infrequently, yet significantly.

For these reasons, I opted for stacked data, putting all observations for all countries and years into one regression. Using this method, I included GDP to control for the size of each economy. There were 80 samples, one for each country / year combination (10 countries; 8 years from 1991-1998). The capital control data were all gathered from the IMF's *Annual Report on Exchange Arrangements and Restrictions*.¹⁶ The component flow data---foreign direct investment (FDI), outward direct investment (ODI), foreign portfolio investment (FPI), and outward portfolio investment (OPI)---was gathered from the Economist Intelligence Unit.¹⁷ All other data used was gathered from the World Bank's *World Development Indicators*¹⁸ and *Euromoney* magazine. All regressions discussed are available in the Appendix along with a key which explains each variable.

In the first regression, predicting net capital flows with the seven controls, GDP, and risk, I found largely in-

significant results. One item that is significant is the coefficient for tax benefits on foreign direct investment. Half of the target countries offered some form of tax relief at some point over the eight years, leading to a total of 24 country/year combinations with FDI tax incentives. The tax benefit coefficient is the largest out of all of them and is positive, indicating that, controlling for GDP, offering tax benefits on FDI led to an additional \$1.3 billion in capital inflows. Another control emerges somewhat significant: that on inflowing bank loans. Further, the coefficient is positive. This is counterintuitive because one would expect that being closed to foreign bank loans would *hurt* capital inflows. It is possible that maybe those countries closed to such loans receive adequate financing through other means. A third coefficient worth mentioning is that on foreign direct investment controls. Although the coefficient was largely insignificant, it is negative, indicating that restrictions on foreign direct investment will have a negative effect on net capital inflows. This makes sense intuitively since foreign direct investment, in most cases, composes the largest portion of net capital inflows.

Aside from the question of risk, there is also the question of return. Tra-

ditionally, the higher the return on investment, the more capital the country will attract. It is, after all, the interest rate that equilibrates savings and investment throughout the world. The interest rate is the primary mechanism which allocates capital to those areas which have the greatest disparity between potentially profitable investments and domestic savings. To hold constant the incentive to invest, in addition to country risk, I included the interest rate spread between the country's discount rate and LIBOR. The London Interbank Offered Rate is the interest rate offered for U.S. dollar deposits of a specific maturity and is frequently used as a benchmark in international interest rate spreads.

When I added this to the regression, the coefficient of the tax benefits for FDI became even more significant and became larger, indicating that there is some relationship (not necessarily causal) between the countries that offered FDI tax benefits and their interest rate premium. No other variable was remotely significant in explaining net capital flows. It is not surprising that a significant relationship does not exist between the interest rate spread and net capital flows because certain types of investment, such as FDI, are not contingent on a large interest rate spread.

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I then wanted to break down capital inflows into the two components for which I had data: foreign direct investment and foreign portfolio investment. First, foreign direct investment: As shown by the third regression in the Appendix, there is a clear negative relationship between the level of FDI and controls on it. GDP held constant, controls on foreign direct investment lead to \$650 million less in foreign direct capital. I concluded above that foreign direct investment should not be affected by a large interest rate spread. It should, however, be affected by the risk of the target country. Foreign direct investment implies a long-term presence; therefore, a country with low investor confidence (high investment risk) will not garner much in FDI. Our hypothesis is confirmed by the fourth regression in the Appendix, in which there is a significantly positive coefficient on risk in predicting FDI. The higher investor confidence, the higher FDI. The explanatory power (measured by R^2) has also increased with the addition of risk. Now, 44% of the variation in FDI is explained by controls on FDI and country risk.

I noted earlier Richard J. Sweeney's proposition that by restricting the outflow of domestic (resident)

capital, the government puts into doubt commitment to its guarantee on the repatriation of foreign profits. These doubts should be captured in measures of country risk, but more directly, we can test the effect of controls on resident capital on foreign direct investment. The fifth regression in the Appendix simply replaces FDI controls from the previous regression with controls on portfolio outflows of resident capital. Indeed, by installing controls on the outflow of domestic capital, countries harm their level of foreign direct investment. As discussed earlier, such controls are only implemented in an attempt to conceal deeper rooted macroeconomic problems. Imposing these controls, beyond simply having no effect, will actually hurt their growth potential.

We now turn our eyes to the second source of foreign capital inflows that we will examine: foreign portfolio investment. The only good predictor of FPI appears to be the interest rate spread. Regression 6 (Appendix) shows that this spread has a negative coefficient. While we would not expect FDI capital to chase after a large spread, we would expect portfolio (speculative) capital to be positively related to the spread. One explanation for this conundrum is that the risk associated with

this high return is too great for most investors. The seventh regression shows the close positive relationship between a country's risk rating and its interest rate spread (Remember that the risk index attaches high numbers to the less risky countries). However there is an upper bound to the risk/return that investors will accept. This problem of excessive riskiness is exacerbated by outliers such as Russia in 1995, which had a 341% premium on its discount rate over LIBOR. This extremely high return is only the product of a much too risky investment.

IV. Concerns

I have three principal concerns with my study. One of the most prominent questions is the reliability of the data which I collected. This was actually his first comment when I told Professor Richard Cooper that I was examining the effects of capital controls in Central and Eastern Europe. Even in the United States, the country that spends by far the most money collecting statistics each year, balance of payment data still contains many discrepancies. The estimated discrepancy even has its own entry in the balance of payments statement every year. This inaccuracy is due to misreporting of capital account transac-

tions and more importantly, questions of exactly what to report; there exist many capital transfers that cannot be easily classified into a balance of payments category. When we shift focus to the countries of CEE, this problem becomes amplified. Especially during their transformation to market economies, these countries are experiencing continual change. Even if faithful data keeping is anticipated, the result of net capital flows will be biased downward due to many omitted transactions.¹⁹

The second problem stems from my collection of the data. Ideally, rather than classifying controls as dummies, I could have created an index capturing the stringency of each control; this would have been far too subjective. I soon found that the process I was using was not much more impartial. Although direct controls (restriction on capital movements) are easy to classify as a "1," indirect controls (like taxes and administrative controls) were much harder to classify. The standard I tried to apply was as follows: If the restriction was stringent enough to keep a significant number of foreign potential entrants out, I assigned a "1" for the control. However, for restrictions that were more of "checks" as opposed to controls---for instance, simple registration or getting a

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permit that it freely granted---I assigned a “0.” A related problem is that a number of countries maintain controls on their books, but in practice, they are useless. The *Annual Report on Exchange Arrangements and Restrictions* would occasionally mention instances where practice distinctly differed from the law (in which case I would adjust my entry), but this does not guarantee that every control was properly classified.

The third problem centered around degrees of freedom. Because I only had a few dozen observations, in many cases there was not enough variation in capital controls from one entry to the next. For instance, in 1998, Russia implemented a number of emergency capital controls that lasted only one year. A regression will poorly capture the isolated effect of each of these capital controls. All of the regressions displayed in the Appendix show a low number in the model degrees of freedom. This was the principal reason why the regressions revealed few significant results.

V. Conclusion

Although the specifics of optimal capital account liberalization are still debated, there is a general consensus that long-term capital inflows, such as

foreign direct investment, can prove invaluable to a growing economy such as those in Central and Eastern Europe. These economies should begin easing restrictions only after a sustainable and stable macroeconomic groundwork has been laid. It is important that they realize that capital controls can only provide temporary relief from the detrimental market consequences of macroeconomic instability. Once basic reforms are met, capital account liberalization is only the next step. Hesitation suggests government uncertainty: “Full [capital account] convertibility signals that the government is confident that it can and will pursue policies the market approves. Less-than-full convertibility announces that the government fears market reactions to its current and future policies.”²⁰ Empirical work also demonstrates that such policies, especially controls on resident capital, do not fool foreign investors. An open capital market with high investor confidence and some tax benefits to FDI is the recipe to the most rapid and stable growth for these economies. In any event, in the next few years, we will witness further easing of the capital account restrictions in CEE countries as part of the requirements to join the European Union.

Appendix : Regression Results

Key

ConFPI Control on inward (foreign) portfolio investment? (1=Yes, 0=No)
 ConOPI Control on outward (resident) portfolio investment?
 fincredr Control on bank lending to the resident country from abroad?
 fincredo Control on bank lending to foreign country from the resident country?
 ConFDI Control on inward (foreign) direct investment?
 repatr Government guarantee on the repatriation of profits?
 taxben Tax benefits attracting FDI?
 GDP Gross Domestic Product
 intsprd Interest rate spread (Local Discount Rate - LIBOR)
 netcapfl Net capital flows (as measured in Balance of Payments)
 banklend Net bank lending flows
 gdpgrow GDP growth
 nclag Net capital flows lagged 1 year
 FDI New foreign direct investment
 ODI New outward direct investment
 FPI New foreign portfolio investment
 OPI New outward portfolio investment
 risk Euromoney's country risk index

Regression 1:

```
. regress netcapfl ConFPI ConOPI fincredr fincredo ConFDI
    repatr taxben GDP risk
```

Source	SS	df	MS	Number of obs = 46
Model	1.8564e+19	9	2.0627e+18	F(9, 36) = 1.01
Residual	7.3608e+19	36	2.0447e+18	Prob > F = 0.4512
Total	9.2172e+19	45	2.0483e+18	R-squared=0.2014
				Adj R-squared=0.0018
				Root MSE=1.4e+9

netcapfl	Coef.	Std. Err.	t	P> t	[95% Conf]	
ConFPI	4.16e+8	6.09e+8	0.682	0.499	-8.20e+8	1.65e+9
ConOPI	-3.05e+8	6.11e+8	-0.499	0.621	-1.54e+9	9.34e+8
fincredr	8.34e+8	5.77e+8	1.445	0.157	-3.36e+8	2.00e+9
fincredo	-6.19e+7	6.74e+8	-0.092	0.927	-1.43e+9	1.30e+9
ConFDI	-6.25e+8	5.85e+8	-1.068	0.293	-1.81e+9	5.62e+8
repatr	-9.55e+8	1.18e+9	-0.809	0.424	-3.35e+9	1.44e+9
taxben	1.31e+9	6.28e+8	2.083	0.044	3.48e+7	2.58e+9
GDP	.0013019	.0022196	0.587	0.561	-.003199	.005803
risk	-1869754	1.92e+7	-0.098	0.923	-4.07e+7	3.70e+7
_cons	-7.74e+7	1.06e+09	-0.073	0.942	-2.22e+9	2.06e+9

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Regression 2:

```
. regress netcapfl GDP ConFPI ConOPI fincredr fincredo
ConFDI repatr taxben intsprd risk
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Source	SS	df	MS	Number of obs = 39
-----				F(10, 28) = 1.02
Model	2.2719e+19	10	2.2719e+18	Prob > F = 0.4541
Residual	6.2540e+19	28	2.2336e+18	R-squared = 0.2665
-----				Adj R-squared=0.0045
Total	8.5260e+19	38	2.2437e+18	Root MSE = 1.5e+09

netcapfl	Coef.	Std. Err.	t	P> t	[95% Conf]	

GDP	.0015898	.003375	0.471	0.641	-.0053236	.0085032
ConFPI	6.03e+07	9.22e+08	0.065	0.948	-1.83e+09	1.95e+09
ConOPI	1.77e+08	8.00e+08	0.222	0.826	-1.46e+09	1.82e+09
fincredr	5.87e+08	7.65e+08	0.768	0.449	-9.79e+08	2.15e+09
fincredo	2.05e+08	7.57e+08	0.271	0.788	-1.35e+09	1.76e+09
ConFDI	-3.01e+8	7.33e+08	-0.411	0.684	-1.80e+09	1.20e+09
repatr	-1.23e+9	2.13e+09	-0.580	0.567	-5.59e+09	3.12e+09
taxben	1.89e+9	7.71e+8	2.448	0.021	3.08e+8	3.47e+9
intsprd	-5748010	7181545	-0.800	0.430	-2.05e+7	8962718
risk	-8737247	2.41e+07	-0.363	0.719	-5.80e+7	4.05e+07
_cons	4.38e+07	1.27e+09	0.035	0.973	-2.56e+9	2.64e+9

Regression 3:

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. regress FDI ConFDI GDP
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Source	SS	df	MS	Number of obs = 69
-----				F(2, 66) = 16.73
Model	4.5275e+19	2	2.2637e+19	Prob > F = 0.0000
Residual	8.9298e+19	66	1.3530e+18	R-squared = 0.3364
-----				Adj R-squared=0.3163
Total	1.3457e+20	68	1.9790e+18	Root MSE = 1.2e+09

FDI	Coef.	Std. Err.	t	P> t	[95% Conf]	

ConFDI	-6.51e+8	2.96e+8	-2.20	0.031	-1.24e+9	-6.01e+7
GDP	.0066829	.0014394	4.643	0.000	.003809	.0095567
_cons	9.75e+08	2.16e+08	4.512	0.000	5.43e+8	1.41e+9

Regression 4

. regress FDI ConFDI risk GDP

Source	SS	df	MS	Number of obs = 69
-----				F(3, 65) = 16.90
Model	5.8963e+19	3	1.9654e+19	Prob > F = 0.0000
Residual	7.5609e+19	65	1.1632e+18	R-squared = 0.4382
-----				Adj R-squared=0.4122
Total	1.3457e+20	68	1.9790e+18	Root MSE = 1.1e+09

FDI	Coef.	Std. Err.	t	P> t	[95% Conf]	

ConFDI	-4.21e+8	2.83e+08	-1.491	0.141	-9.86e+8	1.43e+08
risk	3.15e+7	9183599	3.430	0.001	1.32e+7	4.98e+7
GDP	.0078889	.0013802	5.716	0.000	.0051325	.0106452
_cons	-6.96e+8	5.26e+08	-1.321	0.191	-1.75e+9	3.56e+08

Regression 5

. regress FDI risk ConOPI GDP

Source	SS	df	MS	Number of obs = 71
-----				F(3, 67) = 19.11
Model	6.3003e+19	3	2.1001e+19	Prob > F = 0.0000
Residual	7.3611e+19	67	1.0987e+18	R-squared = 0.4612
-----				Adj R-squared=0.4370
Total	1.3661e+20	70	1.9516e+18	Root MSE = 1.0e+09

FDI	Coef.	Std. Err.	t	P> t	[95% Conf]	

risk	3.65e+7	8706302	4.192	0.000	1.91e+07	5.39e+07
ConOPI	-6.33e+8	2.82e+8	-2.243	0.028	-1.20e+9	-6.96e+7
GDP	.0087355	.0012807	6.821	0.000	.0061793	.0112917
_cons	-7.08e+8	4.83e+08	-1.467	0.147	-1.67e+9	2.55e+8

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Regression 6

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. regress FPI intsprd GDP
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Source	SS	df	MS	Number of obs = 57
Model	1.1928e+20	2	5.9640e+19	F(2, 54) = 54.02
Residual	5.9614e+19	54	1.1040e+18	Prob > F = 0.0000
Total	1.7889e+20	56	3.1945e+18	R-squared = 0.6668
				Adj R-squared=0.6544
				Root MSE = 1.1e+09

FPI	Coef.	Std. Err.	t	P> t	[95% Conf]
intsprd	-9624359	3019827	-3.187	0.002	-1.57e+7 -3569970
GDP	.0166417	.0016102	10.335	0.000	.0134133 .01987
_cons	-7.21e+7	1.79e+8	-0.404	0.688	-4.30e+8 2.86e+8

Regression 7

```
. regress intsprd risk
```

Source	SS	df	MS	Number of obs = 59
Model	25339.4194	1	25339.4194	F(1, 57) = 12.06
Residual	119806.16	57	2101.86245	Prob > F = 0.0010
Total	145145.579	58	2502.50999	R-squared = 0.1746
				Adj R-squared=0.1601
				Root MSE = 45.846

intsprd	Coef.	Std. Err.	t	P> t	[95% Conf]
risk	-1.4064	.405079	-3.472	0.001	-2.2176 -.595332
_cons	104.7297	20.5675	5.092	0.000	63.54404 145.9154

Endnotes

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How Helpful is Integration?: Travel Time and Monetarization in Rural Peru

Gordon Carlos McCord

Abstract

High transport costs hinder trade, creating regions of economic isolation and poverty for areas facing difficult topographies. Using recent household data from rural Peru, this study seeks to understand how increased integration -- through decreasing travel time to urban centers and increasing degrees of monetarization -- affects the economic well being of rural households, since better roads and a higher proportion of monetary income presumably increase market access and alleviate the adverse effects of a difficult geography. Using a “livelihood mapping” framework to model the market failures of isolated areas, the longitudinal data shows that decreased travel times to urban centers not only increases income per capita, but also consumption of a “livelihood consumption basket” when holding total income constant, suggesting that decreased travel time has the added benefit of alleviating market failures. However, the increased degree of monetary income for households is shown to have an adverse short-term effect on economic well being, suggesting that while transportation integration is beneficial in the short term, increased monetary integration can have short-term consequences for rural households.

I. Introduction

For decades, scholars have pointed out that areas of the world subject to adverse geographic conditions have a harder time developing into wealthy economies. The complex effects that each country’s geography has on its economic development is not necessarily the same. However, across most of the world, high transport costs visibly hinder trade and thus create regions of economic isolation and poverty for areas facing difficult topographies. This

paper seeks to understand how the development of transportation infrastructure (thus decreasing travel time and costs to urban centers) affects the economic well being of rural households, since better roads presumably increase market access and alleviate the adverse effects of a difficult topography. Moreover, emphasis will be given to the role of the “degree of monetarization” (the percent of income that households received as money as opposed to goods) in the dynamic of households experienc-

ing increased connectedness to urban centers. Peru is chosen for the study because of its geographical and ecological diversity (containing a total of 84 of the world's 104 known living ecological regions and 28 different climates¹) that creates high transport costs for the population. Indeed, the correlation between road density and per capita income across the country's *departamentos* shows a strong relationship (a t-statistic of 3.012), with an elasticity of per capita income with respect to paved road density of 3.5. This quick-glance result for 1999 does not prove causality between infrastructure capital and income, yet the correlation motivates investigation and more rigorous quantitative analysis of the effects of infrastructure growth on economic performance.

International experience has corroborated expectations about returns to infrastructure investment: For example, the work of Ahmed and Hossain (1990) in Bangladesh finds that increases in public infrastructure endowments in rural areas generate 33% returns in rural household income – 24% increases from agricultural production, 78% from livestock production, and almost 100% in non-agricultural income. The importance of expanding infrastruc-

ture networks as a poverty-relief measure has not been lost on the Peruvian government. Since 1996 the Rural Roads Program (PCR) operating within the Transportation Infrastructure Rehabilitation Special Project (PERT) has aggressively worked to rehabilitate roads, improve pack animal roads, and establish routine maintenance. Taking advantage of these initiatives in the rehabilitation and completion of new roads after 1996, this paper uses the Peruvian National Household Surveys (ENAHOs) undertaken yearly from 1998-2000 to explore the economics of livelihood generation in Peru to contribute to understanding the link between transportation and economic development. The emphasis on income composition follows in the footsteps of Amartya Sen's "entitlements" approach towards analytically characterizing poverty and deprivation in terms of livelihood or claiming systems, which inspired Carter and May (1997) to conceptualize the mapping of social and economic endowments into real consumption possibilities. As explained in this paper, their analysis leads them to conclude that poverty is not only a matter of having few assets, but also of facing constraints (due to market failures such as poor transportation infrastruc-

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ture) that limit the effectiveness with which those assets are used. This paper first reviews Carter and May's theoretical foundations explaining the forces that shape (and distort) the nature of livelihood mapping, the linking of assets and endowments to consumption possibilities, and their important finding that "the topography of the estimated livelihood maps helps identify the constraints which limit household's ability to effectively utilize their assets and endowments."² After defining a "consumption livelihood basket" to measure changes in well being of the household, regression analysis is employed to estimate effects and draw conclusions about the nature of livelihood mapping in Peru relative to the improvements of rural households' access to urban centers. The analysis evaluates the overall effect of decreased travel time on income and consumption of the "livelihood basket," and whether or not travel time increases consumption through channels other than income effects. This would indicate that households are successfully improving their consumption bundles for given endowments and income, which the model attributes to correction of market imperfections. Subsequent analysis tests whether one of the channels through which a decrease in travel time increases

consumption is by increasing the degree of monetarization of household income (which itself is expected to alleviate the imperfections of transaction costs in rural economies).

II. Literature Review

Economic writing on transportation infrastructure has occurred in bursts during the last fifty years, as flaws in the original sweeping studies were pointed out, methodologies evolved, and analyses began focusing on manageable topics to relax inaccurate assumptions in previous studies. Lessons learned from previous literature include the fact that different types of infrastructure have significantly different returns, thus casting doubt on the usefulness of aggregate studies of roadway investment. Distinctions should be made between different types of highway investment – such as whether the project is rural or urban, and whether it involves new construction or maintenance. Within the more specific realm of literature concerning rural roads investment (which this paper focuses on), the World Bank has published numerous works based on evaluations of their own projects. Of particular interest is Van de Walle's explanation of the danger of basing conclusions upon simple com-

parisons of outcome indicators in villages with roads versus without them. Since road placement is not random, and simple comparisons do not account for the process by which the road came to be built in a specific location, then measures of impact will be biased and can lead to deceptive policy conclusions.³ This important issue of bias will be discussed more at length during data analysis.

Given the diversity of Peruvian topography and the recent scholarly emphasis on geographic variables, some models might designate the effects of infrastructure secondary to the overarching effects of geography as the determinant of economic development levels. Indeed, one could argue that more effective development efforts would mobilize populations away from geographically adverse areas instead of spending on projects to build infrastructure in geographically adverse regions. Javier Escobal and Máximo Torero (2000) shed light on the subject utilizing Jeffrey Sachs' methodology regressing geographic variables and level of economic development for Peru (using 1998 data at the district level). Their analysis does indeed show a correlation between geography and sizable differences in living standards across regions in Peru.

However, their second tier of regressions includes variables for non-geographic characteristics (termed public and private assets), which they find significantly reduce the coefficients of the geographic variables. Indeed, they conclude that sizable geographic differences in living standard are almost fully explained by the distribution of assets, which means that geography has a negative influence by creating an uneven distribution of infrastructure.⁴ This conclusion rules out the idea of geographic determinism and permits the models used in this paper to discard individual households' specific geographic characteristics (such as altitude), since these have been found to be relatively insignificant when variables for private and public assets are included in the model. Moreover, Escobal and Torero's findings conceptually step towards discarding the null hypothesis (that infrastructure has no effect since geography predetermines economic welfare), since infrastructure investment has a positive impact on economic indicators even in regions suffering from adverse geographies. The analysis in this paper tests the *spatial* interpretation of their results: if the equalization of household assets

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across the Peruvian topography does equalize incomes, then different levels of road infrastructure should not create differences in incomes between two households of equal assets.

III. Theoretical Framework

Carter and May (1997) give a complete explanation of the relation between a household's assets and its level of income, and the differences between the perfect markets scenario and the single- and multiple-market-failures scenarios. This microeconomic framework relates what the authors call household "livelihood maps" (that is, the income generation strategy of each household) with each household's assets. The work of Amartya Sen (1981) directed the attention of scholars not only towards how much income people have, but also to the bundle of assets or endowments held by the poor, the nature of their claims on those assets, and the nature and vulnerability of particular claiming systems. Believing that society's poor and the vulnerable can be identified as those sharing common income-claiming strategies, or "entitlements," Carter and May focus on livelihood strategies, that is, on the strategy people use to attain income, the vulnerability of said strategy. The mapping linking endowments with at-

tainable commodity bundles is what Carter and May call "livelihood mapping."

Livelihood mapping defines the set of commodity bundles attainable by a household with a given set of tangible and intangible endowments, either through the direct use of these endowments or by using them to access other goods through a market or other claiming system (like, for example, a legal system). As the authors explain, a perfect-market scenario results in a livelihood mapping defined simply by the budget set fixed by the endowments of a household and the relative prices of any exchanges it makes. However, the notion of livelihood mapping becomes more complex when sales or quantity constraints (like unemployment), missing markets, and production and price shocks are introduced. Sen defines "entitlement failure" as the result of having claiming systems fail to provide access to the expected bundle of commodities (such as in a world without perfect insurance). The discrepancies between different imperfect-market maps is described by comparing a semi-subsistence farmer with a semi-skilled artisan having the same real income and budget sets, but who are subject to different vulnerability and poverty risks be-

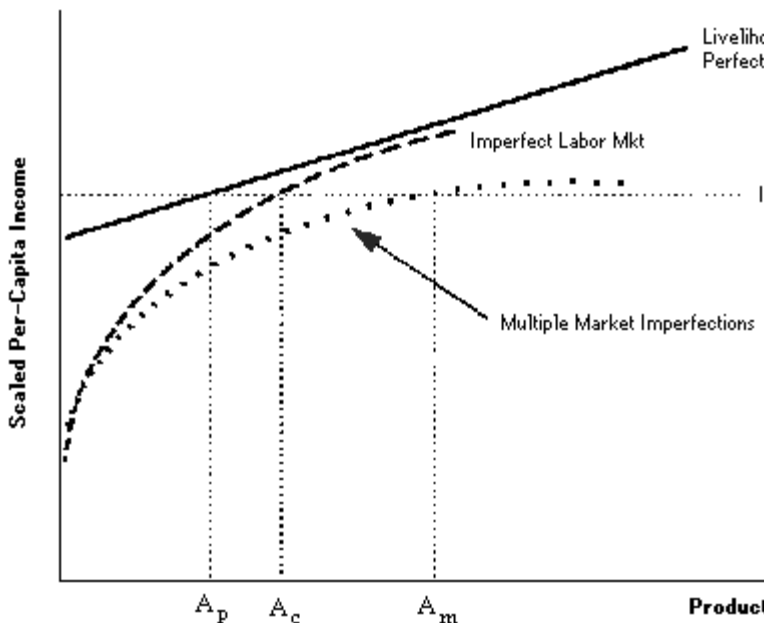
cause of the different production shocks and sales constraints that they are exposed to.⁵

As in Carter and May's analysis, this paper uses a one-dimensional map from assets into income space (unlike Sen's multidimensional framework where a particular endowment commands different dimensions of commodity bundles), allowing for a focus on the constraints limiting a household's ability to generate secure income. Although the mapping of a household's endowment to livelihood results in the mapping of a point onto a distribution (due to the probabilistic factor introduced by risk and imperfect markets), here the

mean of that distribution will be mapped, representing the ex ante expected livelihood resultant from having one bundle of assets.

The microeconomic theory of the household rooted in A.V. Chayanov's 1924 work offers insights into the choicetheoretic basis of Carter and May's livelihood mapping and for understanding the constraints of low-income households. Chayanov's studies (1966) stress how the intensity with which a household uses its fixed assets varies systematically with the household's endowments of land and labor. However, refocusing the theory onto the real income that a household

Figure 1. Microfoundations of Livelihood Mapping and Asset F



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gains and its effect in determining the household's final asset bundle helps provide further foundation for the map linking livelihood, or entitlement, to income.

According to Singh, Squire and Strauss, when a household has access to full and complete markets (meaning it can purchase or sell any quantity of both consumer goods and productive factors like labor or capital), its production and income generation decisions become independent of consumption decisions and its endowments level (1985). This translates onto Carter and May's livelihood map as a line of constant upward slope where marginal livelihood returns to assets and endowments are constant. That is, a household's asset and endowment bundle does not influence the returns to any particular asset or endowment. This is illustrated by the constant line on the two-dimensional map:

For simplicity, Figure 1 assumes that all households have the same structure and requirements so that the left axis can equivalently be expressed in total income and income per-adult units. In the perfect-markets scenario, a household's income falls below the poverty line when its assets and endowments fall below A_p . In this perfect world, poverty would simply be a function of

insufficient assets, and poverty relief would simply be a matter of increasing household's endowments and assets via direct transfers of income or assets.

However, the topography of the livelihood map changes when the perfect markets assumption is relaxed. Chayanov's analysis, for example, presumes that peasant households can neither buy nor sell labor, thus making the pattern of households' resource and use inseparable from the overall wealth level and demographic structure (suddenly, for example, a household with an excess of a particular asset like labor cannot exchange it for something which would increase its income, resulting in different marginal returns for different assets). The livelihood maps now takes the shape of the dash-line in Figure 1, where the expected income level for a particular asset/endowment bundle is equal to the corresponding perfect-market level only when the equivalent perfect-market household would no longer desire to buy or sell labor. In this labor market failure scenario, notice that the required level of assets and endowments necessary for reaching poverty level increases from A_p to A_c , meaning that poverty is now no longer only a function of the asset/endowment bundle of each household, but also of the extent

to which the household is constrained from using these assets and endowments effectively.

Households in developing economies suffer from multiple market failures, as has been documented extensively in the Peruvian context⁶ and particularly for roads in the work of Escobal and Valdivia (1993), who identify the principle Peruvian market failures as a lack of appropriate communication infrastructure, the absence of clear property rights, asymmetric information in the labor and credit markets, and legal and institutional restrictions in several factor markets.⁷ The dotted curve in Figure 1 represents the implications in the livelihood map of multiple market failures. Notice the increased flatness of the entitlement surface, meaning that low wealth households are able to access even fewer entitlements as market failures worsen (for example, low-asset borrowers become increasingly unable to access working capital needed to finance cash costs of production, sometimes even including their immediate consumption needs, meaning that they cannot effectively use land endowments because of their insufficient capital for production). In this new curve of multiple market imperfections, the minimal asset/endowment level neces-

sary to acquire poverty-line-levels of income is increases to A_m . Unlike the perfect-markets scenario, households are now poor due because of their deficient asset/endowment bundle or because they are trapped on a flat part of the endowment space, meaning they fail at transforming their assets/endowments bundle into income.

The resulting policy implication is that poverty alleviation entails not only direct asset transfers to the poor, but also the correction of failures and constraints (that is, shifting the entitlement space curve back towards the straight line) that households face when attempting to channel their assets, endowments, and productive factors into consumption. This paper first explores an important correction for rural Peruvian households – the alleviation of the transportation barrier – and the increase in households' well being (even while holding other assets constant) predicted by the livelihood map model. Second, monetary income as a channel through which decreased travel time affects the household is explored.

The percentage of total income received as money, here termed “degree of monetarization,” is a unique channel through which travel time changes affect consumption, because it

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too is a constraint that prevents rural households from optimally channeling their assets and endowments into consumption. It is assumed that rural households receiving a greater percentage of their money as income engage more frequently in bartering to exchange resources. Bartered transactions allow for less optimal outcomes since a successful exchange requires a double coincidence of wants between people exchanging goods and services, while money allows for more optimal consumption since the unit of transaction can be divided beyond a single good or service. Moreover, rural environments often have nonzero transaction costs due to the market imperfections around them. For example, one can imagine a worker getting paid in a good that he/she would like to sell in order to buy other goods. The process of selling in the rural setting might not be frictionless or cost-free, due maybe to time it takes to find a buyer among neighbors or markets that are often not nearby. This friction implies an opportunity cost to selling since the time it took to make the sale could have been used on an income-generating activity. If, instead, the original income had been in money, the worker would be able to directly purchasing goods without losing time selling oth-

ers.

This paper explores the effects on consumption of both corrections of market imperfections: a reduction of time needed to reach the nearest urban center, and an increase in monetarization. Moreover, it will test the hypothesis that the second correction is a result of the first (due, for example, to the commercialization of agricultural goods as a rural household becomes integrated into a larger economy when a road is built).

IV. Data Description⁸

To analyze under the “livelihood map” framework described above, a choice must be made for a variable representing “commodity bundles” and economic well being or level of development. Any study of development has to contend with the advantages and disadvantages of the various possible indicators of well being. Throughout this analysis, two measures of level of human development will be employed. The first, income per capita, is the most common proxy for level of development (economic and otherwise). Although this indicator does not explicitly consider other facets of well being (such as political freedom, degree of inequality, literacy, infant mortality, nutrition, life expectancy, etc.), it serves as a good proxy

because many argue that higher incomes invariably lead to better health and educational standards in the population.⁹ Debraj Ray's review of the literature on this topic mentions authors who have found high correlations between indicators of quality of life and income per capita, though more rigorous econometric exercises have yielded mixed results.¹⁰ The second indicator for well being used in this analysis is a special measure of household consumption, labeled throughout this paper as the "livelihood consumption basket." Built by selectively aggregating consumption by category, it includes what the household has consumed in foodstuffs, clothing, health services, education, home maintenance, and entertainment. In addition, it includes not only what has been purchased, but also what has been received as payment for a service or what has been donated to the household by another household or a social relief program. Notice that consumption of transportation goods and services are not included. This measure of consumption per capita more directly captures the resources that households consume towards making their lives better (biologically, educationally, and in terms of luxuries), and therefore works well as a representation of a "commodity bundle"

which translates into economic well being. Moreover, this "consumption livelihood basket" variable allows the impact analysis of time of transport and monetarization on consumption *while holding total income fixed*. As a result, it becomes possible to examine how better integration to the national economy determines whether equally wealthy households consume different amounts of resources for their own well being (which would be expected if one is forced to spend more on transport due to poor infrastructure). These two proxies are chosen because the impact on alternative measures of well being (such as health) requires a medium-term analysis to capture the effect of decreased travel time, and the short time span in the sample under study will not allow for significant changes in health variables. Indeed, the simple correlation between health (measured as the percentage of the household experiencing a sickness during the last three months) and travel time does not hold, probably for a plethora of reasons. Although income and consumption per capita are by no means all-encompassing measures of well being, they will be used throughout this paper.

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V. Regression Analysis

The analysis will be in several parts: first the issue of selection bias within our sample will be discussed. Next, having chosen for the purpose of the econometric analysis to proxy road infrastructure with the time it takes to reach the nearest district capital, regressions will be used to determine the impact that the *time* variable has on consumption using both a panel regression and a regression on the first-differential (using differences). Finally, the analysis will use several econometric techniques to test the hypothesis that monetarization is the channel through which increased access to the district capital affects households.

VI. Selection Bias

A true natural experiment would involve the random assignment of road infrastructure upgrades to best measure the “pure” benefits of the upgrades on economic well being. However, infrastructure upgrades are probably not assigned randomly in any society but instead occur following certain criteria depending on the agency investing in the upgrade, which would bias the estimates of gains from the upgrade. To test whether the infrastructure upgrades in the sample are truly nonrandom, the

geographical distribution of the sample and the sub sample of upgrades were evaluated, and since the percentage of households receiving an upgrade are comparable for the three geographical strata, national-level regressions for the sample can be run without worrying that the results are biased towards expressing the dynamic of one geographical region at the expense of another. Next, possible bias due to nonrandom upgrading criteria mentioned above was tested using a LOGIT regression by looking for relationships between whether a village received a road upgrade and possible criteria for road investment. Any statistically significant correlation between places receiving upgraded roads and these criteria would indicate bias in the sample. However, regression analysis¹¹ finds no evidence of ex-ante bias in the variables that will be used as dependent in upcoming equations, or any bias in the geographical dummies. Moreover, although there is a correlation between road improvement and household controls (education and the existence of a health post), these will be included in the controls throughout the analysis and absorb some of the problematic correlation between upgraded villages and consumption or income. In addition, although the inability to accu-

rately estimate a function for road upgrade criteria prevents the complete elimination of bias, the degree to which these criteria affect consumption or income is probably small (since most theoretical determinants of these variables will be included as controls), lending confidence to the assertion that bias in the results is negligible.

VII. Various Techniques to Isolate the Effect of Travel Time¹² on Development

The first part of the analysis will attempt

$$(I) \quad \ln\left(\frac{Y}{P}\right)_i = \beta_1 + \beta_2 \ln(\text{time}_{it}) + \varepsilon_{it}$$

$$(II) \quad \ln\left(\frac{C}{P}\right)_i = \beta_1 + \beta_2 \ln(\text{time}_{it}) + \beta_3 Y_{it} + \varepsilon_{it}$$

to isolate the impact that travel time has on the economic well being of rural Peruvian households. As an upper bound estimate, the dependent variables discussed in the Data Description section (per capita income and per capita consumption of the “livelihood consumption basket”) were regressed against travel time:

This resulted under OLS in a 0.16% increase in income per capita and 0.13% increase in consumption per capita for every percent decrease in time of travel. These magnitudes are not insignificant: if an infrastructure investment project decreases travel time by 50%, income per capita increases by the non-

trivial amount of 8%. It is important to note that a fixed-effects panel was also used. In a fixed effects model, variables that do not change over time are dropped by definition, so we can interpret these results as showing the extent to which changes in travel time affected the dependent variable *for households that experienced a change in travel time*. The decrease in the magnitude of the coefficients when moving from the pooled regressions to the fixed-effects suggests that changes in travel time have a greater effect in the short-term (captured by the fixed-effect method) than in the long-term (identified by the static regression of pooled OLS).

The regression in which consumption is the dependent variable integrates income per capita as a control¹³ to capture the explanatory power that changes in travel time have upon consumption of the “livelihood consumption basket,” *keeping income constant*. That is, if a change in travel time causes an increase in consumption due to an increase in wealth, this change will be captured by b_3 , thus leaving b_2 to explain increases in consumption due to travel time changes that are *not* due to income changes. In accordance with this expectation, the magnitude of b_2 drops slightly from -0.051% to $-$

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0.039%, indicating that some of decreased travel time's effect on consumption is through increased income. At the same time, the fact that b_2 keeps the correct sign and remains statistically significant indicates that travel time increases economic well being beyond just increasing income per capita. Some of this is probably due to the transfer of resources previously spent on transportation costs to other goods within the "livelihood consumption basket." However, this result can also be predicted from the livelihood map of the Theoretical Section of this paper – as the market failure due to transport cost is alleviated, the curved line in Figure 1 shifts back towards the straight line of the perfect-market scenario, and households will be able to consume a more optimal consumption bundle for a given set of assets. In addition, as can be expected, b_2 decreases from 5.1% to 3.9% when moving from (4) to (5), thus strengthening our confidence in the results by suggesting that decreasing travel time does in fact lead to increased well being both through increased income but also through other channels (which this

paper hypothesizes includes the correction of a market failure allowing households to better maximize utility with their given assets and income).

The model in (I) and (II) establish the groundwork to study the impact of changes in travel time on rural households. However, since assets and endowments do greatly determine the consumption bundles chosen by households, then an analysis seeking to understand the impact of changes in travel time on household income and income attainment strategies must distinguish between households with different levels of assets and endowments. The methodology to account for these differences in hopes of isolating the "travel time effect" will be to use controls in the regression. Hoping to leave every household identical to every other within its geographical area, the model will remove the effects of each household's human capital, physical capital, financial capital, and its village's communal capital:

Table 8 shows the results of adding the household and communal controls, where a fixed-effect panel was employed in (1), (2) and (3) after a

$$(III) \quad \ln\left(\frac{Y}{P}\right)_{it} = \beta_1 + \beta_2 X_{it} + \beta_3 Mountain + \beta_4 Jungle + \beta_5 \ln(tim)$$

$$(IV) \quad \ln\left(\frac{C}{P}\right)_{it} = \beta_1 + \beta_2 X_{it} + \beta_3 Mountain + \beta_4 Jungle + \beta_5 \ln(ti)$$

where $X = \gamma_1 K_{hum} + \gamma_2 K_{phy} + \gamma_3 K_{fin} + \gamma_4 K_{comm}$

Hausman test rejected the possibility of using random effects. The comparable R² statistic for the fixed-panel regressions have increased dramatically from around .04 to .25 and .43 in (1) and (2), thus indicating that the controls play a role in explaining fluctuations in the dependent variable. Note that the coefficients and standard errors of the many control terms are not included because they do not further this analysis; it is enough to recognize their effect within the regression on the variables under study. Of note, however, are the geographical area dummies included in

Table 8. Since these do not change over time, they are dropped in the fixed regression, but their significant and negative coefficients in the pooled regression indicate that adverse geography has a negative effect on consumption levels *even when* controlling for household's assets, income, and spatial adversity due to travel time to the nearest district capital. Therefore, it seems that adverse geographies also create of market imperfections shifting the livelihood map in Figure 1 downwards, so that even for a given income level, households in adverse geographies are less well off.

Table 8: Travel Time & Income, Consumption with Controls

Dependent Variable:	ln(Y/P)	ln(C/P)	ln(C/P)
	(1)	(2)	(3)
Method:	FE	FE	FE
<u>Independent Variable</u>			
ln(time)	-0.0412** (0.0187)	-0.0440* (0.0124)	-0.0347* (0.0116)
(Y/P)			0.2252* (0.0149)
Mountain Dummy			
Jungle Dummy			
Constant	4.9968* (0.3492)	5.4288* (0.2303)	4.303* (0.2290)
R ²	0.249	0.4311	0.5638
N	5697	5697	5697

Notes: * Significant at 1%; ** Significant at 5%; *** Significant at 10%.
 All regressions are limited to rural households and contain year dummies
 (1), (2), and (3) are fixed-effects panels grouped by household
 (4) uses standard OLS to pool the observations, clustered by household
 Controls not shown: Human Capital (size of household, age of head, age of head squared, ed average education level of others)
 Physical Capital (house rooms per capita, house value per capita, agric system rank, hygiene system rank, electricity in house dummy)
 Financial Capital (bank dummy, borrowed dummy, informal capital m
 Community Capital (bank, market, school, health post dummies)

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Despite the controls, decreases in travel time have a 4% effect on income per capita, but the effects on consumption per capita have dropped from 5.1% without controls to 4.4% in (2), and from 3.9% to 3.5% in (3). These decreases in explanatory power of the travel time variable indicate that some of the increases in consumption of the “livelihood basket” attributed to travel time in Table 7 were in reality due to changes in the control variables. However, it is difficult to analyze the role of the controls because it is difficult to test causality. Moreover, the more important result is that that travel time keeps a significant coefficient in (3) with the inclusion of controls. Therefore, changes in travel time to the nearest district capital do in fact affect economic well being not only through an effect on total income but also by increasing the amount of resources consumed by rural households towards bettering their livelihood, *even accounting for changes in income and other measures of household capital*. This suggests that in fact a decrease in travel time increases the household’s well being by relaxing market frictions and the transport cost wedge, thus allowing it to spend more of its resources on bettering the quality of life. In the language of Carter and

May’s model described in the Theoretical Framework section, the amelioration of market failure due to transport cost allows households to achieve a more optimal consumption bundle for a given set of assets and endowments. Finally, the pooled regression in (4) is a momentary return to the static analysis to point out that despite controlling for households’ total income and capital (physical, human, financial and communal), nevertheless the travel time remains a significant explainer of consumption of the “livelihood consumption basket” in rural households. This contradicts the recommendations of Torero and Escobal mentioned in the literature review. While they claim that equalizing levels of assets across space and topography will equalize incomes, these results show that despite controlling for levels of all assets and income, does not eliminate the spatial determinant of development among Peruvian households. A first differencing (FD) methodology was then employed¹⁴ using only the paneled households, and differencing between 2000 and 1998. The FD regressions corroborate the results above. Monetization as a Channel for Travel Time Effects

Fort and Aragón (2001) concluded their analysis with results moti-

vating a study of the dynamics between household income, income composition, and road infrastructure development. However, they lacked a panel with which to monitor the effect of changes and were forced to document static relationships in a cross-section. This section builds upon equation (IV) by incorporating the degree of monetarization variable, and testing whether it is a channel through which changes in travel time of rural households to the district capital affects well being. That is, as a conglomerate's transport costs to larger markets decrease, households begin receiving a greater percentage of their incomes in the form of money (much literature exists on the monetarization of peasant economies, mainly due to the influx of wage labor and the commercialization of basic needs). For reasons explained in the Theoretical Framework section, it is expected that monetarization corrects market inefficiencies and allows households to improve their quality of life (because they can more optimally choose their consumption bundles) even

when holding total income constant. That is, just as changes in travel time had a positive effect on consumption even when holding income constant, it is expected that monetarization corrects another market failure whose alleviation yields similar results. The hypothesis that monetarization is a channel through which a change in travel time affects consumption is tested by adding the "percentage of income received as money" (M/Y) variable into equation (IV). Since the coefficient for the travel time variable decreases by half a percentage point with the inclusion of monetarization (while remaining statistically significant), this supports the hypothesis that changes in travel time are partly affecting consumption through the channel of the new variable. Therefore, the new coefficient on the travel time variable in (2) is only the effect of travel time on consumption *not due* to the effect of travel time on monetarization (which in turn affects consumption).

The next step, therefore, is to estimate the total effect of these vari-

$$(VII) \quad \ln\left(\frac{C}{P}\right)_{it} = \beta_1 + \beta_2 X_{it} + \beta_3 \ln(time_{it}) + \beta_4 \ln\left(\frac{Y}{P}\right)$$

$$(VIII) \quad \left(\frac{M}{Y}\right)_{it} = \alpha_1 + \alpha_2 X_{it} + \alpha_3 \ln(time_{it}) + \alpha_4 \ln\left(\frac{Y}{P}\right)$$

$$(IX) \quad \ln\left(\frac{Y}{P}\right)_{it} = \delta_1 + \delta_2 X_{it} + \delta_3 \ln(time_{it})$$

where $X = \gamma_1 K_{hum} + \gamma_2 K_{phy} + \gamma_3 K_{fin} + \gamma_4 K_{comm} + \gamma_5 Mountain$

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ables with both a pooled regression and a fixed-effects panel using the following relationships:

Equations VII, VIII, and IX represent an attempt to isolate the effect that a change in travel time has on consumption. The coefficient of interest is b_3 because it represents the effect of travel time upon the “livelihood consumption basket.” However, b_3 in equation VII only explains the effect of travel time on consumption *not explained* by the change in the other explanatory variables due to a change travel time. As seen in models (1) and (3) of Table 7 and in model (1) of Table 8, travel time is strongly correlated to income per capita in both pooled and fixed-effects regressions (the latter demonstrating coupled movement of the variables over time as travel time changes explain deviations in a household’s mean income). Moreover, the hypothesis under question is that travel time affects the degree of monetarization of the household, which in turn increases consumption by relieving a market failure and shifting the curved line in Figure 1 upwards toward the perfect-market scenario. Therefore, it is expected that b_3 understates the effect of travel time because it fails to represent this variables effect via income and monetarization effects. Equation IX

captures the effect of travel time upon income per capita. Notice the assumption that income per capita is only affected by the controls and the travel time, and not by degree of monetarization or consumption of the “livelihood consumption basket.” This is because an increase in consumption of the basket can only happen due to a reallocation of income towards the goods in the basket or due to an increase in income. An increase in consumption,

$$\hat{\beta}_4 = (\beta_4 * \delta_3)$$

$$\hat{\beta}_5 = \beta_5(\alpha_3 + (\alpha_4 * \delta_3))$$

however, is assumed to not cause an increase in income itself.¹⁵ Equation VIII models the effect of travel time and in-

$$\hat{\beta}_3 = \beta_3 + \hat{\beta}_4 + \hat{\beta}_5$$

$$\hat{\beta}_3 = \beta_3 + (\beta_4 * \delta_3) + \beta_5(\alpha_3 + (\alpha_4 * \delta_3))$$

come upon monetarization. This system of equations allows the algebraic isolation of the contribution of time’s effect on consumption through the income channel ($\hat{\beta}_4$) and through the monetarization channel ($\hat{\beta}_5$) as follows:

Thus, the “total” effect of the time variable on consumption ($\hat{\beta}_3$) is calculated as follows:

The results for both the pooled regressions and the fixed-effect regressions are as follows:

The pooled regressions in (1), (2) and (3) reveal the simple correlations of the variables, and while the fixed-effect regressions of (4)-(9) model changes in variables within the time series, the pooled regressions can be interpreted as bringing to light the long-

via monetarization effects have coefficients of -.0135 and .0093, respectively. That is, a 50% smaller travel time implies a greater consumption level by (-.5*-.0291) 1.46%, of which 1.35% is due to increased income. Time's effect on monetarization, on the other hand,

For pooled regression :

$$\hat{\beta}_3 = \beta_3 + (\beta_4 * \delta_3) + \beta_5(\alpha_3 + (\alpha_4 * \delta_3))$$

$$\hat{\beta}_3 = -.0249 + (.3909 * -.0346) + (-.4562 * (-.0145 + (.1711$$

$$\hat{\beta}_3 = -.0291$$

$$\hat{\beta}_4 = (.3909 * -.0346) = -.0135$$

$$\hat{\beta}_5 = (-.4562 * (-.0145 + (.1711 * -.0346))) = .0093$$

term relationship between the variables. Indeed, the pooled regressions show that across the sample, travel time is strongly correlated to consumption of the "livelihood consumption basket," to degree of monetarization, and to income per capita. By using the above identity, the effects of time on consumption per capita are broken down as:

Since this is a pooled consumption, the results ought to be interpreted as long-term correlations and not necessarily proof for causal relationships in the short-term. The calculations above show that the pooled regression estimates the total effect of travel time to have an elasticity of -.0291, while the effects of time via income effects and

decreased time's effect on consumption by (-.5*.0093) -0.5%. This surprising result will be addressed shortly.

Models (4) – (6) repeat the exercise with the fixed-effect panel method (once again, a Hausman test rejects the accuracy of the random effects method).¹⁶ These results indicate that in the short-term, changes in travel time have a greater effect (-.0425) on consumption than the simple pooled correlation reveals, and these effects are only mildly working through the income channel and are not working through the monetarization channel.

This lack of fixed-effect correlation between monetarization and travel time is problematic for the hypothesis

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that monetarization is a channel through which travel time affects economic well being, since this would at least require that that decreases in travel time would increase monetarization. One possible explanation is that monetarization exhibits only one-way movement in relation to the village's connectedness. As villages get more "plugged in" to the national economy, the households within them experience monetarization, but the relationship does not hold in the negative. That is, if travel time to the district capital increases (possibly due to infrastructure deterioration), this does not

cause *de-monetarization* among the households. Consequently, the relationship between travel time and monetarization would hold only when dropping observations with positive travel time deltas. This is tested in models (7) – (9) in Table 11, where the sample is limited to observations whose changes in travel time are zero or negative. Now, monetarization and travel time *do* have a statistically significant positive correlation. For this subsample, a 50% decrease in travel time has a total effect of increasing consumption by (-.5*-.1003) 5.0%, of which

Table 11: Consumption & Travel Time/Income/Monetarization

Dependent Variable:	ln(CP)	(MY)	ln(Y/P)	ln(CP)	(MY)	ln(Y/P)	ln(CP)
Method:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	CLS	CLS	CLS	FE	FE	FE	FE
Independent Variable							
ln(time)	-0.0249* (0.0080)	-0.145* (0.0048)	-0.0346* (0.0133)	-0.0303* (0.0112)	0.0088 (0.0061)	-0.0412** (0.0187)	-0.0532** (0.0244)
ln(Y/P)	0.3909* (0.0150)	0.1711* (0.0052)		0.2965* (0.0158)	0.1450* (0.0078)		0.2913* (0.0279)
(MY)	-0.4563* (0.0342)			-0.4916* (0.0444)			-0.3857* (0.0729)
Constant	3.634* (0.1055)	0.4339* (0.0459)	5.3155* (0.1405)	4.0738* (0.2223)	-0.4669* (0.1199)	4.9967* (0.3492)	4.5355* (0.3683)
R ²	0.6457	0.4107	0.4394	0.5649	0.3228	0.249	0.5005
N	5697	5697	5697	5697	5697	5697	963

Notes: * Significant at 1%; ** Significant at 5%; *** Significant at 10%

All regressions are limited to rural households and contain year dummies

(1), (2), and (3) are standard CLS clustering by household with robust standard errors

(4)-(9) are fixed-effects panels, R squared is overall R squared

(7)-(9) limit the sample to observations with a delta(time) <= 0

Controls not shown: Human Capital (size of household, age of head, age of head squared, education level of head, average edu in house dummy)
 Physical Capital (house rooms per capita, house value per capita, agricultural capital, water system rank, in house dummy)
 Financial Capital (bank dummy, borrowed dummy, informal capital market dummy)
 Community Capital (bank, market, school, health post dummies)
 Mountain Dummy
 Jungle Dummy

1.6% is due to effects of increased income and 0.8% is due to effects of increased monetarization. The fact that the coefficient has increased in absolute value is due to the nature of the sub-sample: by limiting the sample to households whose travel time has decreased or stayed the same, the benefits of this change becomes more apparent in the coefficient. Indeed, increases in travel time within the sample are probably due to measurement error¹⁷ or to deterioration of infrastructure. However, for a variety of reasons including measurement error near the cutoff of the sub-sample,¹⁸ the validity of these results is cast into doubt.

These methodological shortcomings leave the pooled analysis of models (1)–(3) in Table 11 as the most reliable estimators (recall that the time travel coefficient for these models is $-.0291$). It must be noted, however, that this correlation is not within a fixed-effects context and is better interpreted as a long-term relationship. The failure of the fixed-effect model to explain the direct effect of changes in travel time upon consumption via the monetarization channel means that the structure of equations (VII), (VIII) and (IX) may be inadequate for the short-term dynamic of the variables under study, although

the structure does well to explain long-term relationships.

VIII. The Negative Effects of Increased Monetarization?

The results in Table 11 reveal a surprising negative correlation between degree of monetarization and consumption per capita, both in the pooled regression and in the fixed-effects. Since both regressions are controlling for income per capita, the negative coefficient on degree of monetarization can be interpreted to mean that for two households of equal income, the one that receives more income as money is consuming less of the “livelihood consumption basket.” Likewise, increasing the degree of monetarization decreases consumption (when controlling for income effects). These results are contrary to the prediction (based on what was discussed in the Theoretical Framework section): receiving a greater percentage of income as money had been expected to allow the household to choose a more optimal consumption bundle by alleviating transaction costs, shifting the curve toward the perfect-market scenario in Figure 1, and allowing the household to improve its quality of life. Indeed, running the regressions without controlling

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for income yields a positive coefficient for monetarization for both a pooled regression and a fixed-effects regression. That is, looking across the country, households that are doing better off tend to receive more of their income as money. However, as mentioned above, the relationship is negative and statistically significant when controlling for income, such that even in static analysis, households of equal wealth tend to consume more if they receive *less* of their income as money. Moreover, the fixed-effects panel corroborates this negative relationship: whether or not income is controlled for, the monetarization variable retains a negative sign and is statistically significant. This indicates that *changes* in monetarization are negatively correlated with changes in consumption, since decreased monetarization is an explainer for positive deviations from the mean of a household's consumption over time.

Although these results disprove the prediction that increased monetarization betters living standards in the short-run, two explanations come to mind for why this could be happen-

ing. Firstly, the Peruvian economy has been in recession, as shown in the following table:

The national recession has affected the households paneled in our data. Average per capita income decreased from 527.05 to 492.07 *soles* per trimester (in 1998 *soles*) – a decrease of 6.99%. As a result, *everyone* in the country is experiencing tough economic times as his/her purchasing power goes down with decreasing per capita income. Although the regressions in Table 11 control for income, nevertheless a decrease in purchasing power will have a greater effect on households with greater monetarization. In the rural setting, households that used to receive most of their income in goods may be experiencing greater stability through these troubled economic times than those who have undergone more monetarization. Moreover, it is an especially difficult time for a household to *increase* its level of monetarization when this means becoming interdependent with a struggling national economy. In addition, most of the households in rural Peru have low levels of human capi-

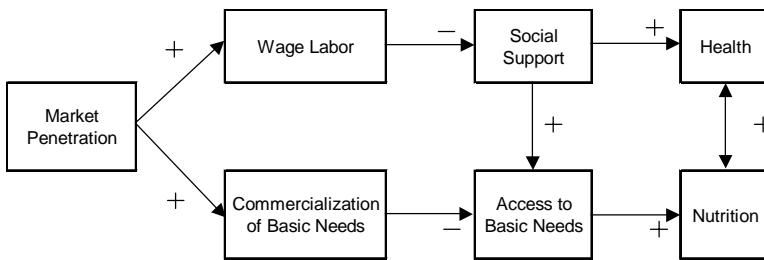
Series	1996	1997	1998
GNP per capita, Atlas method (current US\$)	2,250	2,400	2,250

Source: World Development Indicators database

tal and may require an adjustment period before re-optimizing their economic behavior after increasing their degree of monetarization, which the short time-span in the data interprets as a decrease in well being.

A second reason for why monetarization may be decreasing the well being of rural households stems from a wealth of anthropological literature and new economic literature on the role of social networks, local insurance systems, and consumption smoothing across rural households through reciprocity mechanisms. As has been documented extensively for the Peruvian

tional economic trends. As monetarization in households increases and begins breaking up the social networks of the community, the households become exposed to the national economic volatility and their level of economic growth fluctuates more closely with the national performance. Since the national economy is in recession, then households that increase monetarization may exhibit a decrease in consumption relative to an equally wealthy household that did not increase its monetary income percentage. Therefore, even if the long-run relationship between monetarization and consump-



case, rural communities tend to form strong social networks involving resource transfers that serve as insurance and savings mechanisms, thus allowing for consumption smoothing despite the volatility of their environments and production realities. Moreover, these networks and the communal-level subsistence insulate the households from na-

tion for a fixed income level is positive, it is possible that the effect in the short-run works in the opposite direction. Moreover, having to buy basic goods from merchants makes it tougher to smooth consumption since transactions based on reciprocity become less frequent and poor rural households have little savings to support them when in-

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comes fluctuate. One author's model¹⁹ represents the effects of increased connectedness in the Andean context as follows:

This model emphasizes the negative effects that wage labor and commercialization of basic goods has upon the social support and access to basic needs of the households. Although the intricacies of complex social mechanisms such as ones diagramed here are beyond the scope of this paper, there is little doubt that increased monetarization can sometimes have mixed effects upon rural populations. The curious results in the regression analysis above might, therefore, be picking up these "painful first steps" into the monetary economy. This is especially true since the data covers only three years of national recession. Not only are short-term effects being emphasized in the results, but the national market that households are becoming more connected to is also a tough one. Indeed, these results are not representative of the long-term relationship between the variables, and leave motivation for panel study of long-term effects of monetarization across at least one full business cycle in the economy.

IX. Conclusion

The construction of rural roads is being championed by the World Bank and other development institutions as an instrument necessary for the alleviation of poverty. Seeking to understand the dynamic effects of transportation on rural household economics, this paper found that income is only one of the channels through which consumption of the "livelihood basket" increased with changes in travel time, thus supporting the model's prediction that consumption will increase for a fixed income as market imperfections are alleviated. In addition, the degree of monetarization of household income was found to decrease the coefficient on travel time's effect on consumption, thus supporting the argument that it acts as a channel through which changes in travel time improve economic well being. Finally, a system of equations was employed to isolate the total effect of a change in travel time upon consumption, including through the income and monetarization mechanisms. The resulting coefficient for the "total" effect of time proved to be smaller for the pooled regression than various fixed-effects regressions with different specifications. Though the calculated elasticity fluctuated from -.03 to -.13, the results were robust and nega-

tive across different sub-samples. The coefficients for the income effect were also stable, positive and robust across different specifications. The volatile coefficient was the one for the monetarization channel, which was found to be insignificant on the fixed-effects model for the complete sample size and for the upgraded sub-sample, while positive for the pooled regression and negative for the fixed-effects regression.

These results for monetarization's role as a channel and the counter-intuitive negative effect apparent on consumption when holding income constant prompt an additional analysis of the variable. Indeed, it is found to be positively correlated to consumption in a pooled regression until income is controlled for, while the fixed-effects panel informs that an increase in monetarization causes a decrease in consumption for a fixed income level. The justification of these results are beyond the scope of the paper, though a possible explanation stipulates that the decreasing purchasing power due to the national recession during the years observed forces a household with higher monetarization to consume progressively less in relation to a household of equivalent income but lower monetarization. This possibility moti-

vates longitudinal analysis over a period of time that covers at least one business cycle.

In the context of the debate on geographic determinism, the significant effect of travel time on the economic well being of households encourages discussion on a spatial interpretation of the debate on geography. Since travel time's effect remains despite controls for different types of capital and geography, the notion that equalizing assets across any topography will equalize incomes (forth by Escobal and Torero) seems improbable, since there seems to be a spatial determinant of well being that does not disappear with controls for assets. Indeed, integration into the national market via decreased travel time alleviates spatial bias. Nevertheless, market integration was not found to have a universally positive effect: getting plugged in to the national economy through monetarization seems to have mixed effects in the short term for these households, especially in the consumption of the "livelihood consumption basket." Although this conclusion is very tentative due to shortcomings in the time-series, it will have to be tested by other research. Scholars will have to ask whether this short-term problem is due to inadequate adjustment to the mon-

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etary economy, or whether it is a reflection of the negative effects of becoming integrated into a shrinking national economy. Let it not be forgotten, however, that the net effect of shorter travel times on income and consumption is positive and robust throughout, despite variation in the monetarization channel.

Endnotes

¹ Javier Escobal and Máximo Torero, “Does Geography Explain Differences in Economic Growth in Peru?” (Research Network Working Paper #R-404, Inter-American Development Bank, 2000 - [cited 29 January 2002]), pg 7; available from <http://www.iadb.org/RES/pdf/R-404.pdf>.

² Michael Carter and Julian May, “Poverty, Livelihood and Class in Rural South Africa,” (Staff Paper Series #408, University of Wisconsin—Madison, 1997), 2.

³ Dominique van de Walle, “Choosing Rural Road Investments to Help Reduce Poverty,” (Working Paper 2458, World Bank, 2000 - [cited 29 January 2002]), 4; available from <http://econ.worldbank.org/docs/1213.pdf>.

⁴ Escobal and Torero, 33.

⁵ *Ibid.*, 7, note 8.

⁶ A good literature review for research on market failures and implications at

the household level in Peru is in Fort and Aragón, pg. 6 note 8.

⁷ Fort and Aragón, 1.

⁸ Details on ENAHO data set for rural households discussed in full version of paper.

⁹ Debraj Ray, *Development Economics*, (Princeton, NJ: Princeton University Press, 1998), 25-33.

¹⁰ *Ibid.*, 32, note 16.

¹¹ Detailed in the full version of the paper.

¹² The usage of travel time as a proxy for road infrastructure is justified and tested in the full version of the paper.

¹³ There is a problem of simultaneity in model (5) between the dependent variable (consumption) and the independent income per capita variable because causality could run in both directions. However, in this case of a fixed-panel regression, reverse causality (from increased consumption to increased income) can be dismissed because the effects of increased consumption on income would be of far lesser magnitude than the immediate connection between receiving higher income and consequently consuming more.

¹⁴ Detailed in the full version of the paper.

¹⁵ This assumption would weaken over longer time periods because an increase

in consumption of goods that improve the quality of life may improve people's health, good spirits, etc., thus increasing income via increased productivity. However, for the short time span in this paper this concern can be dismissed because increases in productivity due to personal characteristics outside of the controlled human capital variables is probably negligible.

¹⁶ Detailed in the full version of the paper.

¹⁷ Measurement error may be quite frequent in the sample, especially for small changes in reported travel time. Since the data for this variable is gathered by asking an authority figure in the conglomerate the duration of travel time to the nearest district capital, it is likely that in two different years a different time might be reported when in fact the "true" travel time has not changed.

¹⁸ Explained in the full version of this paper.

¹⁹ Brooke R. Thomas, "The Evolution of Human Adaptability Paradigms," in Building a New Biocultural Synthesis: Political-Economic Perspectives on Human Biology, eds. Alan H. Goodman and Thomas L. Leatherman (Ann Arbor, MI: University of Michigan Press, 1998), 65.

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